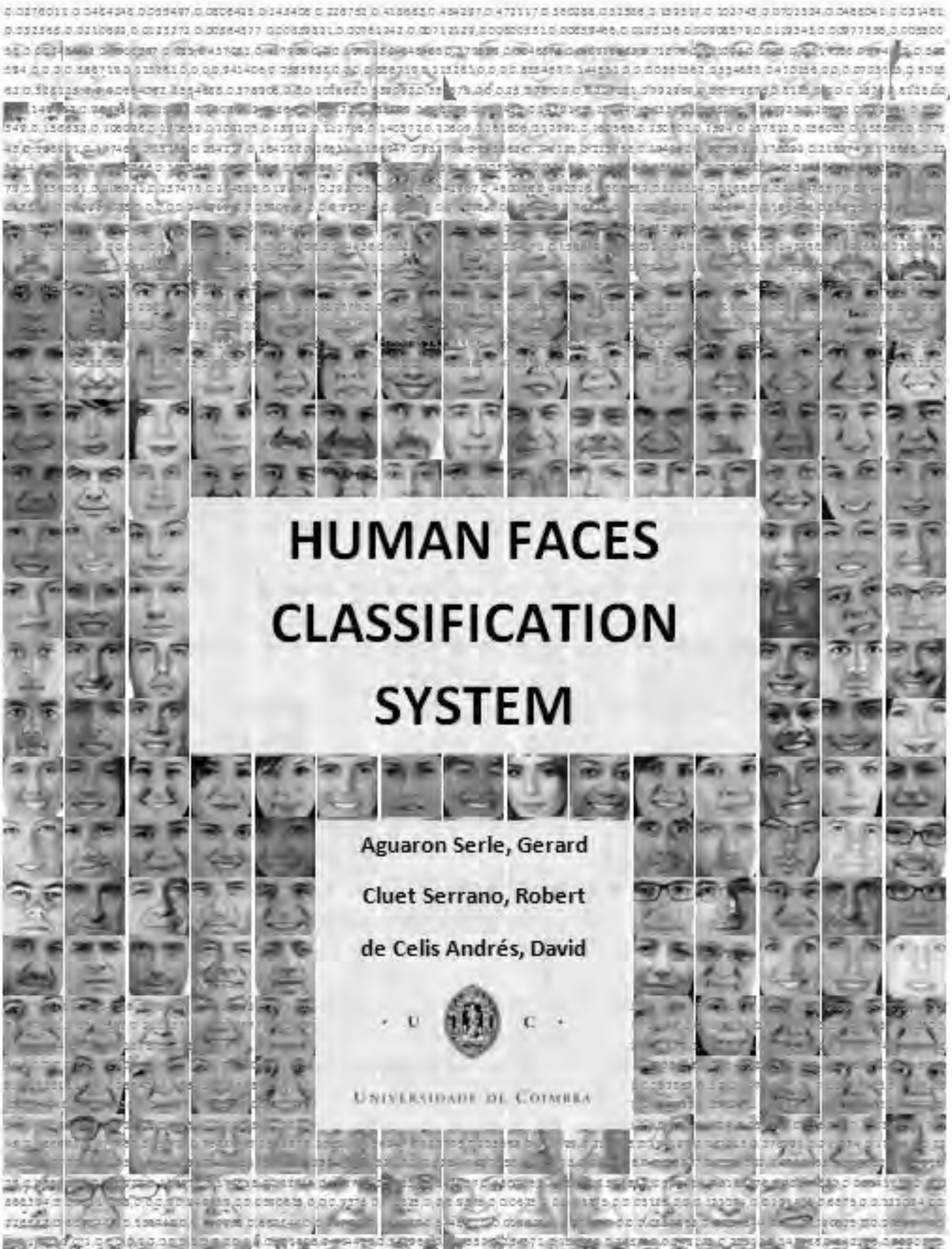


HUMAN FACES CLASSIFICATION SYSTEM

Aguaron Serle, Gerard

Cluet Serrano, Robert

de Celis Andrés, David

· U · C ·

UNIVERSIDADE DE COIMBRA

FACULTY OF SCIENCES AND TECHNOLOGY

UNIVERSITY OF COIMBRA

Human Faces Classification System

Aguaron Serle, Gerard

Cluet Serrano, Robert

de Celis Andrés, David

September 2013

This thesis was done under the supervision of Dr. Nuno Miguel Mendoça da Silva Gonçalves

“Departamento de Engenharia Electrotécnica e Computadores da Faculdade de Ciências e Tecnologia da Universidade de Coimbra”

Acknowledgements

Firstly, we would like to express our gratitude to our advisor Dr. Nuno Gonçalves, for accepting us as his students even being out of time to start the project, and for all the help and support given throughout the time of the work realization.

We would like to thank Dr. Paulo Coimbra, the responsible of the incoming Erasmus students, to help us in the beginning of the stay in Coimbra and to welcome us in the Universidade de Coimbra.

We would like to thank all the students in the Computer Vision Laboratory, especially to Antonio Videira, for his kindness and comprehension with us.

We would like to thank our friends and family, for the great support given.

Finally, we thank both universities; Universidade de Coimbra and Universitat Politècnica de Catalunya to allow us do this project and live this great experience.

Table of contents

List of Figures

Annex figures

16. White, Black and Asian comparison 248

List of Tables

Annex tables

Chapter 1

Introduction

1.1. Motivation

With the evolution of the technologies associated with information, our society is more electronically connected every day. Tasks that were traditionally performed by humans are, thanks to technological improvements, made by automated systems. Among the wide range of possible activities that can be automated, those related to the ability to establish the identity of the individuals has assumed importance.

The digital image processing has a number of advantages over the images stored on paper, so that their use has grown exponentially in recent years. One advantage offered by these images is the large storage capacity in a small physical space. This has meant that the volume of images generated is so large, it has been necessary to implement systems to classify these images automatically.

Nowadays, in the digital period, the image analysis takes importance and there are growing different fields of application. This project could be applied in several areas of the image classification i.e., criminal research, plastic surgery, amongst others.

1.2. Project Objectives

The objective of this project is the design, implementation and evaluation of a system for human faces classification. To train the system we will utilize a database of 150 or 500 human face images (small database and big database) where the true data (age and gender) is known and to evaluate it, we will use another set of 150 human face images where the true data is not known (test database), so that the system assigns a code (age and gender) to each of the input pictures. So in conclusion, there are 2 databases where the true data is known (small and big databases) and 1 database of test images to check the results of the programs (test database).

In this project is intended to classify a set of images called “test” from the extraction of their most important features (after a preliminary study of the set of images from the big database to identify which set of features provides more information) by encoding, in a way that allows performing different classifications of the human faces images according to age.

For the images classification a big volume of features and its combinations have been studied, in a global form of a complete image as well as in a local form, extracting features of sub-images of a complete image that has been previously divided, being these local features more robust being these local features more robust to translations and other global form transformations.

The system design is made in such a way that it is flexible and modular, so they can extend their applications to other human faces classification as according to ethnicity, the gender, the age, the expression and some more applications.

1.3. Document Structure

The content of this report is divided into the following chapters:

- ***Chapter 1: Introduction***

The first chapter gives an overview of the “why” of this project, presents the work objectives to be achieved and describes the structure of the full document.

- ***Chapter 2: State of the Art***

The second chapter is the theoretical introduction in which it is based the subsequent design and implementation of the human face classification. It introduces some concepts of digital image analysis and then discusses in detail the Content Based Image Retrieval (feature extraction and classification).

- ***Chapter 3: Analysis of the human faces classification systems***

The third chapter describes the different modules in which the images classification system designed is divided, with special emphasis on the features extraction module and the features and images classification modules. Also describes the implementation of the functions used in Matlab.

- ***Chapter 4: Implementation of the human faces classification systems***

The fourth chapter talks technically about the programs and functions that make up the system (images classification functions and programs).

- ***Chapter 5: Results Analysis***

The fifth chapter analyses the results obtained from the programs and functions and the changes that have been made to improve the results.

- ***Chapter 6: Conclusions***

The sixth chapter reviews the proposed objectives and exposes the possible improvements to make the Human Faces Classification System more accurate.

Chapter 2

State of the Art

2.1. Image Analysis Introduction

The image analysis discipline constitutes a broad field of study and research in various disciplines with multiple applications. In this sense, cartographers, mathematicians, physicists, engineers, etc. continue investigating multiple issues in this field. [32]

2.1.1. Image digital basics

The smallest element that can be found in a digital image is the pixel, which is the abbreviation of the English expression "picture element". As it has been said, it is the smallest element of an image that can be applied color or intensity individually or it can be distinguished from the others by a particular procedure.

A group of pixels forms a digital image, each one with an associated intensity or brightness value. The digital image is represented by a dimensional array, such that each element of the array corresponds to each pixel in the image.

Depending on the range of the values that can take each pixel the following types of images can be distinguished:

- **Binary Images:** The range is formed only by the black and white values {0 1}.
- **Intensity Images:** Also known as grayscale images, there are up to 256 levels of gray, so its range is between [0, 255].

- **Color Images:** Any RGB color is composed by three basic components. The content of each image pixel is a triplet of values, one value for each basic color component.

2.1.2. Hierarchy image analysis

The different processes and tasks of image analysis can be divided into four categories summarized in the Table 2.1.

Category	Processes and Algorithms	Tasks
System Level	Store, access and display images on screen	Manipulating digital images
Low Level	Improve or enhance images	Images processing
Medium Level	Grouping and segmenting images	Extract simple features
High Level	Understand images	Object recognition and image interpretation

TABLE 2.1. *Category, Processes and Algorithms and Tasks of image analysis.*

2.2. Content Based Image Retrieval

The Content Based Image Retrieval (CBIR) is one of the computerized vision techniques applications that attempt to solve the image classification problem. [33]

That these systems are "Content Based" means that the images classification will analyze the real content of them, rather than the meta-information, such as keywords that are labeled with the images or own descriptions thereof. In this context the term "Content" is referred to the color, shape, texture, or any other information that may result from the image. The results obtained in systems that are based on classification by meta-information (also called "Text Based") produce many incorrect results, and this is the reason that the Content Based systems are preferable.

The development of our system will be specific to the context in which it is working (in this case the human face classification) because the database will be organized and codified according to this context, and also because depending on the requirements of the specific problem being addressed, the features that more information provide may vary. The following sections will explain the different features which can be obtained from an image and the form to extract them.

Generally these image classification systems are composed of two modules:

1. Features extraction module: image features (previously selected as those that provide more information in each case) are extracted.

2. Image classification module: from the features of an image, the system falls into a class (or provides an encoding).

2.3. Image Features

A large number of features can be extracted from an image, this features can be divided in two groups: low-level visual features or physical features and high-level visual features or logical features based in the object recognized.

Low-level visual features or physical features

Describes basic visual features as the color, shape, texture and the localization, and allows finding a connection between the pixels that make up a digital image and the human memory of an image. These features can be extracted quantitatively from the original image.

Color:

It is the most basic feature of the visual content of an image. Color is a visual perception generated in the brain when interpret the nervous signals sent it by photoreceptors of the eye retina. They interpret and make out the different wavelengths that receive from the visible part of the electromagnetic spectrum.

Shape:

Humans can recognize objects seeing its shape, so it is a very important image feature. This information is extracted through segmentation.

This feature allows getting the different areas that are in an image, defining borders, structures and some more.

Texture:

This feature characterizes the different textures of regions of an image, the homogeneity or heterogeneity and the borders of these regions, so it characterizes the relationship between the pixels.

The texture is a visual entity that describes a structural order or direction in the elements that there are in an image. Through it, the person who views the image has the feeling to recognize the tactile sensations that would experience when touching a certain area.

There are to study the neighborhood of a group of pixels to obtain a description about the texture of a pixel, because it is not defined. Depending of the neighborhood size elected the texture can be different and have different characteristics: uniformity, density, coarseness, roughness, regularity, linearity, direction, frequency, sentence and some more.

Localization:

This feature allude the different elements that there are in an image and is used to describe these elements in the spatial domain, identifying its orientation inside the set.

High-level visual features or logical features based in the object recognized

They provide information about the elements that are in the scene and the relation between them.

These features are not easy to extract and less when it is an automatic extraction. By subdividing the image many times the information about the different elements can be destroyed. This is a problem; therefore within this kind of visual features different image segmentation methods are used to keep the complete elements that are looked for to recognize them.

Invariant Features

There is another type of features that are invariant to certain transformation applied to images, such as rotations, translations or interpolations. These features are taken into account when classifying the images.

2.4. Features Extraction

To the design of the classification system of images it is necessary to process and identify the features of each image to be stored in the database.

The first approach to compare the features of the images could be directly assessing the pixel array, and for that all images should have the same dimension. This solution is not typically used for several reasons; first images usually do not have the same size so it would require a re-scaling. On the other hand, for large images may be a too laborious operation due to the large number of pixels compared. But the most important reason not to use this image comparison is that the information given by the comparison of the pixels value refers only to the color, and not to the other features such as the shape, texture or orientation.

For these reasons are used other tools that allow to make a more general comparison of the image features. To make this comparison usually it is done a re-scaling of the images for several reasons: first of all in order to all the images have the same size and can be compared more easily, secondly to reduce the complexity of the pixel array of the image. With the scaled down image it is achieved a representative sample of the original pixels (is common to apply filters over the image before making the scaling to highlight details that may be interesting and not lose that information).

The image features extraction is going to do globally extracting the features of the complete image, and locally segmenting the image and obtaining the features of each part separately. There are several options when it comes to dividing the image, because it can be used fixed-size windows or it can be searched previously selected regions.

In this way, with the global and local features we will obtain a set of features that allow getting as much information as possible in order to perform the image classification.

2.4.1. Color processing tools

Histogram

It is a graphical representation of the values of a variable using bars. Each bar represents a value of the variable and the height of the bar shows the apparition frequency of that value. In that case each bar represents a grayscale level or interval of levels. This representation gives information about the brightness and the contrast of the image, and can help to adjust those parameters. [23]

In the color images case, the histogram provides the occurrence frequency of the different color hues; in case of black and white images gives the information of the different image shades in the grayscale. For color images must be worn three histograms, one for each basic color. In this case will be used a single histogram that contains the values from white to black (grayscale).

With this tool an image description is obtained globally. If the bars are more high (more frequency) in the white area, the image will be more clear, and if the bars are more high in the black area will be more dark. About this representation can conclude also that if the values are concentrated in a small bar numbers, a histogram with narrow profile, will be working with a low contrast image, else if is a dispersed histogram the contrast will be high.

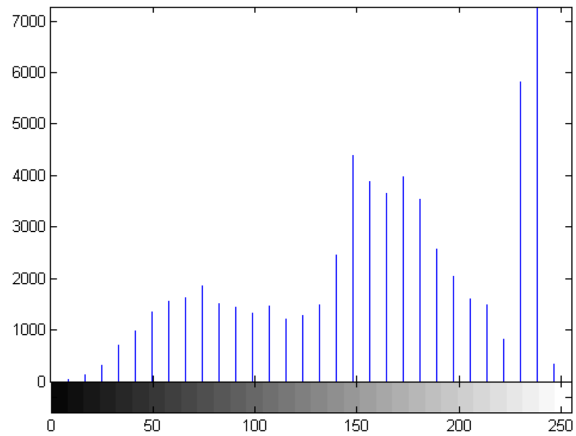


FIGURE 2.1. *Histogram example.*

2.4.2. Texture processing tools

Gabor filters

The Gabor filters are linear filters whose response to an impulse is a sinusoidal function multiplied by a Gaussian function. Introducing this Gaussian surrounding the Gabor functions are located in the domain and frequency spatial (not as the sinusoidal functions that they can only be localized in the domain of the frequency); it leaves a series of functions that allows represent signals instantly in both domains. [17]

Making the Fourier transform of a Gabor filter the Gaussian function, centered in the frequency of the sinusoidal function, is obtained.

The filtering of an image with Gabor filters is linked with the processes in the visual cortex of the humans and it has been used in the digital processes of images, because it has been checked that it is efficient to do segmenting textures, image compression, etc.

The Gabor filter form is given by the next expression: [23]

$$G(x, y, f_0, \sigma_x, \sigma_y, \theta_k)Ç = exp\left(-\frac{1}{2}\left(\frac{x_{\theta k}^2}{\sigma_x^2} + \frac{y_{\theta k}^2}{\sigma_y^2}\right)\right) \cdot exp(2\pi i \cdot f_0 \cdot x_{\theta k}) \quad \text{with k} = 1,2, \dots, \text{m}$$

Where:

- $x_{\theta k} = x \cdot cos(\theta_k) + y \cdot sin(\theta_k)$
- $y_{\theta k} = -x \cdot sin(\theta_k) + y \cdot cos(\theta_k)$
- f_0 : Frequency of the flat sinusoidal wave.
- θ_k : K-th Gabor filters orientation.
- σ_x : Standard Gaussian surrounding deviation in the x axis.
- σ_y : Standard Gaussian surrounding deviation in the y axis.

To apply the Gabor filter are necessary three parameters previously specified:

- Frequency of the flat sinusoidal wave in a given direction (can be given also the wavelength that is directly related with the frequency).
- Filter orientation (All the directions are quantized to cover the space [0 pi]).
- Both standard deviations, σ_x and σ_y.

Tamura characteristics

The Tamura's filters provide six useful characteristics for the analysis of the texture of an image. These six characteristics are: coarseness, contrast, directionality, line-likeness, regularity and roughness. The first three have a big similarity to the human perception of the images, so can be taken into account to identify and classify images. There are characteristics associated with each pixel of the image. [23]

<u>Coarseness</u>:

Coarseness gives information about the size of the textures of the image. If the textures follow a macro-pattern and a micro-pattern, always the biggest pattern is considered. How to do is applying different size operators as explained below:

Step 1. For every pixel (x, y) calculate the average over neighborhoods. The sizes of the neighborhoods are powers of two:

$$A_k(x,y) = \frac{1}{2^{2k}} + \sum_{i=1}^{2^{2k}} \sum_{j=1}^{2^{2k}} pixel\left(x - 2^{k-1} + i, y - 2^{k-1} + j\right)$$

Step 2. For every point (x, y) calculate differences between the not overlapping neighborhoods on opposite sides of the point in horizontal and vertical direction:

$$E_k^h(x,y) = \left|A_k\left(x + 2^{k-1}, y\right) - A_k\left(x - 2^{k-1}, y\right)\right|$$

and

$$E_k^v(x,y) = \left|A_k\left(x, y + 2^{k-1}\right) - A_k\left(x, y - 2^{k-1}\right)\right|$$

Step 3. At each point (x, y) select the size leading to the highest difference value:

$$S(x,y) = max_{d=h,v}\{E_k^d(x,v)\}, \qquad k = \{1, \ldots, 5\}$$

Step 4. Finally take the average over 2^S as a coarseness measure for the image:

$$F_{cr\,s} = \frac{1}{m \cdot n} + \sum_{x=1}^{m} \sum_{y=1}^{n} 2^{S(x,y)}$$

Where "m" is the height and "n" is the width.

Contrast:

It is a characteristic that is influenced by the levels of gray, the polarization in the white and black levels, the definition of the edges and the repetitive patterns period:

$$F_{cont} = \frac{\sigma}{\alpha_4^z} \qquad con\ \alpha_4^z = \frac{\mu_4}{\sigma_4}$$

$$\mu_4 = \frac{1}{XY}\sum_{x=1}^{X}\sum_{y=1}^{Y}(pixel(x,y) - \mu)^4$$

Where "μ_4" is the fourth moment around the mean, "σ_4^2" is the variance of the grey values in the neighborhood and "z" have been configured experimentally as $^1/_4$.

Directionality:

Defines the orientation of the texture:

$$\Delta_H = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix} \qquad \Delta_V = \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

$$|\Delta G| = \frac{\Delta_H + \Delta_V}{2}$$

For each position (x, y) the angles orientation is calculated:

$$\theta = \frac{\pi}{2} + tan^{-1}\left(\frac{\Delta_H(x,y)}{\Delta_V(x,y)}\right)$$

The orientation value will be conceivable between 0 and pi, measured in the direction of clockwise so that the horizontal direction is zero. The histogram H_D is obtained quantifying θ and counting the number of points with a $|\Delta G|$ magnitude over a threshold "t".

To measure quantitatively the histogram directionality must be measured the acuity of the ridges. The approach that it is done is to add the second moments around each maximum of one valley to another valley:

$$F_{dir} = 1 - r \cdot n_p \cdot \sum_{p}^{n_p}\sum_{\Phi \in w_p}(\Phi - \Phi_p)^2 \cdot H_D(\Phi)$$

Where "n_p" is the number of peaks, "Φ_p" is the position of the p-th peak of H_D and "w_p" is the range of the p-th between valleys.

Line-likeness:

When the direction of a pixel and its neighbors is very close, all of them are represented by a single line. So is built an address concurrency matrix whose element $P_{Dd}(i,\ j)$ is defined as a relative frequency with which two neighboring cells are found separate a "d" distance along the edge direction that happens in the image, one with "i" direction and the other with the "j" direction.

$$F_{lm} = \sum_{i}^{n}\sum_{j}^{n} P_{Dd}(i,j) \cdot \cos(i-j) \cdot \frac{2\pi}{n} / \sum_{i}^{n}\sum_{j}^{n} P_{Dd}(i,j)$$

Where P_{Dd} is the local concurrency matrix of nxn size of the points in a "d" distance.

Regularity:

Describe mathematically the repetitive patterns, although doesn't result simple to analyze the regularity of the natural objects, because it is difficult to give an irregularity degree without have dates of the element size and shape. If any texture feature varies along the entire image, it image is irregular. Alike, the image can be divided into several subimages and consider the variation of each of the features in each subimage. As a regularity measure, may be considered the sum of the variation of the four features discussed above:

$$F_{reg} = 1 - r \cdot (\sigma_{coar} + \sigma_{cont} + \sigma_{dir} + \sigma_{ll})$$

Where "r" is a normalization factor and "σ_x" the standard deviation of each of the involved features.

Roughness:

Is linked to the coarseness and the contrast:

$$F_{reg} = F_{coar} + F_{cont}$$

Edge filter

To apply this filter, it is required to analyze the image in 16 different squares, so it is divide in 4 rows and 4 columns the image. Then, a loop has to be created to travel around all the 16 squares and complete the entire image.

I_{11}	I_{12}	I_{13}	I_{14}
I_{21}	I_{22}	I_{23}	I_{24}
I_{31}	I_{32}	I_{33}	I_{34}
I_{41}	I_{42}	I_{43}	I_{44}

FIGURE 2.2. *Image divided*

Inside the loop, the edge code is developed. There are five kinds of edge filter depending on the applying direction. These are horizontal, vertical, both, 45º and 135º.

There are a lot of methods to work with Edge filters. In this project, only two are used: the "Sobel" and the "Roberts". [12][13]

The first, like the name indicates it is based in the Sobel operator. This is an operator used in image processing, generally in edge detection. It works applying a horizontal and a vertical filter sequence. Both are applied to the image and then summed to obtain the final result. They are basic convolution filters, in the way that:

a)

1	2	1
0	0	0
-1	-2	-1

b)

-1	0	1
-2	0	2
-1	0	1

c)

p1	p2	p3
p4	p5	p6
p7	p8	p9

FIGURE 2.3. *a) Horizontal filter. b) Vertical filter. c) Image pixels.*

So, if the image is as in FIGURE 2.3. the horizontal filter centered in p5 is calculated like:

$$new_{pixel_{intensity}} = p1 + (p2 + p2) + p3 - p7 - (p8 + p8) - p9$$

And the vertical filter centered in p5 is calculated like:

$$new_{pixel_{intensity}} = p3 + (p6 + p6) + p9 - p1 - (p4 + p4) - p7$$

So, the final intensity is the addition of both:

$$final_{pixel} = (p1 + (p2 + p2) + p3 - p7 - (p8 + p8) - p9) + (p3 + (p6 + p6) + p9 - p1 - (p4 + p4) - p7)$$

On the other hand, the Roberts operator performs a 2-D spatial gradient on an image. It works with a grayscale images and it estimates the absolute magnitude of spatial gradient in one point in the input image and represents it in the output.

This operator is basically a pair of 2x2 convolution kernels[1] where one is the other rotated 90º.

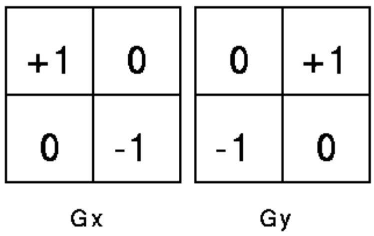


FIGURE 2.4. *Convolution kernels.*

One of them gives the 45º result and the other the 135º.

Finally, the number of values non zero are counted and saved. These are the final results, the number of ones in the figure. So, the edge vector result is a vector of 16x5 values: 80 values.

[1] In an image processing the input arrays are normally just a gray level image. The second array is usually much smaller, and is also two-dimensional and is known as the kernel. The convolution is performed by sliding the kernel over the image, generally starting at the top left corner, so as to move the kernel through all the positions where the kernel fits entirely within the boundaries of the image. Each kernel position corresponds to a single output pixel, the value of which is calculated by multiplying together the kernel value and the underlying image pixel value for each of the cells in the kernel, and then adding all these numbers together.

2.4.3. Other tools

To analyze the shape of an image are used the morphological processing elements, which when are displaced around of the image give information about the relative position of the element with respect to the plane and the bottom of the image. The morphological processing element is situated in the center of each pixel of the original image and is applied a morphological operation on all the pixels that are located below the element. There are different element types of morphological processing elements:

- **Anti-extensive:** the result of the morphological operation is contained in the original set.
- **Extensive:** the result obtained of the morphological operation contains the original set.
- **Dilation:** each white pixel of the original image is replaced by a replica of the structuring element.
- **Erosion:** each pixel of the original image where the structuring element cannot be is eliminated.
- **Opening filters:** combines an erosion operator and a dilation operator with the same structuring element.
- **Closing filters:** combines a dilation operator and an erosion operator with the same structuring element.

Then a brief explanation of other tools for image features extraction which will be used in this project but that are equally important is described:

Laws filters

These features gives information about the energy of the structure of an image, and are calculated from a convolution filters with the image to study and then performing a windowing operation non formal. [34]

Co-Occurrence Matrix

The Co-Occurrence Matrix is a very useful tool for image texture analysis and pattern discrimination. This matrix provides spatial information in the form of relative position between different intensity levels inside of the texture. When the matrix is obtained the texture information is characterized by their second-order statistical moments. [35]

2.5. Features Classification

Chi Square criterion

There are basically two kinds of statistical procedures which test hypotheses involving different assumptions. These are parametric and nonparametric statistical procedures. [8]

Parametric:

These are based on the assumption that the samples come from populations that are normally distributed and they assume that there is homogeneity of variance between groups. The level of measurement for parametric tests is assumed to be interval or at least ordinal. They are more powerful, but they always require numerical data.

Nonparametric:

These do not required that the samples come from populations that are normally distributed and they do not need to assume that there is homogeneity of variance between groups. They are designed for ordinal or nominal data. They are less likely to reject the null hypothesis when it is false and they are easier to compute. They can be used to treat data which have been measured on nominal (classificatory) scales.

The Chi Square Criterion is a nonparametric statistical test. It is employed to test the difference between an actual sample and another hypothetical or previously established distribution. The Chi-squared statistic is the sum of the squares of the differences of observed and expected frequency divided by the expected frequency for every cell:

$$X^2 = \sum \frac{(Observed\ frequency - Expected\ frequency)^2}{Expected\ freqency}$$

In this project, the expected frequency is 30 for each group in the small database and 100 for each group in the big database. For each feature, the program has to count how many images are in each group. The best features are the ones which the Chi Square result is minor, i.e., there are two cases for the big database: observed frequency 1 = 89 and observed frequency 2 = 56. The Chi Square result for them is:

$$X_1 = \frac{(89-100)^2}{89} = 1{,}359$$

$$X_2 = \frac{(56-100)^2}{56} = 34{,}571$$

That means that the first one is better.

Finally it is only necessary to choose how many features are wanted to use (5 features, 10 features, 20 features or 40 features).

2.6. Image Classification

Once all the image features have been obtained, and have been studied to find the set of all that provides more information for the particular application (in the global form and in the local form), the classification tasks must be carried out.

The Naive Bayes Classifier is based on the Bayesian theorem and it is a classification method. [6]

<u>The Bayesian theorem</u>:

This theorem expresses the conditional probability of a random event "A" given "B" in terms of conditional probability distribution of the event "B" given "A" and the marginal probability distribution of only "A".

The Bayesian theorem is very important because link the probability of "A" given "B" with the probability of "B" given "A".

Being {A_1, A_2, A_3, ..., A_i, ..., A_n} a group of events mutually exclusive and exhaustive and such that the probability of it is different to 0. Being "B" any one event which is known conditional probabilities $P(B|A_i)$. Then, the probability of $P(A_i|B)$ is given by:

$$P(A_i|B) = \frac{P(B|A_i) \cdot P(A_i)}{P(B)}$$

Where:

- $P(A_i)$ is the a priori probability.
- $P(B|A_i)$ is the probability of B on the hypothesis A.
- $P(B)$ is the a posteriori probability.

Naive Bayes Classifier

The easiest way to understand the Naive Bayes Classifier is with an example. It is considered this example with green and red objects:

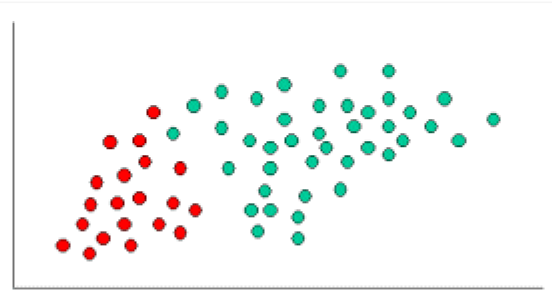


FIGURE 2.5. *Distribution example.*

If it is desired to classify a new point as green or red it is obviously to think that there are more probabilities that this would be green than red. Exactly, the options are:

$$Probability\ of\ green = \frac{Number\ of\ green\ points}{Number\ of\ total\ points} = \frac{40}{60}$$

$$Probability\ of\ red = \frac{Number\ of\ red\ points}{Number\ of\ total\ points} = \frac{20}{60}$$

If a new point appears and it is wanted to classify it, it is logical to think that if it has more green (or red) points near, it will be green (or red). So it is required to analyze the vicinity of the new object or point:

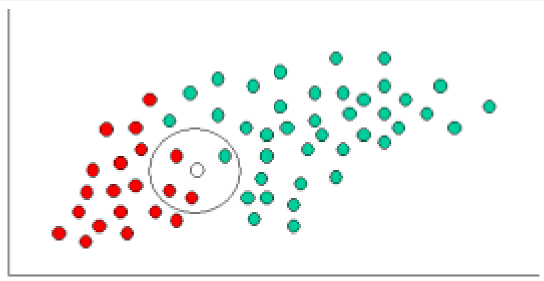


FIGURE 2.6. *Vicinity distribution example.*

$$Probability\ of\ X\ given\ green = \frac{Number\ of\ green\ in\ the\ vicinity\ of\ X}{Number\ of\ total\ green\ points} = \frac{1}{40}$$

$$Probability\ of\ X\ given\ red = \frac{Number\ of\ red\ in\ the\ vicinity\ of\ X}{Number\ of\ total\ red\ points} = \frac{3}{20}$$

Having this, it is easy to calculate the final probability as:

$$Probability\ of\ X\ given\ green = \frac{4}{6} \cdot \frac{1}{40} = \frac{1}{60}$$

$$Probability\ of\ X\ given\ red = \frac{2}{6} \cdot \frac{3}{20} = \frac{1}{20}$$

So the new object will be red.

But the Naive Bayes Classifier can work with a set of variables. When it happens the Naive Bayes can reduce high-dimensional density estimation to one-dimensional kernel density estimation. Naive Bayes can be modeled in several different ways including normal, lognormal, gamma and Poisson density functions. In this case, it is modeled in a normal density function, so the conditional density will be calculated like:

$$p(xk|Cj) = \frac{1}{\sigma_{kj}\sqrt{2\pi}} \exp\left(\frac{-\left(x - \mu_{kj}\right)^2}{2\sigma_{kj}}\right)$$

Where μ is the mean and σ the standard deviation.

Chapter 3

Analysis of the human faces classification system

3.1. System Architecture

As discussed in previous chapters, the aim of this project is the implementation of a human faces automatic classification system according to the chosen parameters. In this case the parameters are the age and the gender.

During the project design a series of decisions are taken:

1. Feature extraction tools. The feature extraction tools used are explained in the previous chapter.
2. Chosen feature set for the images classification (once the big database images have been processed is decided which features are more representative for the further image classification with which it will work).
3. Human faces classification algorithm. The classification algorithm chosen will be expressed in this chapter.
4. Created functions. To make the different images classification has been created a set of functions that will be displayed in this chapter.
5. Big database structure used. The big database that will be used is detailed in this chapter.
6. Set of test images (small database).

The system developed in this project will follow some steps which are represented in the following block diagram:

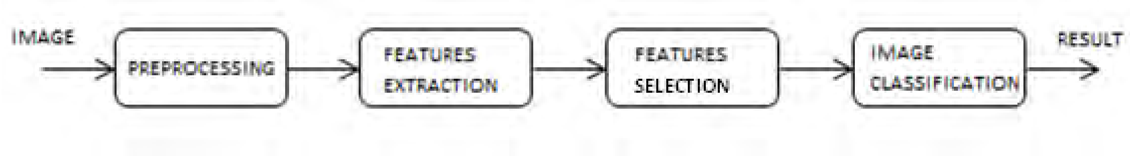


FIGURE 3.1. *System block diagram.*

Preprocessing:

It receives an image as input and sends it to the big database after converting the image to gray and to the set size.

Features extraction:

It receives the preprocessed image as input and returns a features vector. This vector is obtained by the tools explained in the state of the art chapter.

Features selection:

It receives the features vector as input and returns which of them are the most representative of the image. The test that evaluates the features is called Chi-square and is explained in this chapter.

Image classification:

It receives the most representative features of the image as input and returns the image classified according to the established parameters. This process is carried out thanks to the Naïve Bayes classifier.

3.2. Tools used

In this chapter, it is explained the tools which have been used. Mainly, the project has been done with Matlab program. Moreover, Putty program and WinSCP program are used too.

Matlab

Matlab is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. You can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing. [4]

Putty

Putty is a free and open-source terminal emulator; serial console and network file transfer application. It supports several network protocols, including SCP, SSH, Telnet and rlogin. [19]

WinSCP

WinSCP main function is file transfer between a local and a remote computer. Beyond this, WinSCP offers scripting and basic file manager functionality. [15][19]

3.3. Database

As have been discussed above, in this project it has been used three different images database. The two firsts are composed by 150 and 500 human faces (small database and big database) and they have been used to extract the feature vectors of the images, identify which are the most representative and in this manner can classify efficiently the human faces images. The third one is an image set (test database) composed by 150 human faces and it is used to test the classification functions.

3.3.1. Big database

This database consists of images obtained in the Google Image searcher. It is formed by 500 people who are divided equally by women and men and distributed in 5 groups of 100 people each according to age. The images are converted to grayscale and all of them are the same size (256x256). The 5 groups listed above are between these ages:

- 20 – 29 years old
- 30 – 39 years old
- 49 – 49 years old
- 50 – 59 years old
- More than 60 years old

As can be seen below, the images are not taken in a controlled environment, even so it has been tried that a single face appears on each image, that it fills most of the image, that the face is as centered as possible and the picture is facing forward. Also two pictures have been taken for each person, one of the entire face including the hair, forehead and ears, and the other reducing to only the eyes, nose and mouth waiting better results than the no cropped images.

FIGURE 3.2. *Reduced faces example of the big database.*

FIGURE 3.3. *Entire faces example of the big database.*

For this project 500 pictures have been considered that are enough to check the system operation.

3.3.2. Small database

The small database is exactly the same database as the big one, but only change that there are 30 images per group of ages. It is contained in the big database.

3.3.3. Test database

The Test database is a group of 150 human face images that are used to test the different programs. These images are independent of the other two databases (big database and small database).

The architecture of this database is the same of the other ones. It is formed by 150 people who are divided equally by women and men and distributed in 5 groups of 30 people each according to age.

3.4. Preprocessing

To construct the database which is necessary to perform the project, it is important to convert the original images in shades of grey images and [256x256] pixel images. This is useful to permit use the same programs with all the images.

To do the transformation, it has been used two programs: one program (Age 2) and one function (Age 1). [18]

Program Age 2

```
image=imread('image.jpg'); %%Read the different images
figure,imshow(image) %%Show the original image
[x,y]=ginput(2) %%Read the two points (x1,y1)(x2,y2) that you
point in the image

[image2]=age1(image,x,y); %%Call the function age1 and send to
it image, x(x1,x2) and y(y1,y2). Receive image2 as a result
imwrite(image2,'./Grey/name.jpg') %%Save the gray image with the
name.jpg in the carpet grey
```

In this program, the original RGB image is read and showed. Then, it is used the Matlab function "ginput" which permit to choose two points with the cursor and then save the coordinates. Using this, the points are chosen to frame the desired image.

Age 1 is the function created to convert the image into [256x256] pixels and into shades of gray. This is called sending him the two chosen coordinates and the original image. If the original image was a shade of gray image, the function change and it is called Agegray. It is exactly the same function without the command that converts the input image to shades of gray image.

Finally, it is only necessary to save the new image, received from the function age1 and saved as image2.

Function Age 1

```
function [imagefaceage]=age2(image,x,y)
[f,c]=size(image) %%f=number of rows; c=number of columns
t=(c/3); %%it solve the problem that the rows appears multiplied
by 3 %%(256x3)
x1=x(1); %%save the value of x1
x2=x(2); %%save the value of x2
y1=y(1); %%save the value of y1
y2=y(2); %%save the value of y2
```

```
imageface=imcrop(image,[((t-(y2-y1))/2) y1 (y2-y1) (y2-y1)]);
%%It cuts the image in the dimensions defined by [initial x,
initial y, high, width]
%%The original images are more wide than high, so it is
necessary to
%%convert the dimensions of the cut to adapt the image into a
square %%image (and then adapt to 256x256)

imageface_age=rgb2gray(imageface); %%Convert to shades of gray

imagefaceage=imresize(imageface_age, [256 256]);%%Reconvert to
256x256 %%pixel image
figure, imshow(imagefaceage); %%Show the image
```

The function age1 receives two points [(x1, y1) (x2, y2)] of the program Age 2. With the instruction ‘size’ it is obtained the number of rows (f) and the number of columns (c). All the original images have the columns multiplied by 3 in their dimensions, so it is necessary to reduce it with the value t=c/3. Then, the two points received from the program age2 are saved in the variables x1, x2, y1 and y2.

The Matlab instruction “imcrop” permits to cut the image in the desired dimensions. There is the problem that the original images are more wide than high, so it is not possible to convert into a square directly. For this, it is necessary to cut the image choosing the different points (x1,y1) and (x2,y2) and the dimension of the wide and the high.

To define the initial x, it is used t-(y2-y1))/2 to center the image and to avoid the problem with the different between the width and the height. Then, the side dimension of the new square image is defined for the height difference (that is least than the width difference). Finally, the last steps are converting the image to gray (rgb2gray), resize to [256x256] (imresize) pixel image and send it back to the age2 program.

a) b)

FIGURE 3.4. *a) Input Image. b) Output image.*

3.5. Features Extraction

To the study of the different features of the images, a test image of the big database has been selected. The image selection has been chosen randomly and converted to a greyscale and [256x256] pixel image.

FIGURE 3.5. *Example image.*

Histogram

This part contains the histogram of the original image

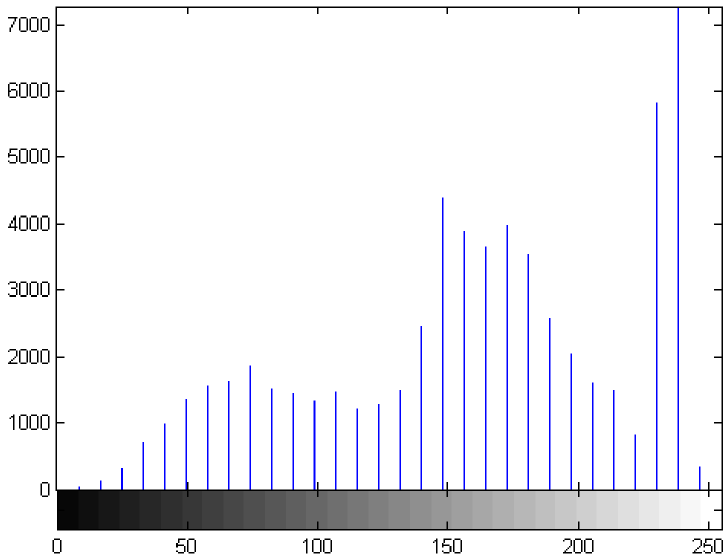
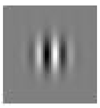
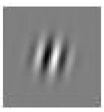
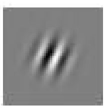
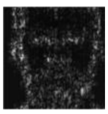


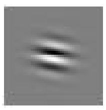
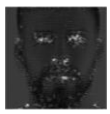
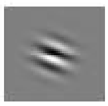
FIGURE 3.6. *Histogram of the example image.*

Gabor filter

With the Gabor filter, 16 directions of applications have been analyzed. This part includes these directions, the directions images and the Gabor application filter in the image.

<u>Original image</u>:

Direction	Direction Image	Filter Application
0		
$\frac{\pi}{16}$		
$\frac{2\pi}{16}$		

Direction	Direction Image	Filter Application
$\frac{8\pi}{16}$		
$\frac{9\pi}{16}$		
$\frac{10\pi}{16}$		

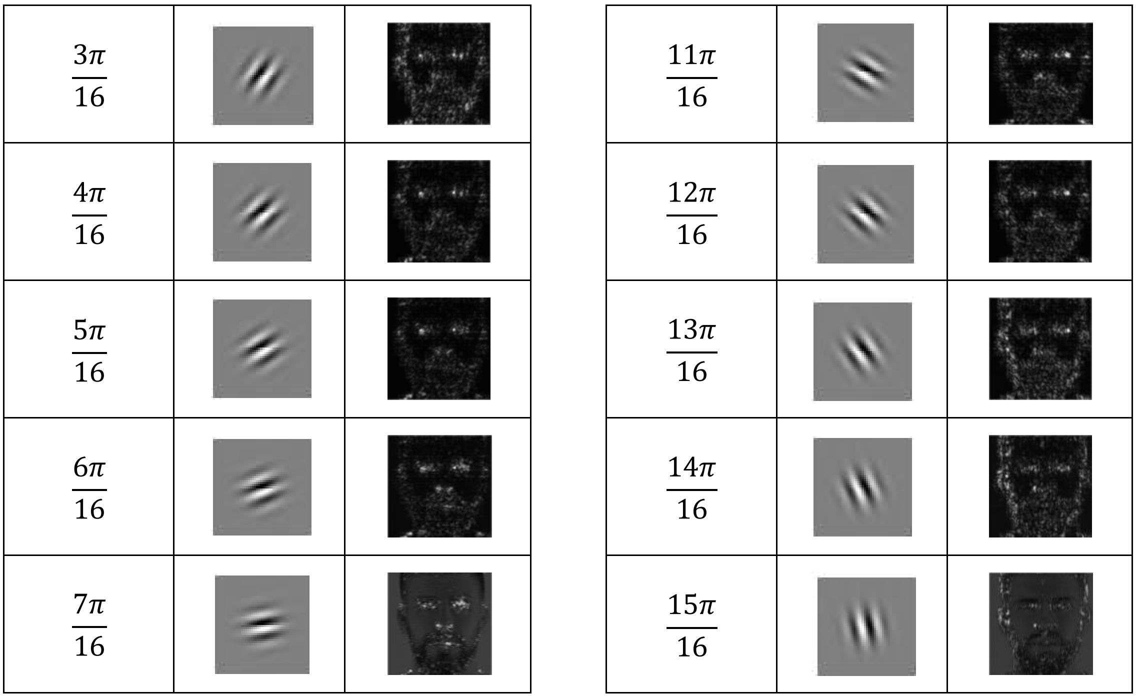


FIGURE 3.7. *Gabor filter of the example image.*

Tamura characteristics

In this part, the three Tamura values of the images have been extracted as it has been explained in the 2.4.2 chapter. The values are:

Fcoarseness	Fcontrast	Fdirection	DeltaT
47,6240	49,6700	0,6132	9,7501

TABLE 3.1. *Tamura characteristics of the example image.*

Edge filter

In this part, there is an image and the application of the different edge filters that are used in this project. It is important to remember that the original image is divided into 16 small images and the different filters are applied to them.

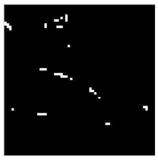
FILTER	IMAGE RESULT
Sobel horizontal edge detector image	
Sobel vertical edge detector image	
Sobel both edge detector image	
Roberts 45 degrees detector image	
Roberts 135 degrees detector image	

TABLE 3.2. *Edge filter of the example image.*

Given a group of images, an analysis of them is done, that is made by feature extraction. For this project the used features are: Histogram, Edge, Tamura and Gabor, which form a 256 vector values.

After making this extraction, the resultant features for the different groups where the images can be classified are evaluated.

A feature will be considered correct, if it has near values for the features of the same group images and it has distant values from the other image groups. This would allow a simple classification, example of that are the following images:

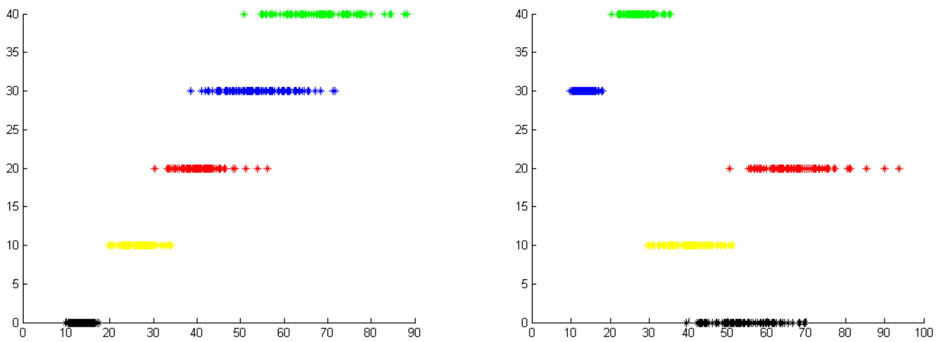


FIGURE 3.8. *Valid features*

A feature will be wrong if the features in the same images group are too similar to the features of another images group i.e.,

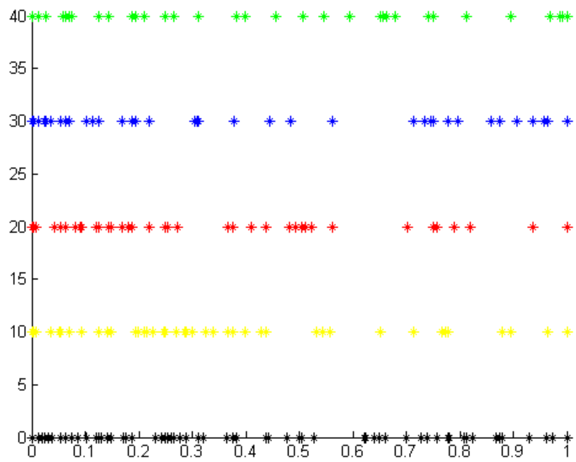


FIGURE 3.9. *Non valid features*

3.6. Features Classification

Chi Square criterion

To explain the Matlab code of the “Chi Square criterion”, it is explained the most difficult part in which it is applied. This is the “age estimation” program, because it is the only one that has 5 groups to classify the different images:

- 20 – 29 years old
- 30 – 39 years old
- 49 – 49 years old
- 50 – 59 years old
- More than 60 years old

While the other programs have only 2 groups:

- Man or women
- More or less 30 years old
- More or less 40 years old
- More or less 50 years old
- More or less 60 years old

To compute the Chi Square Criterion it is necessary to follow 5 steps. To explain it, it is supposed that the program works with the big database, which means 100 images per group and 500 total images. In the case that the program works with the small database it is only necessary to change 100 for 30 and 500 for 150.

The first step is to calculate the median vector for each class of images (100 images of 20-30 years old; 100 images of 30-40 years old; 100 images of 40-50 years old; 100 images of 50-60 years old and 100 images of more than 60 years old). Each image has 256 features, so the results of this step are five vectors (one for each group of ages) with 256 values (the median for each feature).

The second step is to calculate the limits for each feature that will permit to classify the images. To do this, it is necessary, for each feature, to sort the median values to calculate limits between them. It permits that limit12 < limit23 < limit34 < limit45 regardless of the group of images that it is found in any position. If the median values are not sorted, could be given, for example, that the limit12 > limit23, which would make difficult the classification. To permit the final classification, it is necessary to consider that any group of ages could be found in any limit.

For example, could be given:

- 60ormore < limit12 < 2030 < limit23 < 3040 < limit34 < 5060 < limit45 < 4050
- 2030 < limit12 < 3040 < limit23 < 5060 < limit34 < 60ormore < limit45 <4050
- 4050 < limit12 < 2030 < limit23 < 5060 < limit34 < 3040 < limit45 < 60ormore

For this, in the third step it is important to consider all the possibilities. The order is granted for the index of the sorted median vector.

In this way, it is associated to each group of ages an index:

- 20-30 → index1
- 30-40 → index2
- 40-50 → index3
- 50-60 → index4
- 60ormore → index5

When this is done, it is only necessary to do a count of numbers between the limits and associate it to O1, O2, O3, O4 and O5.

The fourth and the last step are only to apply the chi square criterion formula and save the 20 best values and indexes, that it is the same that save the 20 smallest chi results. If the user wants to change the number of the chosen chi results or chi index, the user can change it and increase it or decrease it.

This code is available in [Annex 2].

3.7. Image Classification

Naive Bayes Classifier

To do the code of the Naive Bayes classifier, first of all it is necessary to read the input image that it is necessary to classify. After, it has to be converted into a grayscale image to apply the different filters (Histogram, Gabor, Tamura and Edge).

Then, it is necessary to send to the function "Featurechi" the values of the first 20 chi square criterion results (or the desired ones), the 20 first indexes of the chi square criterion result (or the desired ones), the size of the group (100 images) and the total number of images (500). The result of this function will be a vector of five probabilities [p2030, p3040, p4050, p5060, p60ormore] for each value of the chi square criterion.

Finally, if these vector is related to different classes [class1, class2, class3, class4, class5], to calculate the probability of being in each class, it is only necessary to multiply the probability of each group (100 group images/500 total images) for its probability in the different "Featurechi" result vectors. For example:

```
%For class 2030
class=1;
p_2030=E/numimage;
finalprob_2030=p_2030*finalprob1(class)*finalprob2(class)*finalp
rob3(class)*finalprob4(class)*finalprob5(class)*finalprob6(class
)*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalpro
b10(class)*finalprob11(class)*finalprob12(class)*finalprob13(cla
ss)*finalprob14(class)*finalprob15(class)*finalprob16(class)*fin
alprob17(class)*finalprob18(class)*finalprob19(class)*finalprob2
0(class);
```

That would be the same as:

```
%For class 2030
class=1;
p_2030=E/numimage;
finalprob_2030=p_2030*finalprob1(1)*finalprob2(1)*finalprob3(1)*
finalprob4(1)*finalprob5(1)*finalprob6(1)*finalprob7(1)*finalpro
b8(1)*finalprob9(1)*finalprob10(1)*finalprob11(1)*finalprob12(1)
*finalprob13(1)*finalprob14(1)*finalprob15(1)*finalprob16(1)*fin
alprob17(1)*finalprob18(1)*finalprob19(1)*finalprob20(1);
```

Obviously, the biggest probability will be the group in which the image could be classified. The final code is available in [Annex 2].

If it is desired to work with the small database, it is only necessary to change the values of the group's images to 30 and the number of total images to 150.

Chapter 4

Implementation of the human faces classification system

4.1. Introduction

The design of image classification system has been implemented in Matlab, mathematical software offers an integrated development environment with a proprietary programming language *[Chapter 3.2.]*

4.2. Created Programs

All the programs created in the project are:

1. **Program “Age estimation”**

This program permits the user to classify the image into 10 years ages groups. These ages are 20 to 30 years old, 30 to 40 years old, 40 to 50 years old, 50 to 60 years old and more than 60 years old.

2. **Program “ManorWoman”**

This program is able to classify the images into two groups: men or women.

3. **Program “MoreorLess30”**

This program is used to classify the images between images of more than 30 years old and images of less than 30 years old.

4. Program "MoreorLess40"

This program can distribute the input images between the groups of more or less than 40 years old images.

5. Program "MoreorLess50"

This program permits to classify the images between images of more than 50 years old or images of less than 50 years old.

6. Program "MoreorLess60"

This program is able to distribute the input images between the groups of more or less than 60 years old images.

7. Program "age2"

This program can read an input image and convert it to an image of shades of gray and 256x256 pixel image.

8. Program "MoreorLessAll"

This program has the same objective as the "Age estimation" program, with the difference that this program is a combination of the "MoreorLess30" program, "MoreorLess40" program, "MoreorLess50" program and "MoreorLess60" program. With the results of them, the "MoreorLessAll" classify the images between the 10 years ages groups.

4.3. Created Functions

All the functions used in this project have been made to simplify the work and to avoid the repetition of code.

9. Function "Function"

This function permits the user to obtain a vector of 256 values. These are different features obtained to the application of the filters Gabor, Tamura, Edge and Histogram. The result of function is a vector composed by [rgb 1-32; edge 33-112; Gabor 113-240; Tamura 241-256].

10. Function "FeatureChi"

This function permits to calculate the vector of the probabilities of belonging to a 10 years group of ages [20-30, 30-40, 40-50, 50-60, 60 or more]. It is done to make possible to calculate the vector of probabilities for the requested chi value and chi index.

11. Function "FeatureManorWoman"

This function was done to calculate the vector of the probabilities of belonging to man images or, on the other hand, to woman images. It is done to make possible to calculate the vector of probabilities for the requested chi value and chi index value.

12. Function "FeatureMoreorLess30", "FeatureMoreorLess40", "FeatreMoreorLess50" and "FeatureMoreorLess60"

These functions permit to calculate the vector of the probabilities of belonging to more or less 30 years old images, to more or less 40 years old images, to more or less 50 years old images or to more or less 60 years old images. They are done to make possible to calculate the vector of probabilities for the requested chi value and chi index value.

13. Functions "Function2030", "Function3040", "Function4050", "Function5060", "Function60ormore", "FunctionLess30", "FunctionLess40", "FunctionLess50", "FunctionLess60", "FunctionMore30", "FunctionMore40", "FunctionMore50", "FunctionMore60", "FunctionMan" and "FunctionWoman"

These functions were created to obtain the median vector of the images in each group, i.e., the median vector of the 20 to 30 years old group, the median vector of the less than 40 years old images, the median vector of the man images and some more.

14. Functions "age1" and "agegray"

These functions can convert images to 256x256 pixels image and, if the image is a colour image, the function ‘age1’ convert the image to shades of grey image too. If the image is already a grey shades image, with the function “agegray” only change the size of the image.

15. Function “compute”

This function is necessary to compute the Gabor program.

4.4. Programs Code

In this project, all the programs were constructed in the same way. To minimize the explanations, it is explained an only one program and it is said what varies between them, in this case ‘age estimation’, and the others, ‘more or less 30’, ‘more or less 40’, ‘more or less 50’, ‘more or less 60’ and ‘man or woman’.

The first step consists in specifying the values for “E” and “numimage” (Big database: E=100 and numimage=500; small database: E=30 and numimage=150) and load all the database images.

Then it is necessary to calculate the median values for all the groups that are wanted to classify with a different function for each of them.

In the other cases there are only two functions: ‘Functionmore30’ and “Functionless30" for the program “MoreorLess30”, “Functionmore40” and “Functionless40” for the program “MoreorLess40”, “Functionmore50” and “Functionless50” for the program “MoreorLess50”, “Functionmore60” and “Functionless60” for the program “MoreorLess60” and “FunctionMan” and “FunctionWoman” for the program “ManorWoman”. All these functions are constructed with the same pattern.

The third step in the main program is to apply the “Chi Square criterion” as it is explained in [Chapter 2.5.].

Once the results of the “Chi Square Criterion” are obtained, it is necessary to start the classification. To do this, it is necessary to put a gray shades and 256x256 image and send it to the function called ‘Function’. This applies Gabor, Tamura, Edge and Histogram filters to the input image. The result is a vector of 256 features and this vector is saved into “imagevector” variable and into “evalimage” variable.

After, it is necessary to apply the 'Naive Bayes Classifier' as it is explained in [Chapter 2.6.] and the code of it is available in [Annex 2]. Depending on the numbers of features that are evaluated, it is necessary to call more or less times the function "Featurechi".

4.5. Functions Code

In the different programs appear some different functions that are explained in this chapter.

1. **Function "Function"**

This function permits to create a vector of 256 features of an input image. This vector is the result of the application of Gabor, Tamura, Edge and Histogram filters and it consists on [rgb1-32; edge 33-112; Gabor 113-240; Tamura 241-256].

This function code is available in [Annex 2].

2. **Functions "Featurechi", "FeatureManorWoman", "FeatureMoreorLess30", "FeatureMoreorLess40", "FeatreMoreorLess50" and "FeatureMoreorLess60"**

The set of all these functions is constructed in the same way. Between all of them there are only small variations. To understand the code, it is explained the most difficult one, "Featurechi", because it is the only one that has to calculate five probabilities, while the others only have to calculate two.

When the caller of the function is done, it is necessary to send to it some information and results of the main program. In this case, this information is the values "value", "k", "E" and "numimage". The first one is the value that the analysed image has in the chi square criterion index (for example: evalimage(chi_index(1)), the second one is this index (for example chi_index(1)), "E" is the dimension of the group and "numimage" are the number of images.

In the same way, the function returns a value that is called "finalprob" and it contains the different probabilities of belonging to a group or another.

In order to obtain the final probabilities, first of all it is necessary to group all the same category images in a vector (for example all 20-30 images, all 30-40 images, ...) and calculate for each vector the mean, the standard deviation and the 'Naive Bayes' equation:

$$prob = \frac{1}{\sqrt{2\pi(std)^2}e^{(-\left(\frac{(value-mean)^2}{2(std)^2}\right))}}$$

Finally it is only necessary to send these different probabilities to the main program inside the vector “finalprob”.

This procedure is repeated five times because there are five groups in this case, what means that in the other functions it will be done only two times because they containt only two groups (man or woman, more or less 30, more or less 40, more or less 50 and more or less 60).

These functions are used to calculate the probabilities of belonging to each group. The code of them is available in [Annex 2].

3. **Functions “Function2030”, “Function3040”, “Function4050”, “Function5060”, “Function60ormore”, “FunctionLess30”, “FunctionLess40”, “FunctionLess50”, “FunctionLess60”, “FunctionMore30”, “FunctionMore40”, “FunctionMore50”, “FunctionMore60”, “FunctionMan” and “FunctionWoman”**

All these functions work in the same way and there are only little changes between them. It is only necessary to construct a vector of images of the category that is being analysed and calculate the median of this.

These functions are used to calculate the probabilities of belonging to each group. The code of them is available in [Annex 2].

Chapter 5

Results analysis

The main focus of this thesis is to find programs which permit to classify images according to their age. To do this, it was important to create a big database with different people of different ages. Also several identity programs were created, all of them based on features extraction. Firstly, the programs were based on 256 features vector but after, it was changed for a 166 features vector which yields better recognition results.

5.1. Programs and functions changes

After the use of 256 features vector to many tests, it was observed that the results are not as correct as they were desired. To solve it, the programs were compiled with a different features vector, with 166 values, which obtains the features to another code. This code uses Histogram, Gabor, Tamura, Edge and Coarseness, with the objective of extracting features that compose the 166 vector positions. These are divided as:

[1…31] – Histogram

[32...111] – Edge

[112...129] – Tamura

[130...166] – Gabor

5.1.1. 166 Features vector extraction

The 166 features of the vector are obtained with two programs, PUTTY and WinSCP. When for each image these are extracted, the vector is saved in a Matlab file to be compiled and to use it as database and test images.

Moreover, it is necessary to change the programs of 256 features vector and adapt them to the 166 features vector.

5.1.2. Changes in the programs

All the programs have been changed in order to adapt to the new length of the 166 features vector. Then are represented the code changes in an example program (Main_166), those changes are the same for all the other programs:

- *MoreorLess30, MoreorLess40, MoreorLess50, MoreorLess60 and ManoreWoman.*

Main_166

```
for i=1:500
    str_to_load=sprintf('r%d=load(''r%d.txt'');',i,i);
    eval(str_to_load);
end
```

The code charges the 166 positions vectors which have been compiled with the name of 'r' and their sub index (r1,r2,r3...r499,r500), instead of the 256 positions vectors which have been called 'x'.

```
[median_vector_2030]=Function2030_166();
med2030=median_vector_2030;
```

It is necessary to change the function: "Function2030" by "Function2030_166"

```
chi_vector=zeros(166,1);
for i=1:166
```

To initialize the vector it is important to change the lenght.

```
% Probabilities
finalprob1=Featurechi_166(evalimage(chi_index(1)),chi_index(1),E
,numimage);
finalprob2=Featurechi_166(evalimage(chi_index(2)),chi_index(2),E
,numimage);
```

```
finalprob3=Featurechi_166(evalimage(chi_index(3)),chi_index(3),E
,numimage);
finalprob4=Featurechi_166(evalimage(chi_index(4)),chi_index(4),E
,numimage);
finalprob5=Featurechi_166(evalimage(chi_index(5)),chi_index(5),E
,numimage);
```

In this part of the program, it is important to change the function “Featurechi” of the 256 vector program for the function ‘Featurechi_166’.

5.1.3. Changes in the age and gender functions

All the functions have been changed in order to adapt to the new length of the 166 features vector. Then are represented the code changes in an example program (Function2030_166), those changes are the same for all the other functions:

- *Function3040_166, Function4050_166, Function5060_166 and Function60_166.*

Function2030_166

```
function [median_vector_2030]=Function2030_166()
```

First of all, it is necessary to change the name of the function.

```
median_vector_2030=zeros(166,1);
for i=1:166
```

The vector is initialized with 166 positions and the ‘for’ has to run 166 positions too.

5.1.4. Changes in the feature functions

All the functions have been changed in order to adapt to the new length of the 166 features vector. Then are represented the code changes in an example program (Featurechi_166), those changes are the same for all the other functions:

- *Feature3040_166, Feature4050_166, Feature5060_166 and Feature60_166.*

```
function [finalprobk]=Featurechi_166(value,k,E,numimage)
```

It is necessary to change the name of the function.

5.2. Results analysis

When all the programs were compiled and all the results are saved, it is important to analyze them. To do this, it is evaluated the ratio of success and the different probabilities of classification between the groups. Finally, for each class of programs, one is chosen. To choose it, it is searched the biggest ratio and some rational values for the probabilities of the different groups. It is interesting that none of the probabilities were low, because it could mean that although the program has a big ratio, the trustworthiness is bad, i.e., a program that has 0% in less 30 and 100% in more 30, it has an 80% ratio because there are 120 images of more than 30 years old but only 30 of less than 30 years old, but the program trustworthiness is bad because this only gets right the results of more than 30 images.

In this part it is important to mention the big difference between the 5 group's programs classification and the 2 group's programs classification. The firsts are the age classification programs which classify the images into 10 years groups of ages. These have bad ratios, between 10% and 25% and none it is enough good to classify the images. If this classification was randomly, the ratio would be of 20% (1/5 options) what allows to affirm that the ratio is not enough high. However, in the 2 groups programs classification this probability increases and it can arrive to 80% ratios. If it is compared to a random classification where probability of this is 50% (1/2 options), it is possible to appreciate that some results are good.

In the next tables, the results for each program are explained. These contain the percentage of success in the total classification (called accuracy) and in each group classification (i.e., percentage of success classification in the less than 30 years old images).

More or less 30

	Accurary (%)	Less30 (%)	More30 (%)
166 bg 5f	**81,3**	33,3	93,3
166 bg 10f	80	**43,3**	**89,2**
166 bg 20f	74	50	80
166 crop 5f	36,7	23,3	40
166 crop 10f	34	50	30
166 crop 20f	38	53,3	34,2
256 crop 5f	30,7	30	30,8

256 crop 10f	30,7	30	30,8
256 crop 20f	26,7	40	23,3
256 bg 5f	80	0	100
256 bg 20f	72	20	85
256 bg 40f	76	26,7	88,3

TABLE 5.1. *More or less 30 programs results.*

- The best ratio program is 81.3 which belongs to the' 166 features vector with images with background and 5 features'.
- The chosen program is the '166 features vector with images with background and 10 features' because although the ratio is not the biggest one, it is high and the probabilities are high and closer than the others. The program is bad in the way of less than 30 years old images but it is good in the more than 30 years old images.

More or less 40

	Accurary (%)	Less40 (%)	More40 (%)
166 bg 5f	68	45	83,3
166 bg 10f	66	51,7	75,6
166 bg 20f	**68,7**	**53,3**	**78,9**
166 crop 5f	35,3	73,3	10
166 crop 10f	35,3	71,7	11,1
166 crop 20f	37,3	73,3	13,3
256 crop 5f	34	50	23,3
256 crop 10f	32	58,3	14,4
256 crop 20f	32	70	6,7
256 bg 5f	56	15	83,3
256 bg 20f	52	16,7	75,6
256 bg 40f	56	38,3	67,8

TABLE 5.2. *More or less 40 programs results.*

- The best ratio program is 68% which belongs to the '166 features vector with images with background 20 features '.

- "166 features vector with images with background and 20 features" is the chosen program because has the biggest ratio and the closest probabilities.

More or less 50

	Accurary (%)	Less50 (%)	More50 (%)
166 bg 5f	56,7	72,2	33,3
166 bg 10f	56	67,7	38,3
166 bg 20f	**60**	**65,6**	**51,7**
166 crop 5f	52,7	83,3	6,7
166 crop 10f	52,7	81,1	10
166 crop 20f	51,3	77,8	11,7
256 crop 5f	49,3	80	3,3
256 crop 10f	50	83,3	0
256 crop 20f	50	83,3	0
256 bg 5f	54,7	91,1	0
256 bg 20f	52	86,7	0
256 bg 40f	55,3	52,2	60,0

TABLE 5.3. *More or less 50 programs results.*

- The "166 features vector with images with background and 20 features" is the best program of 'More or Less 50 years old' because it has the highest ratio (60%) and the closest probabilities.

More or less 60

	Accurary (%)	Less60 (%)	More60 (%)
166 bg 5f	77,3	92,5	16,7
166 bg 10f	76	90,8	16,7
166 bg 20f	74	**85,8**	**26,7**
166 crop 5f	75,3	94,2	0
166 crop 10f	74,7	93,3	0
166 crop 20f	74,6	90,8	10
256 crop 5f	77,3	96,7	0

256 crop 10f	72,7	90,8	0
256 crop 20f	72,7	90,8	0
256 bg 5f	**80**	100	0
256 bg 20f	77,3	96,7	0
256 bg 40f	74,7	93,3	0

TABLE 5.4. *More or less 60 programs results.*

- The biggest ratio is 80% and it is given in the "256 features vector with images with background and 5 features". This is the main example of the error in these programs. The 'Less60' has 100% of success but the 'More60' has 0% what means that the answer of the program when it was compiled was always 'this image is less than 60 years old'. The database has 120 images of 'less than 60 years old' and only 30 of 'more than 60 years old' and it causes that the ratio is 80% (120 "less than 60 images"/150 "total images").
- The good program is the "166 features vector with images with background and 20 features" because it has a big ratio of 74% and the closest probabilities.

Main

	Accurary (%)	20-30 (%)	30-40 (%)	40-50 (%)	50-60 (%)	60+ (%)
166 bg 5f	24,0	83,3	0,0	0,0	3,3	33,3
166 bg 10f	20,7	6,7	66,7	0,0	0,0	30,0
166 bg 20f	**24,7**	**16,7**	**23,3**	**11,1**	**33,3**	**40,0**
166 crop 5f	17,3	30,0	6,7	0,0	50,0	0,0
166 crop 10f	20,0	33,3	10,0	0,0	56,7	0,0
166 crop 20f	18,7	30,0	13,3	0,0	43,3	6,7
256 crop 5 f	22,0	13,3	0,0	6,7	10,0	80,0
256 crop 10 f	15,3	16,7	0,0	3,3	3,3	53,3
256 crop 20 f	14,7	23,3	3,3	0,0	6,7	40,0
256 bg 5 f	11,3	36,7	10,0	10,0	0,0	0,0
256 bg 20 f	15,3	63,3	10,0	3,3	0,0	0,0
256 bg 40 f	13,3	60,0	6,7	0,0	0,0	0,0

TABLE 5.5. *Age estimation programs results.*

As it is said in the beginning of this conclusions part, the Main program is the most problematic to obtain good results. To decide which the best is it is only chosen the one which has the biggest ratio. It is the one which has the closest probabilities too.

Man or Woman

	Accurary (%)	Woman (%)	Man (%)
166 bg 5f	52,7	18,7	86,7
166 bg 10f	52,0	24,0	80,0
166 bg 20f	52,0	22,7	81,3
166 crop 5f	58,7	38,7	78,7
166 crop 10f	60,0	40,0	80,0
166 crop 20f	58,0	37,3	78,7
256 crop 5 f	70,0	66,7	73,3
256 crop 10 f	74,0	**72,0**	**76,0**
256 crop 20 f	**76,0**	77,3	61,3
256 bg 5 f	56,0	93,3	18,7
256 bg 20 f	64,0	80,0	48,0
256 bg 40 f	70,0	70,7	69,3

TABLE 5.6. *Man or Women programs results.*

- The biggest ratio is 76% and it is given in the '256 features vector with images without background and 20 features'.
- The chosen program is the '256 features vector with images without background and 10 features' because it has a high ratio and the closest probabilities of all the programs. This is probably the most trustworthy program of the entire project.

Summary table of chosen programs

	Chosen program
Main	**166 bg 20f**
More or less 30	**166 bg 10f**
More or less 40	**166 bg 20f**
More or less 50	**166 bg 20f**
More or less 60	**166 bg 20f**
Man or woman	**256 crop 10 f**

TABLE 5.7. *Summary table of chosen programs.*

This table permits to observe that the images with background are better to classify than the images without background. This is surprising, because it was though that the background of the images affects negatively because there are several kinds of backgrounds which can affect to the classification of the images. However, when the image is cropped, the resultant only framing the image on the part of the eyes, the mouth and the nose, excluding interesting classification features like the fore head, the ears and the hair.

Once the bests programs are chosen, a big program with all of them is done. This consists on making a program that uses the best More or Less 30 program, the best More or Less 40 program, the best More or Less 50 program and the best More or Less 60 program. With these, it is desired to classify the images between 10 years groups of images. It is important to considerate that there are impossible results like:

- More than 30, less than 40, more than 50, more than 60
- More than 30, more than 40, less than 50, more than 60
- Less than 30, more than 40, more than 50, less than 60…

The compiled program results were the following:

	Correct	All	Accurary	%
More or Less All	45,0	**150,0**	**0,3**	**30%**

TABLE 5.8. *Table of the program MoreorLessAll.*

The obtained ratio is low and it is 30%, but this program functions better than the other age estimation programs because the biggest ratio that was obtained with them was less than 25%. Nevertheless, this program cannot be used with trustworthiness because the ratio is lower than the acceptable (more or less 70%).

5.2.1. Chi Square analysis

After analysing the program results and evaluate them, the most trustworthiness programs are chosen. Now, the goal is to analyze these programs, in order to know why these programs work as they do, for this, the chi square criterion will be analyzed, because it is the manager to choose the best features for each program, which thing converts it into a essential part of the program.

Firstly, it is necessary to remember how the vectors are divided, as much the 166 vector positions as the 256 vector positions.

The 166 and 256 vectors are divided as is commented in [pag 41 for the 256 vector, pag 43 for the 166 vector].

More or less 30

More or Less 30	
Chi Index	**Chi Result**
119	60,5425
116	69,2900
21	72,6500
120	73,8000
20	77,6900
145	80,8425
133	81,6325
1	83,9925
129	84,2500
121	86,5600

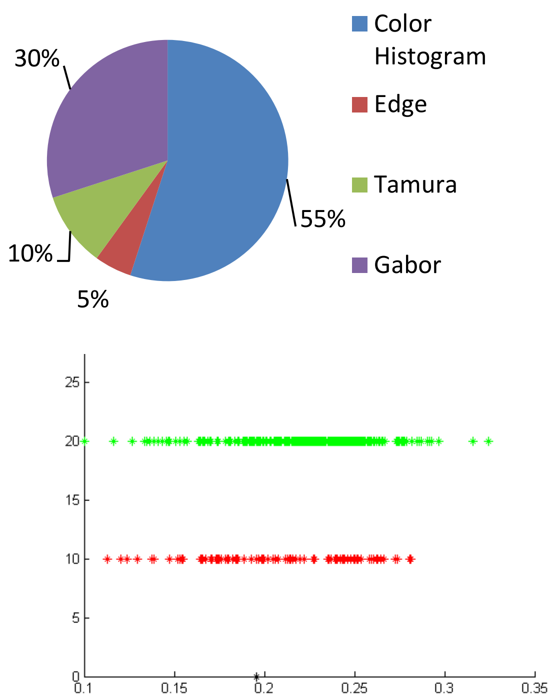


FIGURE 5.1. *More or Less 30 Chi Square analysis.*

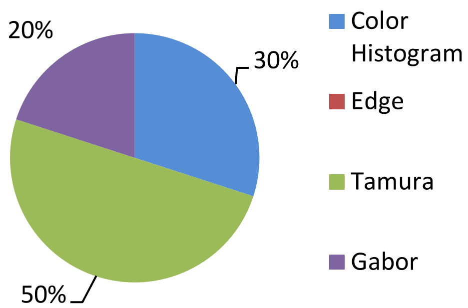
For the program "MoreorLess30" have been used the program with 10 features, because is with the number that the program achieves a better success ratio.

The best feature is in the position 119, belongs to a Tamura's feature, Its result is 60,5. The second feature with better precision is a Tamura feature too.

Of the 10 best features, the half belong to a Tamura feature, 3 are a Color Histogram, 2 belong to a Gabor filter and for this program the edge features are not used.

More or Less 40

More or Less 40	
Chi Index	**Chi Result**
21	68,9833
22	74,5833
20	76,8483
23	78,5550
24	85,8183
133	86,5550
145	86,6133
120	89,9000
166	91,5950
31	94,1833
30	95,1333
29	96,8750
116	97,7033
1	97,7783
19	104,0083
28	104,0883
148	104,0883
157	104,8833
135	105,0583
32	105,8333



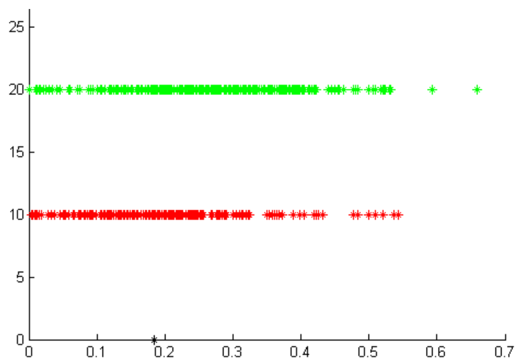


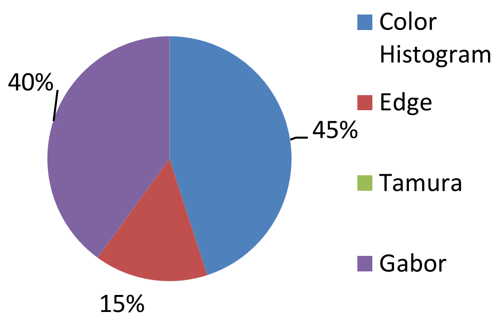
FIGURE 5.2. *More or Less 40 Chi Square analysis.*

The feature with index 21 is the one which offers the best result, because the value of the chi square is the lowest (68, 98) and how much low is the value, better is the trustworthiness to classify. It is a color histogram feature. The first five features belong to this feature group.

The color histogram features are the predominant between the 20 first results, 11 about 20, followed for the Gabor, which belong a 30% of this 20 features, Tamura is represented with 2 and finally edge, which have just one between the 20 best features

More or Less 50

More or Less 50	
Chi Index	**Chi Result**
145	66,9533
21	73,0700
20	76,0500
22	84,1250
23	85,0483
146	86,7200
31	89,0633
157	90,7650
24	91,0183
133	91,7683
32	93,4200
30	95,0750
101	95,7000
106	96,3433
162	98,5683
164	101,2583
96	104,7333
25	105,0433
132	105,6733
166	105,8333



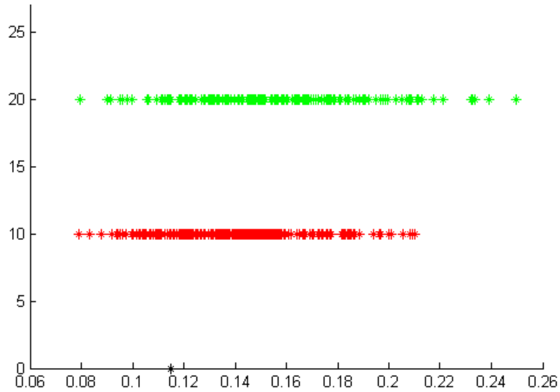


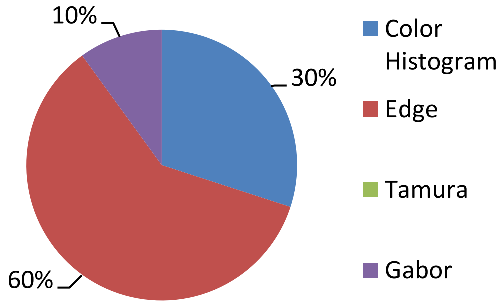
FIGURE 5.3. *More or Less 50 Chi Square analysis.*

For the program “MoreorLess50”, the chi-square with the best efficiency is which has the index 145 of the 166 vector positions, its result is 66,95. This position belongs to a Gabor feature.

The histogram color with 9 between the 20 first features is the most represented, near followed for the Gabor, it represented with 8 features, edge have 3 features, and Tamura feature is not used in this program, because any is in the 20 firsts chi results.

More or Less 60

More or Less 60	
Chi Index	**Chi Result**
106	60,6125
101	64,9700
90	73,8425
100	74,0000
85	74,7400
110	75,8500
95	76,0400
75	76,3625
105	76,8400
21	77,6200
111	79,0225
145	79,3300
22	80,1125
80	80,6900
96	83,5225
23	84,9700
141	86,5525
31	88,2500
20	89,0600
24	89,8925



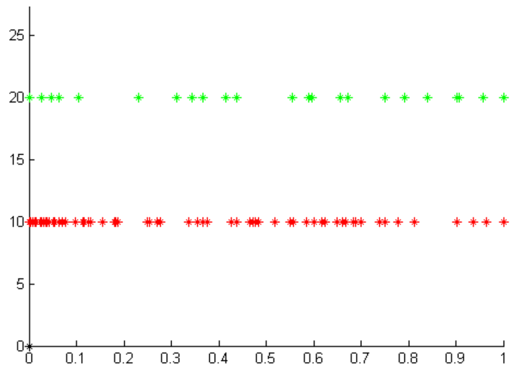


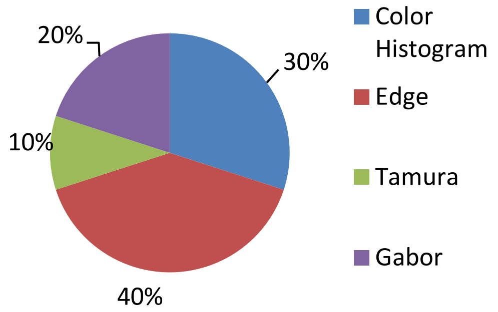
FIGURE 5.4. *More or Less 60 Chi Square analysis.*

The index with best performance is the one that is located in the 106 position, with a result of a 60, 61, this feature belongs to the edge histogram. In this particular case the first 9 results are edge features.

Between de 20 first features exist; 12 of edge, 6 belong to the color histogram, 2 to the Gabor, and Tamura is not represented in this program.

Man or Woman

Man or Woman	
Chi Index	**Chi Result**
97	65,7640
111	66,2560
106	74,5280
13	74,6600
116	76,0680
194	77,3440
241	77,7800
12	77,8600
14	77,8600
100	78,3400



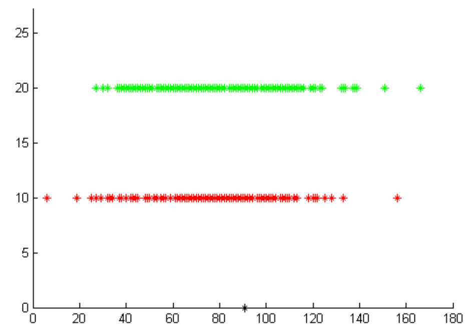


FIGURE 5.5. *Man or Woman Chi Square analysis.*

For this program just the 10 features are used, because with this number of features is how the program achieves the best results.

The 3 best features to classify the image according to the gender, is edge, the best one with a result of 65,75, it is located in the position 97, of the 256 vector positions.

The 10 features are compounded by; 4 edge, 3 color histogram, 2 Gabor filters and 1 of Tamura.

Chi-Square total

Feature	
Color Histogram	32
Edge	20
Tamura	8
Gabor	20

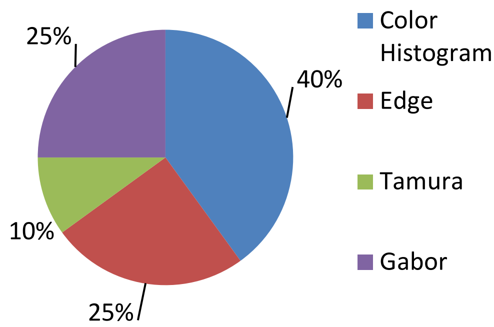


FIGURE 5.6. *Chi Square total analysis.*

Analysing the whole chi-square results, for the best programs of each type, it is observed that the more represented features are the color histogram features, 32 times, which is the 40% of the features that have been used in the four programs.

Edge and Gabor filter are represented 20 times , which is the 25% for each one, finally the less used to classify the images is the Tamura filters, which is used just in 8 occasions, a 10% of the global.

The best chi-square result for each program is:

Tamura for “more or less 30”, Histogram for “more or less 40”, Gabor for “more or less 50” and edge for “more or less 60” and “man or woman”. It is possible to see that every kind of features is the best one in at least one program.

Emphasise that in the 4 programs of age, only 3 features are repeated, these are the positions 20, 21 (color histogram both) and 145 (Gabor). The positions 23, 24, 31 and 133 (the 3 first belongs to Histogram and the last one to the Gabor filter) in 3 of the 4 programs are used.

Stress, that of these best 5 features, the best chi-square result is in the “more or less 30” program, where the value is 60, 54. The second best is the chi of the program “more or less 60”, the result of it is 60, 61.

Finally highlight that the results of the chi-square are not good. These high values demonstrate that the generated features by the images are not enough to classify the people of the images depending neither on their age nor their gender.

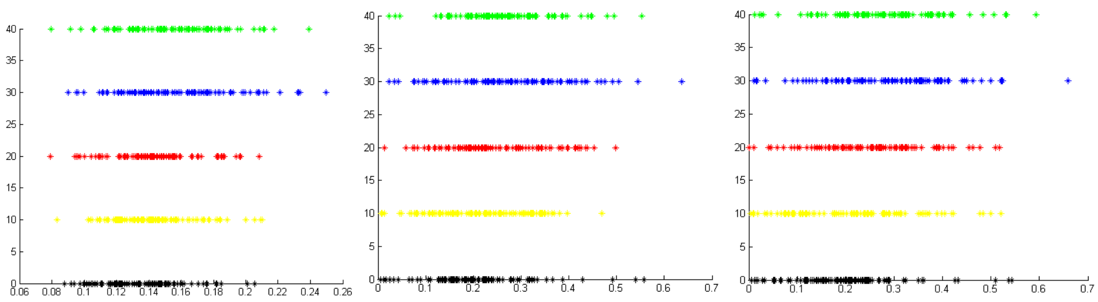


FIGURE 5.7. *Graphic of the three repeated features.*

These images are the three which are used in every program of age classification.

5.2.2. Possible features errors

The feature extraction method is not simply, it could have different kinds of problems which can generate defects on the features and on the posterior classification of the images.

The database is constructed by 500 images, which contain different particularities. The error could be fault of the characteristic of the images that are being compiled or the characteristics of the database images.

After analysing the results of all the programs, several kinds of error, that can be the responsible of the low trustworthiness, are deduced, these errors are the follows:

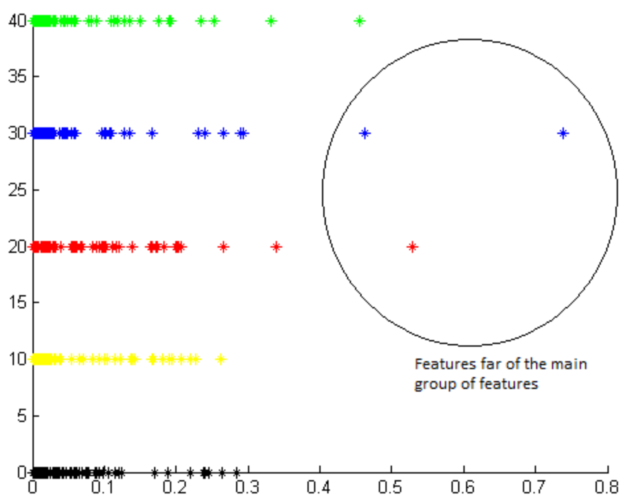


FIGURE 5.8. *Wrong features.*

Error because of the image origin

Not all the Internet pictures have the same format, this fact requires a regulation to convert every image into a common format, and in this process some images lose properties. So it is possible to affirm that the web page origin of the image can affect to the features of them.

An example of this case would be, if it is have a data base with all the images obtained of the same web, the success ratio would be higher if the tested images are from the same data base than if the tested images are from another web page.

Error because of the resolution of the image

This is one of the clearest cases; an image with a high resolution will have different features between images with low resolution. For example the colors of a good resolution image are more defined than the colors of a low resolution image.

FIGURE 5.9. *High or low resolution.*

Error because of the face expression

The used faces not always present the same expression, that can affect to the subsequent classification, because the extracted features of a smiling face are different to the features that can be extracted of a serious face.

FIGURE 5.10. *Different expression faces.*

For example, when a person smiles appear wrinkles in the skin, which seems that the person is older than he is.

Error because of the position, inclination of the face

The persons in the used images, not always are watching in front, that produces, for instance, while in one image is possible to see the two ears of the person in the other image only is possible to see one ear because the person is watching to the side, that affects to the feature extraction.

FIGURE 5.11. *Different face direction.*

Chapter 6

Conclusions

Throughout the implementation of the project, important conclusions have been made. First of all, the importance of the size of the database has been demonstrated. The results with the 500 images database are better than the results with the 150 images database. One of the improvements of the project could be increase the number of the images that the database contains.

Moreover, the importance of the number of features chosen is observed. The results change with 5 features, 10 features, 20 features or 40 features. Nevertheless, the use of more features does not mean better results.

In this project, different age classifications have been done. First of them was the classification between 20-30, 30-40, 40-50 and 60 or more. The biggest success ratio that was obtained is less than 25% which is too much low to consider the program as effective. The other classifications were two options classifications, more or less of the requested age. Some of them have a high success ratio but it is important to keep in mind that the trustworthiness is not sufficient because there are programs which always obtain the same result and it, combined with the number of images for each age group in the test database, causes an 80% ratio i.e., the more or less 60 program could obtain always the result of “this image is a less than 60 image” which combined with 120 images of less than 60 years old in the 150 test images database causes an 80% ratio (120/150). The trustworthiness is not sufficient because if the tested images were 50% more than 60 and 50% less than 60, the ratio would decrease until 50%.

With the 5 bests programs of two options age classification, a 5 options age program was done. These options are 10 years old ages groups. The result of it gets better the first age estimation programs with 10 years groups of ages improving the ratio in more than a 5% (less than 25% in the first programs, 30% in the final one).

Finally, the best programs results were obtained in the gender classification. Some of them obtain until a 70% of ratio and trustworthiness. It confirms that the features obtained with the filters Histogram, Tamura, Gabor and Edge are more efficient to classify gender than age.

After the realisation of this project, it can be observed that the used features are not enough determinant to permit an adequate classification. Probably, to improve the results of the project it will be necessary to do an exhaustive study about the features because it was observed that they are the focus of the low results in some programs. So the way to improve the programs and consequently the results would be improve the features that define the images. It is possible that using other filters as the specified in [Chapter 2.4.3.] would be a correct option in order to achieve the desired objectives.

Bibliography

Web pages

[1] Morph. (2004).*Advancing the state of the art in biometrics and identity sciences* [online]. University of North Carolina Wilmington. [consult: 15 march 2013]. Avaliable in <http://www.faceaginggroup.com/>

[2] Crowley, J. (2013).*Face and gesture recognition working group* [online]. Fgnet. [consult: 15 march 2013]. Avaliable in < http://www-prima.inrialpes.fr/FGnet/html/benchmarks.html>

[3] BiolID. (2002).*BiolID face databababase* [online]. Fgnet. [consult: 15 march 2013]. Avaliable in <http://www.bioid.com/downloads/software/bioid-face-database.html>

[4] Mathworks. (2013). *Matlab. El lenguaje de cálculo técnico* [online]. The Mathworks. Inc. [consult: 15 march 2013]. Avaliable in <http://www.mathworks.es>

[5] UPC. (2013). *Bibliotècnia. La biblioteca digital de la UPC* [online]. Universitat Politècnica de Caatalunya. [consult: 26 august 2013]. Avaliable in <http://bibliotecnica.upc.edu>

[6] StatSoft. (2013). *Naive Bayes Classifier*.[online]. [consult: 21 May 2013]. Avaliable in <http://www.statsoft.com/textbook/naive-bayes-classifier/>

[7] MedCalc. (2013). *Chi-squared test*.[online]. [consult: 8May 2013]. Avaliable in <http://www.medcalc.org/manual/chi-square_test.php>

[8] James, P. (1997). *Chi Square*.[online]. Oklahoma State University. [consult: 8May 2013]. Avaliable in

<http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage28.htm >

[9] Stackoverflow (2013). *Automatic Face Detection Using MATLAB*.[online]. [consult: 25 March 2013]. Avaliable in < http://stackoverflow.com/questions/9300379/automatic-face-detection-using-matlab >

[10] UPC (2013). *Bibliotècnica. La biblioteca digital de la UPC*.[online]. Univeritat Politècnica de Catalunya[consult: 27 august 2013]. Avaliable in < http://bibliotecnica.upc.edu>

[11] Fisher, R. (2013). CVonline: Image Database. [online]. CVOnline [consult: 17 march 2013]. Avaliable in < http://homepages.inf.ed.ac.uk/rbf/CVonline/Imagedbase.htm>

[12] Roborealm. (2013). Sobel Edge. [online]. Roborealm. Vision for machines [consult: 8 april 2013]. Avaliable in < http://www.roborealm.com/help/Sobel.php>

[13] Fisher, R. Perkins, S. Walker, A. Wolfart, E. (2003). *Roberts Cross Edge Detector.* [online]. [consult: 10 april 2013]. Avaliable in <http://homepages.inf.ed.ac.uk/rbf/HIPR2/roberts.htm>

[14] Fisher, R. et al (2003). *Convolution.*[online]. [consult: 23 april 2013]. Avaliable in < http://homepages.inf.ed.ac.uk/rbf/HIPR2/convolve.htm>

[15] WinSCP (2013). *Introducing WinSCP*. [online].[consult: 25 july 2013]. Available in <http://winscp.net/eng/docs/introduction>

PDF

[16] Geng , X. Fu, Y. Smith-Miles, K.(2010). *"Automatic Facial Age Estimation".* University of Buffalo

[17] Cachazo, D. (2010). Detector automatic de rasgos oculares mediante filtros de gabor. Universidad Rey Juan Carlos, Madrid.

[18] De Ves, E. (2008). *Matlab: Introducción al procesamiento de imágenes*. Universidad de Valencia.

[19] Videira, A. (2013). *Extraction of features from a set of images.* Universidade de Coimbra, Coimbra.

[20] Suo, J. Zhu, S. Shan, S. Chen, X. (2010).*A Compositional and Dynamic Model for Face Aging.* Institute of computing technology cas.

[21] Geng , X. Zhou, Z. Smith-Miles, K.(2007). *Automatic Age Estimation Based on Facial Aging Patterns.* (vol.29)

[22] Wang, C. Su, Y. Hsu, C. Lin, C. Mark Liao, H.Y.(2009). *Bayesian age estimation on face images.*National Tsing Hua University.

[23] Ney, H. Deselaers, T. (2003). *Features for Image Retrieval.* Rheinisch-Westfälische Techische Hochuschule Aachen, Aachen.

[24] Ling, H. Soatto, S. Ramanathan, N. Jacobs, D. (2010). *Face Verification Across Age Progression Using Discriminative Methods.*(vol.5).

[25] Mahalingam, G. Kabhamettu, C. (2012). *Image and Vision Computing. Face verification of age separated images under the influence of internal and external factors.* University of Delaware, Newark.

[26] Cheng, Y. Chen, S. (2001). *Image classification using color, texture and regions.* Yuan Ze University, Taiwan.

[27] Geng , X. Zhou, Z. Zhang, Y. Li, G. Dai, H.(2006). *Learning from Facial Aging Patterns for Automatic Age Estimation.* Deakin Univerity, Victoria, Australia.

[28] Kekre, H.B. Bharadi, V.A. (2010). *Gabor Filter Feature Vector for Dynamic Signature Recognition.*(vol.2). University Mumbai, Maharashtra, India.

[29] Huang, L. Shimizu, A. Kobatuke, H. (2004). *Robust face detection using Gabor filter features.* Tokyo University, Tokyo.

[30] De Boer, V. Van Someren, W. Lupascu, T. (2011). *Web Pagge Classification Using Image Analysis Features.*Universiteit van Amsterdam, Amsterdam, The Netherlands.

[31] Brunelli, R. Poggio, T. (1993). *Face Recognition: Features versus Templates.*IRST.

[32] González, D. (2007). *Introducción al análisis de imagen.*

[33] Eakins, J. (1999). *Content-based Image Retrieval.*

[34] Grigorescu, S. E. Petkov, N. Kruizinga, P. (2010). *A comparative study of filter based texture operators using Mahalanobis distance.*

[35] Sebastian, V. (2012). *Grey level co-ocurrence matrice: Generalisation and some new features*.

Database

[36] F C Barcelona. (2013). *F C Barcelona.*[online]. [consult: 24 march 2013]. Avaliable in <http://www.fcbarcelona.cat/>

[37] Real Sociedad. (2013). *Real Sociedad.*[online]. [consult: 24 march 2013]. Avaliable in <http://www.realsociedad.com/>

[38] Athletic Club. (2013). *Athletic Club.*[online]. [consult: 24 march 2013]. Avaliable in <http://www.athletic-club.net/>

[39] Valencia C F. (2013). *Valencia C F.*[online]. [consult: 25 march 2013]. Avaliable in <http://www.valenciacf.com/>

[40] Malaga C F. (2013). *Malaga C F.*[online]. [consult: 24 march 2013]. Avaliable in <http://www.malagacf.com/es>

[41] Marca. (2013). *Marca.*[online]. [consult: 24 march 2013]. Avaliable in <http://www.marca.com>

[42] ACB. (2013). *ACB.*[online]. [consult: 25 march 2013]. Avaliable in <http://www.acb.com>

[43] European Parliament. (2013). *European Paliament.*[online]. [consult: 19 July 2013]. Avaliable in <http://www.europarl.europa.eu>

[44] Parlament de Catalunya. (2013). *Parlament de Catalunya.*[online]. Generalitat de Catalunya [consult: 16 July 2013]. Avaliable in <http://www.parlament.cat>

[45] Congreso de los Diputados. (2013). *Comgreso de los diputados.*[online]. [consult: 16 July 2013]. Avaliable in <http://www.congreso.es>

Annex 1

Big data base. 166 features. Images with background. Main 5f

	Right	Wrong	Success rate (%)
TOTAL	36	114	**24,0**

	Right	Wrong	Success rate (%)
20-30	25	5	83,3
30-40	0	30	0,0
40-50	0	30	0,0
50-60	1	29	3,3
+60	10	20	33,3

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	15	0	100,0
Woman 30-40	0	15	0,0
Man 30-40	0	15	0,0
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	0	15	0,0
Man 50-60	1	14	6,7
Woman +60	6	9	40,0
Man +60	4	11	26,7

TABLE 1.- *Big data base. 166 features. Images with background. Main 5f*

- The ratio of the program is 18,7% and it is not enough to work with him.
- The program does not get right any 30-40 and 40-50 image

Big data base. 166 features. Images with background. More or less 30 5 f

	Right	Wrong	Success rate (%)
TOTAL	122	28	**81,3**

	Right	Wrong	Success rate (%)
Less 30	10	20	33,3
More 30	112	8	93,3

	Right	Wrong	Success rate (%)
Woman	62	13	82,7
Man	60	15	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	3	12	20,0
Man 20-30	7	8	46,7
Woman 30-40	15	0	100,0
Man 30-40	11	4	73,3
Woman 40-50	14	1	93,3
Man 40-50	13	2	86,7
Woman 50-60	15	0	100,0
Man 50-60	14	1	93,3
Woman +60	15	0	100,0
Man +60	15	0	100,0

TABLE 2.-.- *Big data base. 166 features. Images with background. More or less 30 5 f*

- The ratio is high and it is 81,3%.
- The program does not offer trustworthiness because it classifies the majority of images as ‘more than 30’ images (122/150).
- The diference between the men and women classifications is low.

Big data base. 166 features. Images with background. More or less 40 5f

	Right	Wrong	Success rate (%)
TOTAL	102	48	**68,0**

	Right	Wrong	Success rate (%)
Less40	27	33	45,0
More 40	75	15	83,3

	Right	Wrong	Success rate (%)
Woman	48	27	64,0
Man	54	21	72,0

	Right	Wrong	Success rate (%)
Woman 20-30	8	7	53,3
Man 20-30	9	6	60,0
Woman 30-40	1	14	6,7
Man 30-40	9	6	60,0
Woman 40-50	12	3	80,0
Man 40-50	14	1	93,3
Woman 50-60	13	2	86,7
Man 50-60	9	6	60,0
Woman +60	14	1	93,3
Man +60	13	2	86,7

TABLE 3.- *Big data base. 166 features. Images with background. More or less 40 5f*

- The ratio is high and it is 68%.
- The program does not offer trustworthiness because it classifies the majority of images as more than 40 years old images (123/150).
- The program classifies better the men than the women.

Big data base. 166 features. Images with background. More or less 50 5f

	Right	Wrong	Success rate (%)
TOTAL	85	65	**56,7**

	Right	Wrong	Success rate (%)
Less50	65	25	72,2
More 50	20	40	33,3

	Right	Wrong	Success rate (%)
Woman	46	29	61,3
Man	39	36	52,0

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	12	3	80,0
Woman 30-40	10	5	66,7
Man 30-40	11	4	73,3
Woman 40-50	14	1	93,3
Man 40-50	7	8	46,7
Woman 50-60	4	11	26,7
Man 50-60	4	11	26,7
Woman +60	7	8	46,7
Man +60	5	10	33,3

TABLE 4.- *Big data base. 166 features. Images with background. More or less 50 5f*

- The ratio is low and it is 56,7%.
- The program does not offer trustworthiness because it has one probability is less than 35% and it classifies the majority of images as less than 50 images.
- The program classifies better the women than the men.

Big data base. 166 features. Images with background. More or less 60 5f

	Right	Wrong	Success rate (%)
TOTAL	116	34	**77,3**

	Right	Wrong	Success rate (%)
Less60	111	9	92,5
More 60	5	25	16,7

	Right	Wrong	Success rate (%)
Woman	60	15	80,0
Man	56	19	74,7

	Right	Wrong	Success rate (%)
Woman 20-30	14	1	93,3
Man 20-30	15	0	100,0
Woman 30-40	14	1	93,3
Man 30-40	14	1	93,3
Woman 40-50	14	1	93,3
Man 40-50	13	2	86,7
Woman 50-60	14	1	93,3
Man 50-60	13	2	86,7
Woman +60	4	11	26,7
Man +60	1	14	6,7

TABLE 5.- *Big data base. 166 features. Images with background. More or less 60 5f*

- The ratio is high and it is 77,3%.
- The program does not offer trustworthiness because it only classifies well five images of more than 60 years old.
- The program classifies well men and women. Both have a high success rate of more than 70%.

Big data base. 166 features. Images with background. Man or Woman 5f

	Right	Wrong	Success rate (%)
TOTAL	79	71	**52,7**

	Right	Wrong	Success rate (%)
Woman	14	61	18,7
Man	65	10	86,7

	Right	Wrong	Success rate (%)
Woman 20-30	5	10	33,3
Man 20-30	14	1	93,3
Woman 30-40	2	13	13,3
Man 30-40	12	3	80,0
Woman 40-50	1	14	6,7
Man 40-50	13	2	86,7
Woman 50-60	4	11	26,7
Man 50-60	14	1	93,3
Woman +60	2	13	13,3
Man +60	12	3	80,0

TABLE 6.- *Big data base. 166 features. Images with background. Man or Woman 5f*

- The ratio is low and it is 52,7%.
- The program classifies the majority of images as men (126/150) and it means that it hits a big percentage for the men and a low percentage for the women.

Big data base. 166 features. Images with background. Main 10f

	Right	Wrong	Success rate (%)
TOTAL	31	119	**20,7**

	Right	Wrong	Success rate (%)
20-30	2	28	6,7
30-40	20	10	66,7
40-50	0	30	0,0
50-60	0	30	0,0
+60	9	21	30,0

	Right	Wrong	Success rate (%)
Woman 20-30	1	14	6,7
Man 20-30	1	14	6,7
Woman 30-40	9	6	60,0
Man 30-40	11	4	73,3
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	6	9	40,0
Man +60	3	12	20,0

TABLE 7.- *Big data base. 166 features. Images with background. Main 10f*

- The ratio of the program is 20,7% and it is not enough to work with him.
- The program does not get right any 40-50 and 50-60 image.

Big data base. 166 features. Images with background. More or less 30 10f

	Right	Wrong	Success rate (%)
TOTAL	120	30	**80,0**

	Right	Wrong	Success rate (%)
Less 30	13	17	43,3
More 30	107	13	89,2

	Right	Wrong	Success rate (%)
Woman	62	13	82,7
Man	58	17	77,3

	Right	Wrong	Success rate (%)
Woman 20-30	6	9	40,0
Man 20-30	7	8	46,7
Woman 30-40	12	3	80,0
Man 30-40	12	3	80,0
Woman 40-50	14	1	93,3
Man 40-50	12	3	80,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	15	0	100,0
Man +60	12	3	80,0

TABLE 8.- *Big data base. 166 features. Images with background. More or less 30 10f*

- The ratio is high and it is 80%.
- The program does not offer trustworthiness because it classifies the majority of images as 'more than 30' images (124/150).
- The diference between the men and women classifications is low.

Big data base. 166 features. Images with background. More or less 40 10f

	Right	Wrong	Success rate (%)
TOTAL	99	51	**66,0**

	Right	Wrong	Success rate (%)
Less40	31	29	51,7
More 40	68	22	75,6

	Right	Wrong	Success rate (%)
Woman	46	29	61,3
Man	53	22	70,7

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	60,0
Man 20-30	10	5	66,7
Woman 30-40	2	13	13,3
Man 30-40	10	5	66,7
Woman 40-50	11	4	73,3
Man 40-50	13	2	86,7
Woman 50-60	12	3	80,0
Man 50-60	8	7	53,3
Woman +60	12	3	80,0
Man +60	12	3	80,0

***TABLE 9.-** Big data base. 166 features. Images with background. More or less 40 10f*

- The ratio is high and it is 66%.
- The program does not offer trustworthiness because it classifies much better the images of more than 40 years old.
- The program classifies better the men than the women.

Big data base. 166 features. Images with background. More or less 50 10f

	Right	Wrong	Success rate (%)
TOTAL	84	66	**56,0**

	Right	Wrong	Success rate (%)
Less50	61	29	67,7
More 50	23	47	38,3

	Right	Wrong	Success rate (%)
Woman	41	34	54,7
Man	43	32	57,3

	Right	Wrong	Success rate (%)
Woman 20-30	13	2	86,7
Man 20-30	12	3	80,0
Woman 30-40	9	6	60,0
Man 30-40	11	4	73,3
Woman 40-50	11	4	73,3
Man 40-50	5	10	33,3
Woman 50-60	2	13	13,3
Man 50-60	7	8	46,7
Woman +60	6	9	40,0
Man +60	8	7	53,3

TABLE 10.- *Big data base. 166 features. Images with background. More or less 50 10f*

- The ratio is low and it is 56%.
- The program does not offer trustworthiness because it has one probability is less than 40%.
- There is no difference between gender classifications.

Big data base. 166 features. Images with background. More or less 60 10f

	Right	Wrong	Success rate (%)
TOTAL	114	36	**76,0**

	Right	Wrong	Success rate (%)
Less60	109	11	90,8
More 60	5	25	16,7

	Right	Wrong	Success rate (%)
Woman	58	17	77,3
Man	56	19	74,6

	Right	Wrong	Success rate (%)
Woman 20-30	14	1	93,3
Man 20-30	15	0	100,0
Woman 30-40	13	2	86,7
Man 30-40	14	1	93,3
Woman 40-50	14	1	93,3
Man 40-50	13	2	86,7
Woman 50-60	13	2	86,7
Man 50-60	13	2	86,7
Woman +60	4	11	26,7
Man +60	1	14	6,7

TABLE 11.- *Big data base. 166 features. Images with background. More or less 60 10f*

- The ratio is high and it is 76%.
- The program does not offer trustworthiness because it only classifies well five images of more than 60 years old.
- The program classifies well men and women. Both have a high success rate of more than 74%.

Big data base. 166 features. Images with background. Man or Woman 10f

	Right	Wrong	Success rate (%)
TOTAL	78	72	**52,0**

	Right	Wrong	Success rate (%)
Woman	18	57	24,0
Man	60	15	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	15	0	100,0
Woman 30-40	2	13	13,3
Man 30-40	11	4	73,3
Woman 40-50	2	13	13,3
Man 40-50	11	4	73,3
Woman 50-60	4	11	26,7
Man 50-60	12	3	80,0
Woman +60	6	9	40,0
Man +60	11	4	73,3

TABLE 12.- *Big data base. 166 features. Images with background. Man or Woman 10f*

- The ratio is low and it is 52%.
- The program classifies the majority of images as men (117/150) and it means that it hits a big percentage for the men and a low percentage for the women.

Big data base. 166 features. Images with background. Main 20f.

	Right	Wrong	Success rate (%)
TOTAL	37	113	**24,7**

	Right	Wrong	Success rate (%)
20-30	5	25	16,7
30-40	7	23	23,3
40-50	3	27	11,1
50-60	10	20	33,3
+60	12	18	40,0

	Right	Wrong	Success rate (%)
Woman 20-30	3	12	20,0
Man 20-30	2	13	13,3
Woman 30-40	4	11	26,7
Man 30-40	3	12	20,0
Woman 40-50	1	14	6,7
Man 40-50	2	13	13,3
Woman 50-60	3	12	20,0
Man 50-60	7	8	46,7
Woman +60	6	9	40,0
Man +60	6	9	40,0

TABLE 13.- *Big data base. 166 features. Images with background. Main 20f.*

- The ratio of the program is 24,7% and it is not enough to work with him.

Big data base. 166 features. Images with background. More or less 30 20f

	Right	Wrong	Success rate (%)
TOTAL	111	39	**74,0**

	Right	Wrong	Success rate (%)
Less 30	15	15	50,0
More 30	96	24	80,0

	Right	Wrong	Success rate (%)
Woman	58	17	77,3
Man	53	22	70,7

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	8	7	53,3
Woman 30-40	10	5	66,7
Man 30-40	10	5	66,7
Woman 40-50	13	2	86,7
Man 40-50	11	4	73,3
Woman 50-60	15	0	100,0
Man 50-60	12	3	80,0
Woman +60	13	2	86,7
Man +60	12	3	80,0

TABLE 14.- *Big data base. 166 features. Images with background. More or less 30 20f*

- The ratio is high and it is 74%.
- The program does not offer trustworthiness because it returns ‘more than 30’ the majority of times (126/150)
- The diference between the men and women classifications is low.

Big data base. 166 features. Images with background. More or less 40 20f

	Right	Wrong	Success rate (%)
TOTAL	103	47	**68,7**

	Right	Wrong	Success rate (%)
Less40	32	28	53,3
More 40	71	19	78,9

	Right	Wrong	Success rate (%)
Woman	51	24	68,0
Man	52	23	69,3

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	9	6	60,0
Woman 30-40	3	12	20,0
Man 30-40	10	5	66,7
Woman 40-50	12	3	80,0
Man 40-50	13	2	86,7
Woman 50-60	13	2	86,7
Man 50-60	9	6	60,0
Woman +60	13	2	86,7
Man +60	11	4	73,3

TABLE 15.- *Big data base. 166 features. Images with background. More or less 40 20f*

- The ratio is high and it is 68,7%.
- The program does not offer trustworthiness because it classifies the majority of images as more than 40 years old images.
- There is no diference between men and women classification.

Big data base. 166 features. Images with background. More or less 50 20f

	Right	Wrong	Success rate (%)
TOTAL	90	60	**60,0**

	Right	Wrong	Success rate (%)
Less50	59	31	65,6
More 50	31	29	51,7

	Right	Wrong	Success rate (%)
Woman	43	32	57,3
Man	47	28	62,7

	Right	Wrong	Success rate (%)
Woman 20-30	12	3	80,0
Man 20-30	13	2	86,7
Woman 30-40	6	9	40,0
Man 30-40	12	3	80,0
Woman 40-50	7	8	46,7
Man 40-50	9	6	60,0
Woman 50-60	10	5	66,7
Man 50-60	5	10	33,3
Woman +60	8	7	53,3
Man +60	8	7	53,3

TABLE 16.- *Big data base. 166 features. Images with background. More or less 50 20f*

- The ratio is 60%.
- The program has the two probabilities with values of more than 50% but it is not enough.
- The program classifies better the men than the women.

Big data base. 166 features. Images with background. More or less 60 20f

	Right	Wrong	Success rate (%)
TOTAL	111	39	**74,0**

	Right	Wrong	Success rate (%)
Less60	103	17	85,8
More 60	8	22	26,7

	Right	Wrong	Success rate (%)
Woman	55	20	73,3
Man	56	19	74,7

	Right	Wrong	Success rate (%)
Woman 20-30	13	2	86,7
Man 20-30	15	0	100,0
Woman 30-40	12	3	80,0
Man 30-40	13	2	86,7
Woman 40-50	13	2	86,7
Man 40-50	12	3	80,0
Woman 50-60	12	3	80,0
Man 50-60	13	2	86,7
Woman +60	5	10	33,3
Man +60	3	12	20,0

TABLE 17.- *Big data base. 166 features. Images with background. More or less 60 20f*

- The ratio is high and it is 74%.
- The program does not offer trustworthiness because it only classifies well eight images of more than 60 years old.
- The program classifies well men and women. Both have a high success rate of more than 73%.

Big data base. 166 features. Images with background. Man or Woman 20f

	Right	Wrong	Success rate (%)
TOTAL	78	72	**52,0**

	Right	Wrong	Success rate (%)
Woman	17	58	22,7
Man	61	14	81,3

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	14	1	93,3
Woman 30-40	2	13	13,3
Man 30-40	11	4	73,3
Woman 40-50	2	13	13,3
Man 40-50	12	3	80,0
Woman 50-60	3	12	20,0
Man 50-60	12	3	80,0
Woman +60	6	9	40,0
Man +60	12	3	80,0

TABLE 18.- *Big data base. 166 features. Images with background. Man or Woman 20f*

- The ratio is low and it is 52%.
- The program classifies the majority of images as men (119/150) and it means that it hits a big percentage for the men and a low percentage for the women.

Big data base. 166 features. Images without background (crop). Main 5f

	Right	Wrong	Success rate (%)
TOTAL	26	124	**17,3**

	Right	Wrong	Success rate (%)
20-30	9	21	30,0
30-40	2	28	6,7
40-50	0	30	0,0
50-60	15	15	50,0
+60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman 20-30	6	9	40,0
Man 20-30	3	12	20,0
Woman 30-40	1	14	6,7
Man 30-40	1	14	6,7
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	7	8	46,7
Man 50-60	8	7	53,3
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 19.- *Big data base. 166 features. Images without background (crop). Main 5f*

- The ratio of the program is 17,3% and it is not enough to work with him.
- The program does not get right any 40-50 and 60+ image.

Big data base. 166 features. Images without background (crop). More or Less 30 5f

	Right	Wrong	Success rate (%)
TOTAL	55	95	**36,7**

	Right	Wrong	Success rate (%)
Less 30	7	23	23,3
More 30	48	72	40,0

	Right	Wrong	Success rate (%)
Woman	19	56	25,3
Man	36	39	48,0

	Right	Wrong	Success rate (%)
Woman 20-30	3	12	20,0
Man 20-30	4	11	26,7
Woman 30-40	3	12	20,0
Man 30-40	9	6	60,0
Woman 40-50	5	10	33,3
Man 40-50	3	12	20,0
Woman 50-60	2	13	13,3
Man 50-60	9	6	60,0
Woman +60	6	9	40,0
Man +60	11	4	73,3

TABLE 20.- *Big data base. 166 features. Images without background (crop). More or Less 30 5f*

- The ratio is low and it is 36,7%.
- The program does not offer trustworthiness because the two classifications do not have more than 40%.
- The program classifies better the men than the women.

Big data base. 166 features. Images without background (crop). More or Less 40 5f

	Right	Wrong	Success rate (%)
TOTAL	53	97	**35,3**

	Right	Wrong	Success rate (%)
Less40	44	16,0	73,3
More 40	9	81,0	10,0

	Right	Wrong	Success rate (%)
Woman	28	47	37,3
Man	25	50	33,3

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	10	5	66,7
Woman 30-40	14	1	93,3
Man 30-40	9	6	60,0
Woman 40-50	2	13	13,3
Man 40-50	0	15	0,0
Woman 50-60	1	14	6,7
Man 50-60	3	12	20,0
Woman +60	0	15	0,0
Man +60	3	12	20,0

TABLE 21.- *Big data base. 166 features. Images without background (crop). More or Less 40 5f*

- The ratio is low and it is 35,3%.
- The program does not offer trustworthiness because it classifies the majority of images as less than 40 years old images (125/150).
- The program does not have differences between men or women.

Big data base. 166 features. Images without background (crop). More or Less 50 5f

	Right	Wrong	Success rate (%)
TOTAL	79	71	**52,7**

	Right	Wrong	Success rate (%)
Less50	75	15	83,3
More 50	4	56	6,7

	Right	Wrong	Success rate (%)
Woman	41	34	54,7
Man	38	37	50,7

	Right	Wrong	Success rate (%)
Woman 20-30	12	3	80,0
Man 20-30	10	5	66,7
Woman 30-40	14	1	93,3
Man 30-40	9	6	60,0
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	0	15	0,0
Man 50-60	1	14	6,7
Woman +60	0	15	0,0
Man +60	3	12	20,0

***TABLE 22.-** Big data base. 166 features. Images without background (crop). More or Less 50 5f*

- The ratio is low and it is 52,7%.
- The program does not offer trustworthiness because it only classifies well four images of more than 50 years old.
- There is no difference between gender classifications.

Big data base. 166 features. Images without background (crop). More or Less 60 5f

	Right	Wrong	Success rate (%)
TOTAL	113	37	**75,3**

	Right	Wrong	Success rate (%)
Less60	113	7	94,2
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	57	18	76,0
Man	56	19	74,7

	Right	Wrong	Success rate (%)
Woman 20-30	14	1	93,3
Man 20-30	12	3	80,0
Woman 30-40	14	1	93,3
Man 30-40	14	1	93,3
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	14	1	93,3
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 23.- *Big data base. 166 features. Images without background (crop). More or Less 60 5f*

- The ratio is high and it is 75,3%.
- The program does not offer trustworthiness because it does not classify well any images of more than 60 years old.
- The program classifies well men and women. Both have a high success rate of more than 74%.

Big data base. 166 features. Images without background (crop). Man or Woman 5f

	Right	Wrong	Success rate (%)
TOTAL	88	62	**58,7**

	Right	Wrong	Success rate (%)
Woman	29	46	38,7
Man	59	16	78,7

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	13	2	86,7
Woman 30-40	5	10	33,3
Man 30-40	10	5	66,7
Woman 40-50	6	9	40,0
Man 40-50	11	4	73,3
Woman 50-60	8	7	53,3
Man 50-60	12	3	80,0
Woman +60	6	9	40,0
Man +60	13	2	86,7

TABLE 24.- *Big data base. 166 features. Images without background (crop). Man or Woman 5f*

- The ratio is low and it is 58,7%.
- The program classifies the majority of images as men (105/150) and it means that it hits a big percentage for the men and a low percentage for the women.

Big data base. 166 features. Images without background (crop). Main 10f

	Right	Wrong	Success rate (%)
TOTAL	30	120	**20,0**

	Right	Wrong	Success rate (%)
20-30	10	20	33,3
30-40	3	27	10,0
40-50	0	30	0,0
50-60	17	13	56,7
+60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	3	12	20,0
Woman 30-40	2	13	13,3
Man 30-40	1	14	6,7
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	6	9	40,0
Man 50-60	11	4	73,3
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 25.- *Big data base. 166 features. Images without background (crop). Main 10f*

- The ratio of the program is 20% and it is not enough to work with him.
- The program does not get right any 40-50 image.

Big data base. 166 features. Images without background (crop). More or Less 30 10f

	Right	Wrong	Success rate (%)
TOTAL	51	99	**34,0**

	Right	Wrong	Success rate (%)
Less 30	15	15	50,0
More 30	36	84	30,0

	Right	Wrong	Success rate (%)
Woman	19	56	25,3
Man	32	43	42,7

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	8	7	53,3
Woman 30-40	1	14	6,7
Man 30-40	8	7	53,3
Woman 40-50	5	10	33,3
Man 40-50	3	12	20,0
Woman 50-60	2	13	13,3
Man 50-60	5	10	33,3
Woman +60	4	11	26,7
Man +60	8	7	53,3

TABLE 26.- *Big data base. 166 features. Images without background (crop). More or Less 30 10f*

- The ratio is low and it is 34,0%.
- The program does not offer trustworthiness because the two classifications do not have more than 50%.
- The program classifies better the men than the women.

Big data base. 166 features. Images without background (crop). More or Less 40 10f

	Right	Wrong	Success rate (%)
TOTAL	53	97	**35,3**

	Right	Wrong	Success rate (%)
Less40	43	17,0	71,7
More 40	10	80,0	11,1

	Right	Wrong	Success rate (%)
Woman	29	46,0	38,7
Man	24	51,0	32,0

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	10	5	66,7
Woman 30-40	14	1	93,3
Man 30-40	9	6	60,0
Woman 40-50	3	12	20,0
Man 40-50	0	15	0,0
Woman 50-60	2	13	13,3
Man 50-60	2	13	13,3
Woman +60	0	15	0,0
Man +60	3	12	20,0

TABLE 27.- *Big data base. 166 features. Images without background (crop). More or Less 40 10f*

- The ratio is low and it is 35,3%.
- The program does not offer trustworthiness because it classifies the majority of images as less than 40 years old images (123/150).
- The program does not have differences between men or women.

Big data base. 166 features. Images without background (crop). More or Less 50 10f

	Right	Wrong	Success rate (%)
TOTAL	79	71	**52,7**

	Right	Wrong	Success rate (%)
Less50	73	17	81,1
More 50	6	54	10,0

	Right	Wrong	Success rate (%)
Woman	40	35	53,3
Man	39	36	52,0

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	10	5	66,7
Woman 30-40	14	1	93,3
Man 30-40	9	6	60,0
Woman 40-50	14	1	93,3
Man 40-50	15	0	100,0
Woman 50-60	1	14	6,7
Man 50-60	2	13	13,3
Woman +60	0	15	0,0
Man +60	3	12	20,0

TABLE 28.- *Big data base. 166 features. Images without background (crop). More or Less 50 10f*

- The ratio is low and it is 51,3%.
- The program does not offer trustworthiness because it only classifies well seven images of more than 50 years old.
- There is no difference between gender classifications.

Big data base. 166 features. Images without background (crop). More or Less 60 10f

	Right	Wrong	Success rate (%)
TOTAL	112	38	**74,7**

	Right	Wrong	Success rate (%)
Less60	112	8	93,3
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	56	19	74,7
Man	56	19	74,7

	Right	Wrong	Success rate (%)
Woman 20-30	13	2	86,7
Man 20-30	13	2	86,7
Woman 30-40	14	1	93,3
Man 30-40	14	1	93,3
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	14	1	93,3
Man 50-60	14	1	93,3
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 29.- *Big data base. 166 features. Images without background (crop). More or Less 60 10f*

- The ratio is high and it is 74,7%.
- The program does not offer trustworthiness because it does not classify well any images of more than 60 years old.
- The program classifies well men and women. Both have a high success rate of more than 70%.

Big data base. 166 features. Images without background (crop). Man or Woman 10f

	Right	Wrong	Success rate (%)
TOTAL	90	60	**60,0**

	Right	Wrong	Success rate (%)
Woman	30	45	40,0
Man	60	15	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	13	2	86,7
Woman 30-40	4	11	26,7
Man 30-40	12	3	80,0
Woman 40-50	6	9	40,0
Man 40-50	10	5	66,7
Woman 50-60	7	8	46,7
Man 50-60	12	3	80,0
Woman +60	6	9	40,0
Man +60	13	2	86,7

TABLE 30.- *Big data base. 166 features. Images without background (crop). Man or Woman 10f*

- The ratio is 60%.
- The program classifies the majority of images as men (105/150) and it means that it hits a big percentage for the men and a low percentage for the women.

Big data base. 166 features. Images without background (crop). Main 20f

	Right	Wrong	Success rate (%)
TOTAL	28	122	**18,7**

	Right	Wrong	Success rate (%)
20-30	9	21	30,0
30-40	4	26	13,3
40-50	0	30	0,0
50-60	13	17	43,3
+60	2	28	6,7

	Right	Wrong	Success rate (%)
Woman 20-30	6	9	40,0
Man 20-30	3	12	20,0
Woman 30-40	2	13	13,3
Man 30-40	2	13	13,3
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	4	11	26,7
Man 50-60	9	6	60,0
Woman +60	2	13	13,3
Man +60	0	15	0,0

TABLE 31.- *Big data base. 166 features. Images without background (crop). Main 20f*

- The ratio of the program is 18,7% and it is not enough to work with him.
- The program does not get right any 40-50 image.

Big data base. 166 features. Images without background (crop). More or Less 30 20f

	Right	Wrong	Success rate (%)
TOTAL	57	93	**38**

	Right	Wrong	Success rate (%)
Less 30	16	14	53,3
More 30	41	79	34,2

	Right	Wrong	Success rate (%)
Woman	25	50	33,3
Man	32	43	42,7

	Right	Wrong	Success rate (%)
Woman 20-30	8	7	53,3
Man 20-30	8	7	53,3
Woman 30-40	1	14	6,7
Man 30-40	10	5	66,7
Woman 40-50	7	8	46,7
Man 40-50	2	13	13,3
Woman 50-60	4	11	26,7
Man 50-60	5	10	33,3
Woman +60	5	10	33,3
Man +60	7	8	46,7

TABLE 32.- *Big data base. 166 features. Images without background (crop). More or Less 30 20f*

- The ratio is low and it is 38%.
- The program does not offer trustworthiness because the two classifications do not have more than 54%.
- The program classifies better the men than the women.

Big data base. 166 features. Images without background (crop). More or Less 40 20f

	Right	Wrong	Success rate (%)
TOTAL	56	94	**37,3**

	Right	Wrong	Success rate (%)
Less40	44	16	73,3
More 40	12	78	13,3

	Right	Wrong	Success rate (%)
Woman	29	46	38,7
Man	27	48	36,0

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	11	4	73,3
Woman 30-40	14	1	93,3
Man 30-40	9	6	60,0
Woman 40-50	3	12	20,0
Man 40-50	0	15	0,0
Woman 50-60	2	13	13,3
Man 50-60	2	13	13,3
Woman +60	0	15	0,0
Man +60	5	10	33,3

TABLE 33.- *Big data base. 166 features. Images without background (crop). More or Less 40 20f*

- The ratio is low and it is 37,3%.
- The program does not offer trustworthiness because it classifies the majority of images as less than 40 years old images.
- The program does not have differences between men or women.

Big data base. 166 features. Images without background (crop). More or Less 50 20f

	Right	Wrong	Success rate (%)
TOTAL	77	73	**51.3**

	Right	Wrong	Success rate (%)
Less50	70	20	77,8
More 50	7	53	11,7

	Right	Wrong	Success rate (%)
Woman	38	37	50,7
Man	39	36	52,0

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	9	6	60,0
Woman 30-40	14	1	93,3
Man 30-40	10	5	66,7
Woman 40-50	12	3	80,0
Man 40-50	15	0	100,0
Woman 50-60	2	13	13,3
Man 50-60	1	14	6,7
Woman +60	0	15	0,0
Man +60	4	11	26,7

TABLE 34.- *Big data base. 166 features. Images without background (crop). More or Less 50 20f*

- The ratio is low and it is 51,3%.
- The program does not offer trustworthiness because it only classifies well seven images of more than 50 years old.
- There is no difference between gender classifications.

Big data base. 166 features. Images without background (crop). More or Less 60 20f

	Right	Wrong	Success rate (%)
TOTAL	112	38	**74,6**

	Right	Wrong	Success rate (%)
Less60	109	11	90,8
More 60	3	27	10,0

	Right	Wrong	Success rate (%)
Woman	58	17	77,3
Man	54	21	72,0

	Right	Wrong	Success rate (%)
Woman 20-30	13	2	86,7
Man 20-30	13	2	86,7
Woman 30-40	13	2	86,7
Man 30-40	13	2	86,7
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	14	1	93,3
Man 50-60	13	2	86,7
Woman +60	3	12	20,0
Man +60	0	15	0,0

TABLE 35.- *Big data base. 166 features. Images without background (crop). More or Less 60 20f*

- The ratio is high and it is 74,6%.
- The program does not offer trustworthiness because it only classifies well three images of more than 60 years old.
- The program classifies well men and women. Both have a high success rate of more than 70%.

Big data base. 166 features. Images without background (crop). Man or Woman 20f

	Right	Wrong	Success rate (%)
TOTAL	87	63	**58,0**

	Right	Wrong	Success rate (%)
Woman	28	47	37,3
Man	59	16	78,7

	Right	Wrong	Success rate (%)
Woman 20-30	5	10	33,3
Man 20-30	13	2	86,7
Woman 30-40	4	11	26,7
Man 30-40	11	4	73,3
Woman 40-50	6	9	40,0
Man 40-50	10	5	66,7
Woman 50-60	7	8	46,7
Man 50-60	12	3	80,0
Woman +60	6	9	40,0
Man +60	13	2	86,7

TABLE 36.- *Big data base. 166 features. Images without background (crop). Man or Woman 20f*

- The ratio is 58%.
- The program does not offer trustworthiness because it classifies the majority of images as men.

Big data base. 256 features. Images without background (crop). Main 5f

	Right	Wrong	Success rate (%)
TOTAL	33	117	**22,0**

	Right	Wrong	Success rate (%)
20-30	4	26	13,3
30-40	0	30	0,0
40-50	2	28	6,7
50-60	3	27	10,0
+60	24	6	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	2	13	13,3
Man 20-30	2	13	13,3
Woman 30-40	0	15	0,0
Man 30-40	0	15	0,0
Woman 40-50	0	15	0,0
Man 40-50	2	13	13,3
Woman 50-60	1	14	6,7
Man 50-60	2	13	13,3
Woman +60	12	3	80,0
Man +60	12	3	80,0

TABLE 37.- *Big data base. 256 features. Images without background (crop). Main 5f*

- The ratio of the program is 22% and it is not enough to work with him.
- The program does not get right any 30-40 image.

Big data base. 256 features. Images without background (crop). More or Less 30 5f

	Right	Wrong	Success rate (%)
TOTAL	46	104	**30,7**

	Right	Wrong	Success rate (%)
Less 30	9	21	30,0
More 30	37	83	30,8

	Right	Wrong	Success rate (%)
Woman	18	57	24,0
Man	28	47	37,3

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	2	13	13,3
Woman 30-40	2	13	13,3
Man 30-40	11	4	73,3
Woman 40-50	5	10	33,3
Man 40-50	3	12	20,0
Woman 50-60	1	14	6,7
Man 50-60	5	10	33,3
Woman +60	3	12	20,0
Man +60	7	8	46,7

TABLE 38.- *Big data base. 256 features. Images without background (crop). More or Less 30 5f*

- The ratio is low and it is 30,7%.
- The program does not offer trustworthiness because the two probabilities are less than 31%.
- The program classifies better the men than the women.

Big data base. 256 features. Images without background (crop). More or Less 40 5f

	Right	Wrong	Success rate (%)
TOTAL	51	99	**34**

	Right	Wrong	Success rate (%)
Less40	30	30	50,0
More 40	21	69	23,3

	Right	Wrong	Success rate (%)
Woman	33	42	44,0
Man	18	57	24,0

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	60,0
Man 20-30	6	9	40,0
Woman 30-40	9	6	60,0
Man 30-40	6	9	40,0
Woman 40-50	9	6	60,0
Man 40-50	2	13	13,3
Woman 50-60	2	13	13,3
Man 50-60	2	13	13,3
Woman +60	4	11	26,7
Man +60	2	13	13,3

TABLE 39.- *Big data base. 256 features. Images without background (crop). More or Less 40 5f*

- The ratio is low and it is 34%.
- The program does not offer trustworthiness because the two probabilities are less than 50%.
- The program classifies better the women than the men.

Big data base. 256 features. Images without background (crop). More or Less 50 5f

	Right	Wrong	Success rate (%)
TOTAL	74	76	**49,3**

	Right	Wrong	Success rate (%)
Less50	72	18	80,0
More 50	2	58	3,3

	Right	Wrong	Success rate (%)
Woman	37	38	49,3
Man	37	38	49,3

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	9	6	60,0
Woman 30-40	13	2	86,7
Man 30-40	13	2	86,7
Woman 40-50	12	3	80,0
Man 40-50	15	0	100,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	2	13	13,3
Man +60	0	15	0,0

TABLE 40.- *Big data base. 256 features. Images without background (crop). More or Less 50 5f*

- The ratio is low and it is less than 50%.
- The program does not offer trustworthiness because it classifies correctly only 2 images of more than 50 years old images.
- There is no difference between the men and women classification.

Big data base. 256 features. Images without background (crop). More or Less 60 5f

	Right	Wrong	Success rate (%)
TOTAL	116	34	**77,3**

	Right	Wrong	Success rate (%)
Less60	116	4	96,7
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	58	17	77,3
Man	58	17	77,3

	Right	Wrong	Success rate (%)
Woman 20-30	14	1	93,3
Man 20-30	14	1	93,3
Woman 30-40	14	1	93,3
Man 30-40	14	1	93,3
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 41.- *Big data base. 256 features. Images without background (crop). More or Less 60 5f*

- The ratio is high and it is 77,3%.
- The program does not offer trustworthiness because it classifies incorrectly all the images of more than 60 years old.
- The classification between men or women has the same percentage.

Big data base. 256 features. Images without background (crop). Man or Woman 5f

	Right	Wrong	Success rate (%)
TOTAL	105	45	**70,0**

	Right	Wrong	Success rate (%)
Woman	50	25	66,7
Man	55	20	73,3

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	11	4	73,3
Woman 30-40	9	6	60,0
Man 30-40	15	0	100,0
Woman 40-50	10	5	66,7
Man 40-50	11	4	73,3
Woman 50-60	10	5	66,7
Man 50-60	10	5	66,7
Woman +60	10	5	66,7
Man +60	8	7	53,3

TABLE 42.- *Big data base. 256 features. Images without background (crop). Man or Woman 5f*

- The ratio is high and it is 70%
- The program classifies well the men and the women because the two probabilities are more or less 70%.

Big data base. 256 features. Images without background (crop). Main 10f

	Right	Wrong	Success rate (%)
TOTAL	23	127	**15,3**

	Right	Wrong	Success rate (%)
20-30	5	25	16,7
30-40	0	30	0,0
40-50	1	29	3,3
50-60	1	29	3,3
+60	16	14	53,3

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	1	14	6,7
Woman 30-40	0	15	0,0
Man 30-40	0	15	0,0
Woman 40-50	0	15	0,0
Man 40-50	1	14	6,7
Woman 50-60	0	15	0,0
Man 50-60	1	14	6,7
Woman +60	11	4	73,3
Man +60	5	10	33,3

TABLE 43.- *Big data base. 256 features. Images without background (crop). Main 10f*

- The ratio of the program is 15,3% and it is not enough to work with him.
- The program does not get right any 30-40 image.

Big data base. 256 features. Images without background (crop). More or Less 30 10f

	Right	Wrong	Success rate (%)
TOTAL	46	104	**30,7**

	Right	Wrong	Success rate (%)
Less 30	9	21	30,0
More 30	37	83	30,8

	Right	Wrong	Success rate (%)
Woman	22	53	29,3
Man	24	51	32,0

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	2	13	13,3
Woman 30-40	3	12	20,0
Man 30-40	10	5	66,7
Woman 40-50	7	8	46,7
Man 40-50	2	13	13,3
Woman 50-60	1	14	6,7
Man 50-60	5	10	33,3
Woman +60	4	11	26,7
Man +60	5	10	33,3

TABLE 44.- *Big data base. 256 features. Images without background (crop). More or Less 30 10f*

- The ratio is low and it is 30.7%.
- The program does not offer trustworthiness because the two probabilities are less of 31%.
- The classification between men or women is similar.

Big data base. 256 features. Images without background (crop). More or Less 40 10f

	Right	Wrong	Success rate (%)
TOTAL	48	102	**32,0**

	Right	Wrong	Success rate (%)
Less40	35	25	58,3
More 40	13	77	14,4

	Right	Wrong	Success rate (%)
Woman	30	45	40,0
Man	18	57	24,0

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	60,0
Man 20-30	6	9	40,0
Woman 30-40	13	2	86,7
Man 30-40	7	8	46,7
Woman 40-50	4	11	26,7
Man 40-50	0	15	0,0
Woman 50-60	1	14	6,7
Man 50-60	3	12	20,0
Woman +60	3	12	20,0
Man +60	2	13	13,3

TABLE 45.- *Big data base. 256 features. Images without background (crop). More or Less 40 10f*

- The ratio is low and it is 32%.
- The program does not offer trustworthiness because it classifies the less than 40 images better than the more than 40 images.
- The program classifies better the women than the men.

Big data base. 256 features. Images without background (crop). More or Less 50 10f

	Right	Wrong	Success rate (%)
TOTAL	75	75	**50,0**

	Right	Wrong	Success rate (%)
Less50	75	15	83,3
More 50	0	60	0,0

	Right	Wrong	Success rate (%)
Woman	37	38	49,3
Man	38	37	50,7

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	10	5	66,7
Woman 30-40	14	1	93,3
Man 30-40	13	2	86,7
Woman 40-50	13	2	86,7
Man 40-50	15	0	100,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 46.- *Big data base. 256 features. Images without background (crop). More or Less 50 10f*

- The ratio is low and it is 50%.
- The program does not offer trustworthiness because it does not classify well any image of more than 50 years old.
- The program classifies better the women than the men.

Big data base. 256 features. Images without background (crop). More or Less 60 10f

	Right	Wrong	Success rate (%)
TOTAL	109	41	**72,7**

	Right	Wrong	Success rate (%)
Less60	109	11	90,8
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	54	21	72,0
Man	55	20	73,3

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	12	3	80,0
Woman 30-40	14	1	93,3
Man 30-40	13	2	86,7
Woman 40-50	14	1	93,3
Man 40-50	15	0	100,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 47.- *Big data base. 256 features. Images without background (crop). More or Less 60 10f*

- The ratio is high and it is 72,7%.
- The program classifies well the men and the women because the two probabilities are more than 70% probabilities.

Big data base. 256 features. Images without background (crop). Man or Woman 10f

	Right	Wrong	Success rate (%)
TOTAL	111	39	**74,0**

	Right	Wrong	Success rate (%)
Woman	54	21	72,0
Man	57	18	76,0

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	12	3	80,0
Woman 30-40	12	3	80,0
Man 30-40	14	1	93,3
Woman 40-50	11	4	73,3
Man 40-50	9	6	60,0
Woman 50-60	10	5	66,7
Man 50-60	11	4	73,3
Woman +60	10	5	66,7
Man +60	11	4	73,3

TABLE 48.- *Big data base. 256 features. Images without background (crop). Man or Woman 10f*

- The ratio is high and it is 74%.
- The program classifies well the men and the women because the two probabilities are more than 70%.

Big data base. 256 features. Images without background (crop). Main 20f

	Right	Wrong	Success rate (%)
TOTAL	22	128	**14,7**

	Right	Wrong	Success rate (%)
20-30	7	23	23,3
30-40	1	29	3,3
40-50	0	30	0,0
50-60	2	28	6,7
+60	12	18	40,0

	Right	Wrong	Success rate (%)
Woman 20-30	6	9	40,0
Man 20-30	1	14	6,7
Woman 30-40	0	15	0,0
Man 30-40	1	14	6,7
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	0	15	0,0
Man 50-60	2	13	13,3
Woman +60	9	6	60,0
Man +60	3	12	20,0

TABLE 49.- *Big data base. 256 features. Images without background (crop). Main 20f*

- The ratio of the program is 14,3% and it is not enough to work with him.
- The program does not get right any 40-50 image.

Big data base. 256 features. Images without background (crop). More or Less 30 20f

	Right	Wrong	Success rate (%)
TOTAL	40	110	**26.7**

	Right	Wrong	Success rate (%)
Less 30	12	18	40,0
More 30	28	92	23,3

	Right	Wrong	Success rate (%)
Woman	16	59	21,3
Man	24	51	32,0

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	5	10	33,3
Woman 30-40	1	14	6,7
Man 30-40	8	7	53,3
Woman 40-50	4	11	26,7
Man 40-50	2	13	13,3
Woman 50-60	1	14	6,7
Man 50-60	5	10	33,3
Woman +60	3	12	20,0
Man +60	4	11	26,7

TABLE 50.- *Big data base. 256 features. Images without background (crop). More or Less 30 20f*

- The ratio is low and it is 26.7%.
- The program does not offer trustworthiness because the two probabilities are less of 50%.
- The program classifies better the men than the women.

Big data base. 256 features. Images without background (crop). More or Less 40 20f

	Right	Wrong	Success rate (%)
TOTAL	48	102	**32,0**

	Right	Wrong	Success rate (%)
Less40	42	18	70,0
More 40	6	84	6,7

	Right	Wrong	Success rate (%)
Woman	27	48	36,0
Man	21	54	28,0

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	60,0
Man 20-30	9	6	60,0
Woman 30-40	14	1	93,3
Man 30-40	10	5	66,7
Woman 40-50	3	12	20,0
Man 40-50	0	15	0,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	1	14	6,7
Man +60	2	13	13,3

TABLE 51.- *Big data base. 256 features. Images without background (crop). More or Less 40 20f*

- The ratio is low and it is 32%.
- The program does not offer trustworthiness because it only classifies well 6 images of more than 40 years old.
- The program classifies better the women than the men.

Big data base. 256 features. Images without background (crop). More or Less 50 20f

	Right	Wrong	Success rate (%)
TOTAL	75	75	**50**

	Right	Wrong	Success rate (%)
Less50	75	15	83,3
More 50	0	60	0,0

	Right	Wrong	Success rate (%)
Woman	37	38	49,3
Man	38	37	50,7

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	11	4	73,3
Woman 30-40	14	1	93,3
Man 30-40	12	3	80,0
Woman 40-50	12	3	80,0
Man 40-50	15	0	100,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 52.- *Big data base. 256 features. Images without background (crop). More or Less 50 20f*

- The ratio is low and it is 50%.
- The program does not offer trustworthiness because it does not get right any image of more than 50 years old.
- The difference between men images and women images is not much.

Big data base. 256 features. Images without background (crop). More or Less 60 20f

	Right	Wrong	Success rate (%)
TOTAL	109	41	**72.7**

	Right	Wrong	Success rate (%)
Less60	109	11	90,8
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	55	20	73,3
Man	54	21	72,0

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	12	3	80,0
Woman 30-40	14	1	93,3
Man 30-40	12	3	80,0
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

__TABLE 53.-__ Big data base. 256 features. Images without background (crop). More or Less 60 20f

- The ratio is high and it is 72.7%.
- The program does not offer trustworthiness because it does not get right any image of more than 60 years old.
- The difference between men images and women images is not much.

Big data base. 256 features. Images without background (crop). Man or Woman 20f

	Right	Wrong	Success rate (%)
TOTAL	104	46	**69,3**

	Right	Wrong	Success rate (%)
Woman	58	17	77,3
Man	46	29	61,3

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	0,60
Man 20-30	11	4	0,73
Woman 30-40	14	1	0,93
Man 30-40	14	1	0,93
Woman 40-50	12	3	0,80
Man 40-50	4	11	0,27
Woman 50-60	11	4	0,73
Man 50-60	8	7	0,53
Woman +60	12	3	0,80
Man +60	9	6	0,60

TABLE 54.- *Big data base. 256 features. Images without background (crop). Man or Woman 20f*

- The ratio is high and it is 80%.
- The program does not offer trustworthiness because it gets right more women than men.

Big data base. 256 features. Images with background. Main 5f

	Right	Wrong	Success rate (%)
TOTAL	17	133	**11,3**

	Right	Wrong	Success rate (%)
20-30	11	19	36,7
30-40	3	27	10,0
40-50	3	27	10,0
50-60	0	30	0,0
+60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	7	8	46,7
Woman 30-40	1	14	6,7
Man 30-40	2	13	13,3
Woman 40-50	2	13	13,3
Man 40-50	1	14	6,7
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 55.- *Big data base. 256 features. Images with background. Main 5f*

- The ratio of the program is 11,3% and it is not enough to work with him.
- The program does not get right any 50-60 and 60+ image.

Big data base. 256 features. Images with background. More or Less 30 5f

	Right	Wrong	Success rate (%)
TOTAL	120	30	**80**

	Right	Wrong	Success rate (%)
Less 30	0	30	0,0
More 30	120	0	100,0

	Right	Wrong	Success rate (%)
Woman	60	15	80,0
Man	60	15	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	0	15	0,0
Man 20-30	0	15	0,0
Woman 30-40	15	0	100,0
Man 30-40	15	0	100,0
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	15	0	100,0
Man +60	15	0	100,0

TABLE 56.- *Big data base. 256 features. Images with background. More or Less 30 5f*

- The ratio is high and it is 80%.
- The program does not offer trustworthiness because it does not get right any image of more than 30.
- The program hits the same number of men and women images.

Big data base. 256 features. Images with background. More or Less 40 5f

	Right	Wrong	Success rate (%)
TOTAL	84	66	**56**

	Right	Wrong	Success rate (%)
Less40	9	51,0	15,0
More 40	75	15,0	83,3

	Right	Wrong	Success rate (%)
Woman	42	33,0	56,0
Man	42	33,0	56,0

	Right	Wrong	Success rate (%)
Woman 20-30	2	13	13,3
Man 20-30	1	14	6,7
Woman 30-40	2	13	13,3
Man 30-40	4	11	26,7
Woman 40-50	13	2	86,7
Man 40-50	12	3	80,0
Woman 50-60	11	4	73,3
Man 50-60	11	4	73,3
Woman +60	14	1	93,3
Man +60	14	1	93,3

TABLE 57.- *Big data base. 256 features. Images with background. More or Less 40 5f*

- The ratio is low and it is 56%.
- The program does not offer trustworthiness because it hits more images of more than 40 than less than 40.
- There is no difference in gender classification.

Big data base. 256 features. Images with background. More or Less 50 5f

	Right	Wrong	Success rate (%)
TOTAL	82	68	**54.7**

	Right	Wrong	Success rate (%)
Less50	82	8	91,1
More 50	0	60	0,0

	Right	Wrong	Success rate (%)
Woman	38	37	50,7
Man	44	31	58,7

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	14	1	93,3
Woman 30-40	13	2	86,7
Man 30-40	15	0	100,0
Woman 40-50	14	1	93,3
Man 40-50	15	0	100,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 58.- *Big data base. 256 features. Images with background. More or Less 50 5f*

- The ratio is low and it is 54.7%.
- The program does not offer trustworthiness because it does not get right any image of more than 50.
- The program classifies better the men than the women.

Big data base. 256 features. Images with background. More or Less 60 5f

	Right	Wrong	Success rate (%)
TOTAL	120	30	**80**

	Right	Wrong	Success rate (%)
Less60	120	0	100,0
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	60	15	80,0
Man	60	15	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	15	0	100,0
Man 20-30	15	0	100,0
Woman 30-40	15	0	100,0
Man 30-40	15	0	100,0
Woman 40-50	15	0	100,0
Man 40-50	15	0	100,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 59.- *Big data base. 256 features. Images with background. More or Less 60 5f*

- The ratio is high and it is 80%.
- The program does not offer trustworthiness because it does not get right any image of more than 60.
- The program hits the same number of men and women images.

Big data base. 256 features. Images with background. Man or Woman 5f

	Right	Wrong	Success rate (%)
TOTAL	84	66	**56,0**

	Right	Wrong	Success rate (%)
Woman	70	5	93,3
Man	14	61	18,7

	Right	Wrong	Success rate (%)
Woman 20-30	12	3	80,0
Man 20-30	5	10	33,3
Woman 30-40	15	0	100,0
Man 30-40	4	11	26,7
Woman 40-50	13	2	86,7
Man 40-50	2	13	13,3
Woman 50-60	15	0	100,0
Man 50-60	1	14	6,7
Woman +60	15	0	100,0
Man +60	2	13	13,3

TABLE 60.- *Big data base. 256 features. Images with background. Man or Woman 5f*

- The ratio presents a low ratio of 56%.
- The program classifies almost all the images like woman images. The program does not offer trustworthiness.

Big data base. 256 features. Images with background. Main 20f

	Right	Wrong	Success rate (%)
TOTAL	23	127	**15,3**

	Right	Wrong	Success rate (%)
20-30	19	11	63,3
30-40	3	27	10,0
40-50	1	29	3,3
50-60	0	30	0,0
+60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	60,0
Man 20-30	10	5	66,7
Woman 30-40	0	15	0,0
Man 30-40	3	12	20,0
Woman 40-50	1	14	6,7
Man 40-50	0	15	0,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 61.- *Big data base. 256 features. Images with background. Main 20f*

- The ratio of the program is 15,3% and it is not enough to work with him.
- The program does not get right any 50-60 and 60+ image.

Big data base. 256 features. Images with background. More or Less 30 20f

	Right	Wrong	Success rate (%)
TOTAL	108	42	**72**

	Right	Wrong	Success rate (%)
Less 30	6	24	20,0
More 30	102	18	85,0

	Right	Wrong	Success rate (%)
Woman	58	17	77,3
Man	50	25	66,7

	Right	Wrong	Success rate (%)
Woman 20-30	2	13	13,3
Man 20-30	4	11	26,7
Woman 30-40	14	1	93,3
Man 30-40	11	4	73,3
Woman 40-50	13	2	86,7
Man 40-50	12	3	80,0
Woman 50-60	14	1	93,3
Man 50-60	13	2	86,7
Woman +60	15	0	100,0
Man +60	10	5	66,7

TABLE 62.- *Big data base. 256 features. Images with background. More or Less 30 20f*

- The program has a good ratio of 72%.
- The program does not offer trustworthiness because the program only gets right 6 images of less than 30.
- The program classifies better the women than the men.

Big data base. 256 features. Images with background. More or Less 40 20f

	Right	Wrong	Success rate (%)
TOTAL	78	72	**52**

	Right	Wrong	Success rate (%)
Less40	10	50,0	16,7
More 40	68	22,0	75,6

	Right	Wrong	Success rate (%)
Woman	38	37,0	50,7
Man	40	35,0	53,3

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	1	14	6,7
Woman 30-40	2	13	13,3
Man 30-40	3	12	20,0
Woman 40-50	11	4	73,3
Man 40-50	12	3	80,0
Woman 50-60	9	6	60,0
Man 50-60	12	3	80,0
Woman +60	12	3	80,0
Man +60	12	3	80,0

TABLE 63.- *Big data base. 256 features. Images with background. More or Less 40 20f*

- The ratio is low and it is 52%.
- The trustworthiness is low because the program gets right more images of ‘more than 40’ than ‘less than 40’.
- The program classifies better men images.

Big data base. 256 features. Images with background. More or Less 50 20f

	Right	Wrong	Success rate (%)
TOTAL	78	72	**52**

	Right	Wrong	Success rate (%)
Less50	78	12	86,7
More 50	0	60	0,0

	Right	Wrong	Success rate (%)
Woman	36	39	48,0
Man	42	33	56,0

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	13	2	86,7
Woman 30-40	14	1	93,3
Man 30-40	14	1	93,3
Woman 40-50	11	4	73,3
Man 40-50	15	0	100,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 64.- *Big data base. 256 features. Images with background. More or Less 50 20f*

- The ratio is low and it is 52%.
- The program does not offer trustworthiness because the program does not get right any program of more than 50 images.
- The program classifies better the men images.

Big data base. 256 features. Images with background. More or Less 60 20f

	Right	Wrong	Success rate (%)
TOTAL	116	34	**77.3**

	Right	Wrong	Success rate (%)
Less60	116	4	96,7
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	56	19	74,7
Man	60	15	80,0

	Right	Wrong	Success rate (%)
Woman 20-30	13	2	86,7
Man 20-30	15	0	100,0
Woman 30-40	15	0	100,0
Man 30-40	15	0	100,0
Woman 40-50	13	2	86,7
Man 40-50	15	0	100,0
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 65.- *Big data base. 256 features. Images with background. More or Less 60 20f*

- The ratio is 77.3%, so it is a good ratio.
- The program does not offer trustworthiness because the program does not get right any image of more than 60.
- The program gets right more men than women.

Big data base. 256 features. Images with background. Man or Woman 20f

	Right	Wrong	Success rate (%)
TOTAL	96	150	**64,0**

	Right	Wrong	Success rate (%)
Woman	60	15	80,0
Man	36	39	48,0

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	9	6	60,0
Woman 30-40	13	2	86,7
Man 30-40	10	5	66,7
Woman 40-50	11	4	73,3
Man 40-50	8	7	53,3
Woman 50-60	15	0	100,0
Man 50-60	5	10	33,3
Woman +60	10	5	66,7
Man +60	4	11	26,7

TABLE 66.- *Big data base. 256 features. Images with background. Man or Woman 20f*

- The program presents a success rate of 64%.
- The program classify the majority of the images like woman, therefore the program trustworthiness is not enough high.

Big data base. 256 features. Images with background. Main 40f

	Right	Wrong	Success rate (%)
TOTAL	20	130	**13,3**

	Right	Wrong	Success rate (%)
20-30	18	12	60,0
30-40	2	27	6,7
40-50	0	30	0,0
50-60	0	30	0,0
+60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman 20-30	8	7	53,3
Man 20-30	10	5	66,7
Woman 30-40	0	15	0,0
Man 30-40	2	13	13,3
Woman 40-50	0	15	0,0
Man 40-50	0	15	0,0
Woman 50-60	0	15	0,0
Man 50-60	0	15	0,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 67.- *Big data base. 256 features. Images with background. Main 40f*

- The ratio of the program is 13,3% and it is not enough to work with him.
- The program does not get right any 40-50, 50-60 and 60+ image.

Big data base. 256 features. Images with background. More or Less 30 40f

	Right	Wrong	Success rate (%)
TOTAL	114	36	**76**

	Right	Wrong	Success rate (%)
Less 30	8	22	26,7
More 30	106	14	88,3

	Right	Wrong	Success rate (%)
Woman	59	16	78,7
Man	55	20	73,3

	Right	Wrong	Success rate (%)
Woman 20-30	2	13	13,3
Man 20-30	6	9	40,0
Woman 30-40	14	1	93,3
Man 30-40	11	4	73,3
Woman 40-50	14	1	93,3
Man 40-50	14	1	93,3
Woman 50-60	15	0	100,0
Man 50-60	13	2	86,7
Woman +60	14	1	93,3
Man +60	11	4	73,3

TABLE 68.- *Big data base. 256 features. Images with background. More or Less 30 40f.*

- There is a good ratio of 76%.
- The program does not offer trustworthiness because the program only gets right 8 images of less than 30.
- The gender difference is small.

Big data base. 256 features. Images with background. More or Less 40 40f

	Right	Wrong	Success rate (%)
TOTAL	84	66	**56**

	Right	Wrong	Success rate (%)
Less40	23	37,0	38,3
More 40	61	29,0	67,8

	Right	Wrong	Success rate (%)
Woman	46	29,0	61,3
Man	38	37,0	50,7

	Right	Wrong	Success rate (%)
Woman 20-30	8	7	53,3
Man 20-30	8	7	53,3
Woman 30-40	1	14	6,7
Man 30-40	6	9	40,0
Woman 40-50	12	3	80,0
Man 40-50	5	10	33,3
Woman 50-60	12	3	80,0
Man 50-60	12	3	80,0
Woman +60	13	2	86,7
Man +60	7	8	46,7

TABLE 69.- *Big data base. 256 features. Images with background. More or Less 40 40f*

- The ratio is 56%.
- The trustworthiness is low because the program gets right more images of 'more than 40' than 'less than 40'.
- It classifies better women than men.

Big data base. 256 features. Images with background. More or Less 50 40f

	Right	Wrong	Success rate (%)
TOTAL	83	67	**55,3**

	Right	Wrong	Success rate (%)
Less50	47	43	52,2
More 50	36	24	60,0

	Right	Wrong	Success rate (%)
Woman	45	30	60,0
Man	38	37	50,7

	Right	Wrong	Success rate (%)
Woman 20-30	10	5	66,7
Man 20-30	6	9	40,0
Woman 30-40	10	5	66,7
Man 30-40	9	6	60,0
Woman 40-50	10	5	66,7
Man 40-50	2	13	13,3
Woman 50-60	4	11	26,7
Man 50-60	9	6	60,0
Woman +60	11	4	73,3
Man +60	12	3	80,0

TABLE 70.- *Big data base. 256 features. Images with background. More or Less 50 40f*

- The program has a ratio of less than 60%.
- The trustworthiness is bad because the program does not classify with a more than 60% the images of more and less than 60 years old.
- The program classifies better the women than the men.

Big data base. 256 features. Images with background. More or Less 60 40f

	Right	Wrong	Success rate (%)
TOTAL	112	38	**74.7**

	Right	Wrong	Success rate (%)
Less60	112	8	93,3
More 60	0	30	0,0

	Right	Wrong	Success rate (%)
Woman	54	21	72,0
Man	58	17	77,3

	Right	Wrong	Success rate (%)
Woman 20-30	11	4	73,3
Man 20-30	15	0	100,0
Woman 30-40	15	0	100,0
Man 30-40	15	0	100,0
Woman 40-50	13	2	86,7
Man 40-50	13	2	86,7
Woman 50-60	15	0	100,0
Man 50-60	15	0	100,0
Woman +60	0	15	0,0
Man +60	0	15	0,0

TABLE 71.- *Big data base. 256 features. Images with background. More or Less 60 40f*

- The ratio of the program is 74.7%.
- The trustworthiness is bad because the program does not get right any image of more than 60 years old.
- The program classifies better the men than the women but there is not a big difference.

Big data base. 256 features. Images with background. Man or Woman 40f

	Right	Wrong	Success rate (%)
TOTAL	105	45	**70,0**

	Right	Wrong	Success rate (%)
Woman	53	22	70,7
Man	52	23	69,3

	Right	Wrong	Success rate (%)
Woman 20-30	9	6	60,0
Man 20-30	11	4	73,3
Woman 30-40	12	3	80,0
Man 30-40	10	5	66,7
Woman 40-50	11	4	73,3
Man 40-50	13	2	86,7
Woman 50-60	14	1	93,3
Man 50-60	10	5	66,7
Woman +60	7	8	46,7
Man +60	8	7	53,3

TABLE 72.- *Big data base. 256 features. Images with background. Man or Woman 40f*

- The ratio is 70%.
- There are not differences between the classification of men and women.
- The classification of women and men has a high ratio. This means that the program classify good the men and the women.

Small data base. 256 features. Images with background. Main 5f

	Right	Wrong	Success rate (%)
TOTAL	36	114	**24,0**

	Right	Wrong	Success rate (%)
20-30	7	23	23,3
30-40	3	27	11,1
40-50	19	11	63,3
50-60	1	29	3,4
+60	6	24	20,0

	Right	Wrong	Success rate (%)
Woman 20-30	5	10	33,3
Man 20-30	2	13	13,3
Woman 30-40	1	14	6,7
Man 30-40	2	13	13,3
Woman 40-50	8	7	53,3
Man 40-50	11	4	73,3
Woman 50-60	0	15	0
Man 50-60	1	14	6,7
Woman +60	3	12	20,0
Man +60	3	12	20,0

TABLE 73.- *Small data base. 256 features. Images with background. Main 5f*

- The ratio is 24% and it is not enough to work with it.

Small data base. 256 features. Images with background. More or Less 30 5f

	Right	Wrong	Success rate (%)
TOTAL	111	39	**74**

	Right	Wrong	Success rate (%)
Less 30	6	24	20,0
More 30	105	15	87,5

	Right	Wrong	Success rate (%)
Woman	59	16	78,7
Man	52	23	69,3

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	2	13	13,3
Woman 30-40	13	2	86,7
Man 30-40	14	1	93,3
Woman 40-50	14	1	93,3
Man 40-50	11	4	73,3
Woman 50-60	14	1	93,3
Man 50-60	13	2	86,7
Woman +60	14	1	93,3
Man +60	12	3	80,0

TABLE 74.- *Small data base. 256 features. Images with background. More or Less 30 5f*

- There is a good ratio of 74%.
- The program does not offer trustworthiness because the program only gets right 6 images of less than 30.
- It classifies better women than men.

Small data base. 256 features. Images with background. More or Less 40 5f

	Right	Wrong	Success rate (%)
TOTAL	80	70	**53,3**

	Right	Wrong	Success rate (%)
Less40	30	30,0	50,0
More 40	50	40,0	55,6

	Right	Wrong	Success rate (%)
Woman	44	31,0	58,7
Man	36	39,0	48,0

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	6	9	40,0
Woman 30-40	9	6	60,0
Man 30-40	8	7	53,3
Woman 40-50	12	3	80,0
Man 40-50	5	10	33,3
Woman 50-60	8	7	53,3
Man 50-60	8	7	53,3
Woman +60	8	7	53,3
Man +60	9	6	60,0

TABLE 75.- *Small data base. 256 features. Images with background. More or Less 40 20f*

- The ratio is 53,3%.
- The trustworthiness is low because the two probabilities (less and more) are less than 60%.
- It classifies better women than men.

Small data base. 256 features. Images with background. More or Less 50 5f

	Right	Wrong	Success rate (%)
TOTAL	76	74	**50,6**

	Right	Wrong	Success rate (%)
Less50	45	45	50,0
More 50	31	29	51,7

	Right	Wrong	Success rate (%)
Woman	44	31	58,7
Man	32	43	42,7

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	2	13	13,3
Woman 30-40	11	4	73,3
Man 30-40	6	9	40,0
Woman 40-50	8	7	53,3
Man 40-50	11	4	73,3
Woman 50-60	10	5	66,7
Man 50-60	5	10	33,3
Woman +60	8	7	53,3
Man +60	8	7	53,3

TABLE 76.- *Small data base. 256 features. Images with background. More or Less 50 5f*

- The program has a ratio of 50,6%.
- The trustworthiness is bad because the program does not classify never more than 52%.
- The program classifies better the women than the men.

Small data base. 256 features. Images with background. More or Less 60 5f

	Right	Wrong	Success rate (%)
TOTAL	104	46	**69,3**

	Right	Wrong	Success rate (%)
Less60	94	26	78,3
More 60	10	20	33,3

	Right	Wrong	Success rate (%)
Woman	56	19	74,7
Man	48	27	64,0

	Right	Wrong	Success rate (%)
Woman 20-30	14	1	93,3
Man 20-30	12	3	80,0
Woman 30-40	14	1	93,3
Man 30-40	9	6	60,0
Woman 40-50	11	4	73,3
Man 40-50	14	1	93,3
Woman 50-60	10	5	66,7
Man 50-60	10	5	66,7
Woman +60	7	8	46,7
Man +60	3	12	20,0

TABLE 77.- *Small data base. 256 features. Images with background. More or Less 60 5f*

- The ratio of the program is 69,3%.
- The trustworthiness is bad because the program classifies bad the majority of the images of more than 60 years old.
- The program classifies better the women than the men.

Small data base. 256 features. Images with background. Man or Woman 5f

	Right	Wrong	Success rate (%)
TOTAL	80	70	**53,3**

	Right	Wrong	Success rate (%)
Woman	8	67	5,3
Man	72	3	96,0

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,6
Man 20-30	15	0	100,0
Woman 30-40	1	14	6,6
Man 30-40	14	1	93,3
Woman 40-50	2	13	13,3
Man 40-50	15	0	100,0
Woman 50-60	1	14	6,6
Man 50-60	14	1	93,3
Woman +60	0	15	0,0
Man +60	14	1	93,3

TABLE 78.- *Big data base. 256 features. Images with background. Man or Woman 5f*

- The ratio is low and it is 53,3%.
- The trustworthiness is low because it only classifies well 8 woman images.

Small data base. 256 features. Images with background. Main 20f

	Right	Wrong	Success rate (%)
TOTAL	35	115	**23,3**

	Right	Wrong	Success rate (%)
20-30	3	27	10,0
30-40	6	24	20,0
40-50	18	12	60,0
50-60	1	29	3,3
+60	7	23	23,3

	Right	Wrong	Success rate (%)
Woman 20-30	3	12	20,0
Man 20-30	0	15	0,0
Woman 30-40	4	11	26,7
Man 30-40	2	13	13,3
Woman 40-50	10	5	66,7
Man 40-50	8	7	53,3
Woman 50-60	0	15	0,0
Man 50-60	1	14	6,7
Woman +60	4	11	26,7
Man +60	3	12	20,0

TABLE 79.- *Small data base. 256 features. Images with background. Main 20f*

- The ratio of the program is 23,3% and it is not enough to work with him.

Small data base. 256 features. Images with background. More or Less 30 20f

	Right	Wrong	Success rate (%)
TOTAL	112	38	**74,6**

	Right	Wrong	Success rate (%)
Less 30	7	23	23,3
More 30	105	15	87,5

	Right	Wrong	Success rate (%)
Woman	61	14	81,3
Man	51	24	68,0

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	3	12	20,0
Woman 30-40	13	2	86,7
Man 30-40	14	1	93,3
Woman 40-50	14	1	93,3
Man 40-50	10	5	66,7
Woman 50-60	15	0	100,0
Man 50-60	12	3	80,0
Woman +60	15	0	100,0
Man +60	12	3	80,0

TABLE 80.- *Small data base. 256 features. Images with background. More or Less 30 20f*

- There is a good ratio of 74,6%.
- The program does not offer trustworthiness because the program only gets right 7 images of less than 30.
- It classifies better women than men.

Small data base. 256 features. Images with background. More or Less 40 20f

	Right	Wrong	Success rate (%)
TOTAL	92	58	**61,3**

	Right	Wrong	Success rate (%)
Less40	32	28,0	53,3
More 40	60	30,0	66,7

	Right	Wrong	Success rate (%)
Woman	53	22,0	70,7
Man	39	36,0	52,0

	Right	Wrong	Success rate (%)
Woman 20-30	8	7	53,3
Man 20-30	8	7	53,3
Woman 30-40	10	5	66,7
Man 30-40	6	9	40,0
Woman 40-50	11	4	73,3
Man 40-50	6	9	40,0
Woman 50-60	12	3	80,0
Man 50-60	10	5	66,7
Woman +60	12	3	80,0
Man +60	9	6	60,0

TABLE 81.- *Small data base. 256 features. Images with background. More or Less 40 20f*

- The ratio is 61,3%.
- The trustworthiness is low because the program gets right more images of 'more than 40' than 'less than 40'.
- It classifies better women than men.

Small data base. 256 features. Images with background. More or Less 50 20f

	Right	Wrong	Success rate (%)
TOTAL	71	79	**47,3**

	Right	Wrong	Success rate (%)
Less50	46	44	51,1
More 50	25	35	41,7

	Right	Wrong	Success rate (%)
Woman	40	35	53,3
Man	31	44	41,3

	Right	Wrong	Success rate (%)
Woman 20-30	6	9	40,0
Man 20-30	4	11	26,7
Woman 30-40	11	4	73,3
Man 30-40	3	12	20,0
Woman 40-50	10	5	66,7
Man 40-50	12	3	80,0
Woman 50-60	8	7	53,3
Man 50-60	6	9	40,0
Woman +60	5	10	33,3
Man +60	6	9	40,0

TABLE 82.- *Small data base. 256 features. Images with background. More or Less 50 20f*

- The program has a ratio of less than 50%.
- The trustworthiness is bad because the program does not classify in a more than 52% of success in the less or more classifications.
- The program classifies better the women than the men.

Small data base. 256 features. Images with background. More or Less 60 20f

	Right	Wrong	Success rate (%)
TOTAL	82	68	**54,6**

	Right	Wrong	Success rate (%)
Less60	73	47	60,8
More 60	9	21	30,0

	Right	Wrong	Success rate (%)
Woman	43	32	57,3
Man	39	36	52,0

	Right	Wrong	Success rate (%)
Woman 20-30	7	8	46,7
Man 20-30	9	6	60,0
Woman 30-40	14	1	93,3
Man 30-40	4	11	26,7
Woman 40-50	9	6	60,0
Man 40-50	13	2	86,7
Woman 50-60	7	8	46,7
Man 50-60	10	5	66,7
Woman +60	6	9	40,0
Man +60	3	12	20,0

TABLE 83.- *Small data base. 256 features. Images with background. More or Less 60 20f*

- The ratio of the program is 54,3%.
- The trustworthiness is bad because the program classifies bad the majority of the images of more than 60 years old.
- The program classifies better the women than the men.

Small data base. 256 features. Images with background. Man or Woman 20f

	Right	Wrong	Success rate (%)
TOTAL	82	68	**54,6**

	Right	Wrong	Success rate (%)
Woman	10	65	13,3
Man	72	3	96,0

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,6
Man 20-30	15	0	100,0
Woman 30-40	2	14	6,6
Man 30-40	14	1	93,3
Woman 40-50	3	13	13,3
Man 40-50	15	0	100,0
Woman 50-60	1	14	6,6
Man 50-60	13	1	93,3
Woman +60	0	15	0,0
Man +60	15	1	93,3

TABLE 84.- *Big data base. 256 features. Images with background. Man or Woman 20f*

- The ratio is low and it is 54,6%.
- The trustworthiness is low because it only classifies well 10 woman images.

Small data base. 256 features. Images with background. Main 40f

	Right	Wrong	Success rate (%)
TOTAL	34	116	**22,6**

	Right	Wrong	Success rate (%)
20-30	4	26	13,3
30-40	6	24	20,0
40-50	15	15	50,0
50-60	2	28	6,6
+60	7	23	23,3

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	0	15	0,0
Woman 30-40	2	13	13,3
Man 30-40	4	11	26,7
Woman 40-50	10	5	66,7
Man 40-50	5	10	33,3
Woman 50-60	0	15	0,0
Man 50-60	2	13	13,3
Woman +60	4	11	26,7
Man +60	3	12	20,0

TABLE 85.- *Small data base. 256 features. Images with background. Main 40f*

- The ratio of the program is 22,6% and it is not enough to work with him.

Small data base. 256 features. Images with background. More or Less 30 40f

	Right	Wrong	Success rate (%)
TOTAL	104	46	**69,3**

	Right	Wrong	Success rate (%)
Less 30	6	24	20,0
More 30	98	22	81,7

	Right	Wrong	Success rate (%)
Woman	57	18	76,0
Man	47	28	62,7

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	2	13	13,3
Woman 30-40	12	3	80,0
Man 30-40	14	1	93,3
Woman 40-50	14	1	93,3
Man 40-50	8	7	53,3
Woman 50-60	14	1	93,3
Man 50-60	12	3	80,0
Woman +60	13	2	86,7
Man +60	11	4	73,3

TABLE 86.- *Small data base. 256 features. Images with background. More or Less 30 40f*

- There ratio is 69,3%.
- The program does not offer trustworthiness because the program only gets right 6 images of less than 30.
- It classifies better women than men.

Small data base. 256 features. Images with background. More or Less 40 40f

	Right	Wrong	Success rate (%)
TOTAL	76	74	**50,6**

	Right	Wrong	Success rate (%)
Less40	26	34,0	43,3
More 40	50	40,0	55,6

	Right	Wrong	Success rate (%)
Woman	47	28,0	62,7
Man	29	46,0	38,7

	Right	Wrong	Success rate (%)
Woman 20-30	4	11	26,7
Man 20-30	6	9	40,0
Woman 30-40	11	4	73,3
Man 30-40	5	10	33,3
Woman 40-50	11	4	73,3
Man 40-50	4	11	26,7
Woman 50-60	10	5	66,7
Man 50-60	8	7	53,3
Woman +60	11	4	73,3
Man +60	6	9	40,0

TABLE 87.- *Small data base. 256 features. Images with background. More or Less 40 40f*

- The ratio is 50,6%.
- The trustworthiness is low because the program gets right more images of 'morethan 40' than 'less than 40' and the two probabilities are less than 60%.
- It classifies better men than women.

Small data base. 256 features. Images with background. More or Less 50 40f

	Right	Wrong	Success rate (%)
TOTAL	66	84	**44,0**

	Right	Wrong	Success rate (%)
Less50	45	45	50,0
More 50	21	39	35,0

	Right	Wrong	Success rate (%)
Woman	38	37	50,7
Man	28	47	37,3

	Right	Wrong	Success rate (%)
Woman 20-30	6	9	40,0
Man 20-30	3	12	20,0
Woman 30-40	11	4	73,3
Man 30-40	3	12	20,0
Woman 40-50	10	5	66,7
Man 40-50	12	3	80,0
Woman 50-60	5	10	33,3
Man 50-60	6	9	40,0
Woman +60	6	9	40,0
Man +60	4	11	26,7

TABLE 88.- *Small data base. 256 features. Images with background. More or Less 50 40f*

- The program has a ratio of 44%.
- The trustworthiness is bad because the program does not classify in a more than 50% of success in the less or more classifications.
- The program classifies better the women than the men.

Small data base. 256 features. Images with background. More or Less 60 40f

	Right	Wrong	Success rate (%)
TOTAL	81	69	**54,0**

	Right	Wrong	Success rate (%)
Less60	76	44	63,3
More 60	5	25	16,7

	Right	Wrong	Success rate (%)
Woman	45	30	60,0
Man	36	39	48,0

	Right	Wrong	Success rate (%)
Woman 20-30	8	7	53,3
Man 20-30	6	9	40,0
Woman 30-40	13	2	86,7
Man 30-40	4	11	26,7
Woman 40-50	11	4	73,3
Man 40-50	13	2	86,7
Woman 50-60	10	5	66,7
Man 50-60	11	4	73,3
Woman +60	3	12	20,0
Man +60	2	13	13,3

TABLE 89.- *Small data base. 256 features. Images with background. More or Less 60 40f*

- The ratio of the program is 54%.
- The trustworthiness is bad because the program classifies the majority of images as less than 60 images.
- The program classifies better the women than the men.

Small data base. 256 features. Images with background. Man or Woman 40f

	Right	Wrong	Success rate (%)
TOTAL	85	65	**56,6**

	Right	Wrong	Success rate (%)
Woman	13	62	17,3
Man	72	3	96,0

	Right	Wrong	Success rate (%)
Woman 20-30	5	11	26,6
Man 20-30	15	0	100,0
Woman 30-40	2	14	6,6
Man 30-40	14	1	93,3
Woman 40-50	5	13	13,3
Man 40-50	15	0	100,0
Woman 50-60	1	14	6,6
Man 50-60	13	1	93,3
Woman +60	0	15	0,0
Man +60	15	1	93,3

TABLE 90.- *Big data base. 256 features. Images with background. Man or Woman 40f*

- The ratio is low and it is 56,6%.
- The trustworthiness is low because it classifies the majority of images as men images.

Black and White classification. 256 features. Images witouth background (crop). 5f

	Right	Wrong	Success rate (%)
TOTAL	39	11	**78,0**

	Right	Wrong	Success rate (%)
Black	20	5	80,0
White	19	6	76,0

TABLE 91.- *Black and White classification. 256 features. Images witouth background (crop). 5f*

- The ratio is high and it is 78%.
- The program offers a high trustworthiness, the group with less percentage obtains a 76%.

Black and White classification. 256 features. Images witouth background (crop). 10f

	Right	Wrong	Success rate (%)
TOTAL	40	10	**80,0**

	Right	Wrong	Success rate (%)
Black	20	5	80,0
White	20	5	80,0

TABLE 92.- *Black and White classification. 256 features. Images witouth background (crop). 10f*

- The ratio is high and it is 80%.
- The program offers a high trustworthiness, each group obtains the same percentage, 80%.

Black and White classification. 256 features. Images without background (crop). 20f

	Right	Wrong	Success rate (%)
TOTAL	44	6	**88,0**

	Right	Wrong	Success rate (%)
Black	22	3	88,0
White	22	3	88,0

TABLE 93.- *Black and White classification. 256 features. Images witouth background (crop). 20f*

- The ratio is high and it is 88%.
- The program offers a high trustworthiness, because for the two groups it obtains the same high ratio.

Annex 2

'Age estimation' program

```
E=100;
numimage=500;

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

[median_vector_2030]=Function2030();
med2030=median_vector_2030;

[median_vector_3040]=Function3040();
med3040=median_vector_3040;

[median_vector_4050]=Function4050();
med4050=median_vector_4050;

[median_vector_5060]=Function5060();
med5060=median_vector_5060;

[median_vector_60ormore]=Function60ormore();
med60ormore=median_vector_60ormore;

chi_vector=zeros(256,1);
for i=1:256
    if i==246
        disp('Here.');
    end
    %Step 1
    b1=med2030(i); % median value for 20-30 in (i) posicion
    b2=med3040(i); % median value for 30-40 in (i) posicion
    b3=med4050(i); % median value for 40-50 in (i) posicion
    b4=med5060(i); % median value for 50-60 in (i) posicion
    b5=med60ormore(i);%% median value for 60or more in (i)
posicion
    %Step 2
    c=[b1,b2,b3,b4,b5]; % we do a vector of median values
    [w,index]=sort(c); % we sort de median values
    % we can calculate limits because the values are sorted
    limit12=(w(1)+w(2))/2;
    limit23=(w(2)+w(3))/2;
    limit34=(w(3)+w(4))/2;
    limit45=(w(4)+w(5))/2;
    %Step 3
    %z1 - for class 1
    if index(1)==1

z1=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
```

```
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    elseif index(1)==2

z1=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i)];
    elseif index(1)==3

z1=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i)];
    elseif index(1)==4

z1=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i)];
    else

z1=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
```

```
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end
    %z2 - for class 2
    if index(2)==1

z2=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    elseif index(2)==2

z2=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i)];
    elseif index(2)==3

z2=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i)];
    elseif index(2)==4

z2=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
```

```
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i)];
    else

z2=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end
    %z3 - for class 3
    if index(3)==1

z3=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    elseif index(3)==2

z3=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
```

```
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i)];
    elseif index(3)==3

z3=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i)];
    elseif index(3)==4

z3=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i)];
    else

z3=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end
    %z4 - for class 4
    if index(4)==1

z4=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
```

```
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    elseif index(4)==2

z4=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i)];
    elseif index(4)==3

z4=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i)];
    elseif index(4)==4

z4=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i)];
    else

z4=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
```

```
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end
    %z5 - for class 5
    if index(5)==1

z5=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    elseif index(5)==2

z5=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i)];
    elseif index(5)==3

z5=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i)];
    elseif index(5)==4
```

```
z5=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i)];
    else

z5=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end

    %Class 1 - leftmost
    O1=numel(find(z1<=limit12));
    %Class 2
    O2=numel(find(z2<=limit23))-numel(find(z2<limit12));
    %Class 3
    O3=numel(find(z3<=limit34))-numel(find(z3<limit23));
    %Class 4
    O4=numel(find(z4<=limit45))-numel(find(z4<limit34));
    %Class 5
    O5=numel(find(z5>limit45));

    %for u=1:150
    %    if z(u)<limit12
    %        O1=O1+1;
    %    elseif z(u)<limit23
    %        O2=O2+1;
    %    elseif z(u)<limit34
    %        O3=O3+1;
    %    elseif z(u)<limit45
    %        O4=O4+1;
    %    else
    %        O5=O5+1;
    %    end
    %end
```

```
    %Step 4
    chi=((O1-E)^2+(O2-E)^2+(O3-E)^2+(O4-E)^2+(O5-E)^2)/30;
    %eval(['chi_' num2str(i) '=[chi]']);
    chi_vector(i)=chi;
end

%chi_vector=[chi_1,chi_2,chi_3,chi_4,chi_5,chi_6,chi_7,chi_8,chi
_9,chi_10,chi_11,chi_12,chi_13,chi_14,chi_15,chi_16,chi_17,chi_1
8,chi_19,chi_20,chi_21,chi_22,chi_23,chi_24,chi_25,chi_26,chi_27
,chi_28,chi_29,chi_30,chi_31,chi_32,chi_33,chi_34,chi_35,chi_36,
chi_37,chi_38,chi_39,chi_40,chi_41,chi_42,chi_43,chi_44,chi_45,c
hi_46,chi_47,chi_48,chi_49,chi_50,chi_51,chi_52,chi_53,chi_54,ch
i_55,chi_56,chi_57,chi_58,chi_59,chi_60,chi_61,chi_62,chi_63,chi
_64,chi_65,chi_66,chi_67,chi_68,chi_69,chi_70,chi_71,chi_72,chi_
73,chi_74,chi_75,chi_76,chi_77,chi_78,chi_79,chi_80,chi_81,chi_8
2,chi_83,chi_84,chi_85,chi_86,chi_87,chi_88,chi_89,chi_90,chi_91
,chi_92,chi_93,chi_94,chi_95,chi_96,chi_97,chi_98,chi_99,chi_100
,chi_101,chi_102,chi_103,chi_104,chi_105,chi_106,chi_107,chi_108
,chi_109,chi_110,chi_111,chi_112,chi_113,chi_114,chi_115,chi_116
,chi_117,chi_118,chi_119,chi_120,chi_121,chi_122,chi_123,chi_124
,chi_125,chi_126,chi_127,chi_128,chi_129,chi_130,chi_131,chi_132
,chi_133,chi_134,chi_135,chi_136,chi_137,chi_138,chi_139,chi_140
,chi_141,chi_142,chi_143,chi_144,chi_145,chi_146,chi_147,chi_148
,chi_149,chi_150,chi_151,chi_152,chi_153,chi_154,chi_155,chi_156
,chi_157,chi_158,chi_159,chi_160,chi_161,chi_162,chi_163,chi_164
,chi_165,chi_166,chi_167,chi_168,chi_169,chi_170,chi_171,chi_172
,chi_173,chi_174,chi_175,chi_176,chi_177,chi_178,chi_179,chi_180
,chi_181,chi_182,chi_183,chi_184,chi_185,chi_186,chi_187,chi_188
,chi_189,chi_190,chi_191,chi_192,chi_193,chi_194,chi_195,chi_196
,chi_197,chi_198,chi_199,chi_200,chi_201,chi_202,chi_203,chi_204
,chi_205,chi_206,chi_207,chi_208,chi_209,chi_210,chi_211,chi_212
,chi_213,chi_214,chi_215,chi_216,chi_217,chi_218,chi_219,chi_220
,chi_221,chi_222,chi_223,chi_224,chi_225,chi_226,chi_227,chi_228
,chi_229,chi_230,chi_231,chi_232,chi_233,chi_234,chi_235,chi_236
,chi_237,chi_238,chi_239,chi_240,chi_241,chi_242,chi_243,chi_244
,chi_245,chi_246,chi_247,chi_248,chi_249,chi_250,chi_251,chi_252
,chi_253,chi_254,chi_255,chi_256]

[chi_sort,chi_sort2]=sort(chi_vector);

chi_result=chi_sort(1:40)
chi_index=chi_sort2(1:40)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASSIFICATION
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
disp('Start classification ...');

disp('...reading input image...');
I= imread('./Imatgesprova/60-Male/rei_75.jpg');%%image that we
want to avaluate

if size(I,3)>1
    I=rgb2gray(I); %%convert the image into a grayscale image
end
```

```
disp('...computing features...');
imagevector=Function(I);
evalimage=imagevector;


% Probabilities
finalprob1=Featurechi(evalimage(chi_index(1)),chi_index(1),E,num
image);
finalprob2=Featurechi(evalimage(chi_index(2)),chi_index(2),E,num
image);
finalprob3=Featurechi(evalimage(chi_index(3)),chi_index(3),E,num
image);
finalprob4=Featurechi(evalimage(chi_index(4)),chi_index(4),E,num
image);
finalprob5=Featurechi(evalimage(chi_index(5)),chi_index(5),E,num
image);
%
finalprob6=Featurechi(evalimage(chi_index(6)),chi_index(6),E,num
image);
%
finalprob7=Featurechi(evalimage(chi_index(7)),chi_index(7),E,num
image);
%
finalprob8=Featurechi(evalimage(chi_index(8)),chi_index(8),E,num
image);
%
finalprob9=Featurechi(evalimage(chi_index(9)),chi_index(9),E,num
image);
%
finalprob10=Featurechi(evalimage(chi_index(10)),chi_index(10),E,
numimage);
%
finalprob11=Featurechi(evalimage(chi_index(11)),chi_index(11),E,
numimage);
%
finalprob12=Featurechi(evalimage(chi_index(12)),chi_index(12),E,
numimage);
%
finalprob13=Featurechi(evalimage(chi_index(13)),chi_index(13),E,
numimage);
%
finalprob14=Featurechi(evalimage(chi_index(14)),chi_index(14),E,
numimage);
%
finalprob15=Featurechi(evalimage(chi_index(15)),chi_index(15),E,
numimage);
%
finalprob16=Featurechi(evalimage(chi_index(16)),chi_index(16),E,
numimage);
%
finalprob17=Featurechi(evalimage(chi_index(17)),chi_index(17),E,
numimage);
%
finalprob18=Featurechi(evalimage(chi_index(18)),chi_index(18),E,
numimage);
```

```
%
finalprob19=Featurechi(evalimage(chi_index(19)),chi_index(19),E,
numimage);
%
finalprob20=Featurechi(evalimage(chi_index(20)),chi_index(20),E,
numimage);
%
finalprob21=Featurechi(evalimage(chi_index(21)),chi_index(21),E,
numimage);
%
finalprob22=Featurechi(evalimage(chi_index(22)),chi_index(22),E,
numimage);
%
finalprob23=Featurechi(evalimage(chi_index(23)),chi_index(23),E,
numimage);
%
finalprob24=Featurechi(evalimage(chi_index(24)),chi_index(24),E,
numimage);
%
finalprob25=Featurechi(evalimage(chi_index(25)),chi_index(25),E,
numimage);
%
finalprob26=Featurechi(evalimage(chi_index(26)),chi_index(26),E,
numimage);
%
finalprob27=Featurechi(evalimage(chi_index(27)),chi_index(27),E,
numimage);
%
finalprob28=Featurechi(evalimage(chi_index(28)),chi_index(28),E,
numimage);
%
finalprob29=Featurechi(evalimage(chi_index(29)),chi_index(29),E,
numimage);
%
finalprob30=Featurechi(evalimage(chi_index(30)),chi_index(30),E,
numimage);
%
finalprob31=Featurechi(evalimage(chi_index(31)),chi_index(31),E,
numimage);
%
finalprob32=Featurechi(evalimage(chi_index(32)),chi_index(32),E,
numimage);
%
finalprob33=Featurechi(evalimage(chi_index(33)),chi_index(33),E,
numimage);
%
finalprob34=Featurechi(evalimage(chi_index(34)),chi_index(34),E,
numimage);
%
finalprob35=Featurechi(evalimage(chi_index(35)),chi_index(35),E,
numimage);
%
finalprob36=Featurechi(evalimage(chi_index(36)),chi_index(36),E,
numimage);
```

```
%
finalprob37=Featurechi(evalimage(chi_index(37)),chi_index(37),E,
numimage);
%
finalprob38=Featurechi(evalimage(chi_index(38)),chi_index(38),E,
numimage);
%
finalprob39=Featurechi(evalimage(chi_index(39)),chi_index(39),E,
numimage);
%
finalprob40=Featurechi(evalimage(chi_index(40)),chi_index(40),E,
numimage);


%For class 2030
class=1;
p_2030=E/numimage;
finalprob_2030=p_2030*finalprob1(class)*finalprob2(class)*finalp
rob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(clas
s)*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalpr
ob10(class)*finalprob11(class)*finalprob12(class)*finalprob13(cl
ass)*finalprob14(class)*finalprob15(class)*finalprob16(class)*fi
nalprob17(class)*finalprob18(class)*finalprob19(class)*finalprob
20(class)%*finalprob21(class)*finalprob22(class)*finalprob23(cla
ss)*finalprob24(class)*finalprob25(class)*finalprob26(class)*fin
alprob27(class)*finalprob28(class)*finalprob29(class)*finalprob3
0(class)*finalprob31(class)*finalprob32(class)*finalprob33(class
)*finalprob34(class)*finalprob35(class)*finalprob36(class)*final
prob37(class)*finalprob38(class)*finalprob39(class)*finalprob40(
class);

%For class 3040
class=2;
p_3040=E/numimage;
finalprob_3040=p_3040*finalprob1(class)*finalprob2(class)*finalp
rob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(clas
s)*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalpr
ob10(class)*finalprob11(class)*finalprob12(class)*finalprob13(cl
ass)*finalprob14(class)*finalprob15(class)*finalprob16(class)*fi
nalprob17(class)*finalprob18(class)*finalprob19(class)*finalprob
20(class)%*finalprob21(class)*finalprob22(class)*finalprob23(cla
ss)*finalprob24(class)*finalprob25(class)*finalprob26(class)*fin
alprob27(class)*finalprob28(class)*finalprob29(class)*finalprob3
0(class)*finalprob31(class)*finalprob32(class)*finalprob33(class
)*finalprob34(class)*finalprob35(class)*finalprob36(class)*final
prob37(class)*finalprob38(class)*finalprob39(class)*finalprob40(
class);

%For class 4050
class=3;
p_4050=E/numimage;
finalprob_4050=p_4050*finalprob1(class)*finalprob2(class)*finalp
rob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(clas
s)*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalpr
ob10(class)*finalprob11(class)*finalprob12(class)*finalprob13(cl
ass)*finalprob14(class)*finalprob15(class)*finalprob16(class)*fi
```

```
nalprob17(class)*finalprob18(class)*finalprob19(class)*finalprob
20(class)%*finalprob21(class)*finalprob22(class)*finalprob23(cla
ss)*finalprob24(class)*finalprob25(class)*finalprob26(class)*fin
alprob27(class)*finalprob28(class)*finalprob29(class)*finalprob3
0(class)*finalprob31(class)*finalprob32(class)*finalprob33(class
)*finalprob34(class)*finalprob35(class)*finalprob36(class)*final
prob37(class)*finalprob38(class)*finalprob39(class)*finalprob40(
class);

%For class 5060
class=4;
p_5060=E/numimage;
finalprob_5060=p_5060*finalprob1(class)*finalprob2(class)*finalp
rob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(clas
s)*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalpr
ob10(class)*finalprob11(class)*finalprob12(class)*finalprob13(cl
ass)*finalprob14(class)*finalprob15(class)*finalprob16(class)*fi
nalprob17(class)*finalprob18(class)*finalprob19(class)*finalprob
20(class)%*finalprob21(class)*finalprob22(class)*finalprob23(cla
ss)*finalprob24(class)*finalprob25(class)*finalprob26(class)*fin
alprob27(class)*finalprob28(class)*finalprob29(class)*finalprob3
0(class)*finalprob31(class)*finalprob32(class)*finalprob33(class
)*finalprob34(class)*finalprob35(class)*finalprob36(class)*final
prob37(class)*finalprob38(class)*finalprob39(class)*finalprob40(
class);

%For class 60ormore
class=5;
p_60ormore=E/numimage;
finalprob_60ormore=p_60ormore*finalprob1(class)*finalprob2(class
)*finalprob3(class)*finalprob4(class)*finalprob5(class)%*finalpr
ob6(class)*finalprob7(class)*finalprob8(class)*finalprob9(class)
*finalprob10(class)*finalprob11(class)*finalprob12(class)*finalp
rob13(class)*finalprob14(class)*finalprob15(class)*finalprob16(c
lass)*finalprob17(class)*finalprob18(class)*finalprob19(class)*f
inalprob20(class)%*finalprob21(class)*finalprob22(class)*finalpr
ob23(class)*finalprob24(class)*finalprob25(class)*finalprob26(cl
ass)*finalprob27(class)*finalprob28(class)*finalprob29(class)*fi
nalprob30(class)*finalprob31(class)*finalprob32(class)*finalprob
33(class)*finalprob34(class)*finalprob35(class)*finalprob36(clas
s)*finalprob37(class)*finalprob38(class)*finalprob39(class)*fina
lprob40(class);

all_prob=[finalprob_2030,finalprob_3040,finalprob_4050,finalprob
_5060,finalprob_60ormore];
if finalprob_2030==max(all_prob)
    disp('Image is class 2030 - people in image is between 20
and 30 years old.');
elseif finalprob_3040==max(all_prob)
    disp('Image is class 3040 - people in image is between 30
and 40 years old.');
elseif finalprob_4050==max(all_prob)
    disp('Image is class 4050 - people in image is between 40
and 50 years old.');
elseif finalprob_5060==max(all_prob)
```

```
    disp('Image is class 5060 - people in image is between 50
and 60 years old.');
else
    disp('Image is class 60ormore - people in image is more than
60 years old.');
end
```

'Man and woman' program

```
E=250;
numimage=500;

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

[median_vector_Woman]=FunctionWoman();
med2030=median_vector_Woman;

[median_vector_Man]=FunctionMan();
med3040=median_vector_Man;

chi_vector=zeros(256,1);
for i=1:256

    %Step 1
    b1=med2030(i); % median value for 20-30 in (i) posicion
    b2=med3040(i); % median value for 30-40 in (i) posicion
    c=[b1,b2]; % we do a vector of median values
    [e,index]=sort(c); % we sort de median values
    limit12=(b1+b2)/2;

    %Step 3

    %z1 - for class 1
     if index(1)==1

z1=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x101(i),x102(i),x103(i),x104(i),x105(i)
,x106(i),x107(i),x108(i),x109(i),x110(i),x111(i),x112(i),x113(i)
,x114(i),x115(i),x116(i),x117(i),x118(i),x119(i),x120(i),x121(i)
,x122(i),x123(i),x124(i),x125(i),x126(i),x127(i),x128(i),x129(i)
,x130(i),x131(i),x132(i),x133(i),x134(i),x135(i),x136(i),x137(i)
,x138(i),x139(i),x140(i),x141(i),x142(i),x143(i),x144(i),x145(i)
,x146(i),x147(i),x148(i),x149(i),x150(i),x201(i),x202(i),x203(i)
,x204(i),x205(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i)
,x212(i),x213(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i)
,x220(i),x221(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i)
,x228(i),x229(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i)
,x236(i),x237(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i)
,x244(i),x245(i),x246(i),x247(i),x248(i),x249(i),x250(i),x301(i)
,x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308(i),x309(i)
,x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316(i),x317(i)
,x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324(i),x325(i)
,x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332(i),x333(i)
,x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340(i),x341(i)
,x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348(i),x349(i)
,x350(i),x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i)
```

```
,x408(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i)
,x416(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i)
,x424(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i)
,x432(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i)
,x440(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i)
,x448(i),x449(i),x450(i)];
     else

z1=[x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x57(i),x58(i),x59(
i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i),x66(i),x67(i),x68(i
),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i),x75(i),x76(i),x77(i)
,x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),x84(i),x85(i),x86(i),
x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x93(i),x94(i),x95(i),x
96(i),x97(i),x98(i),x99(i),x100(i),x151(i),x152(i),x153(i),x154(
i),x155(i),x156(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(
i),x163(i),x164(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(
i),x171(i),x172(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(
i),x179(i),x180(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(
i),x187(i),x188(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(
i),x195(i),x196(i),x197(i),x198(i),x199(i),x200(i),x251(i),x252(
i),x253(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(
i),x261(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(
i),x269(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(
i),x277(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(
i),x285(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(
i),x293(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(
i),x351(i),x352(i),x353(i),x354(i),x355(i),x356(i),x357(i),x358(
i),x359(i),x360(i),x361(i),x362(i),x363(i),x364(i),x365(i),x366(
i),x367(i),x368(i),x369(i),x370(i),x371(i),x372(i),x373(i),x374(
i),x375(i),x376(i),x377(i),x378(i),x379(i),x380(i),x381(i),x382(
i),x383(i),x384(i),x385(i),x386(i),x387(i),x388(i),x389(i),x390(
i),x391(i),x392(i),x393(i),x394(i),x395(i),x396(i),x397(i),x398(
i),x399(i),x400(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456(
i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464(
i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472(
i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480(
i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488(
i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496(
i),x497(i),x498(i),x499(i),x500(i)];
    end
    %z2 - for class 2
    if index(2)==1

z2=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x101(i),x102(i),x103(i),x104(i),x105(i)
,x106(i),x107(i),x108(i),x109(i),x110(i),x111(i),x112(i),x113(i)
,x114(i),x115(i),x116(i),x117(i),x118(i),x119(i),x120(i),x121(i)
,x122(i),x123(i),x124(i),x125(i),x126(i),x127(i),x128(i),x129(i)
,x130(i),x131(i),x132(i),x133(i),x134(i),x135(i),x136(i),x137(i)
,x138(i),x139(i),x140(i),x141(i),x142(i),x143(i),x144(i),x145(i)
,x146(i),x147(i),x148(i),x149(i),x150(i),x201(i),x202(i),x203(i)
,x204(i),x205(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i)
```

```
,x212(i),x213(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i)
,x220(i),x221(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i)
,x228(i),x229(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i)
,x236(i),x237(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i)
,x244(i),x245(i),x246(i),x247(i),x248(i),x249(i),x250(i),x301(i)
,x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308(i),x309(i)
,x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316(i),x317(i)
,x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324(i),x325(i)
,x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332(i),x333(i)
,x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340(i),x341(i)
,x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348(i),x349(i)
,x350(i),x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i)
,x408(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i)
,x416(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i)
,x424(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i)
,x432(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i)
,x440(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i)
,x448(i),x449(i),x450(i)];
     else

z2=[x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x57(i),x58(i),x59(
i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i),x66(i),x67(i),x68(i
),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i),x75(i),x76(i),x77(i)
,x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),x84(i),x85(i),x86(i),
x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x93(i),x94(i),x95(i),x
96(i),x97(i),x98(i),x99(i),x100(i),x151(i),x152(i),x153(i),x154(
i),x155(i),x156(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(
i),x163(i),x164(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(
i),x171(i),x172(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(
i),x179(i),x180(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(
i),x187(i),x188(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(
i),x195(i),x196(i),x197(i),x198(i),x199(i),x200(i),x251(i),x252(
i),x253(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(
i),x261(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(
i),x269(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(
i),x277(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(
i),x285(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(
i),x293(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(
i),x351(i),x352(i),x353(i),x354(i),x355(i),x356(i),x357(i),x358(
i),x359(i),x360(i),x361(i),x362(i),x363(i),x364(i),x365(i),x366(
i),x367(i),x368(i),x369(i),x370(i),x371(i),x372(i),x373(i),x374(
i),x375(i),x376(i),x377(i),x378(i),x379(i),x380(i),x381(i),x382(
i),x383(i),x384(i),x385(i),x386(i),x387(i),x388(i),x389(i),x390(
i),x391(i),x392(i),x393(i),x394(i),x395(i),x396(i),x397(i),x398(
i),x399(i),x400(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456(
i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464(
i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472(
i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480(
i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488(
i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496(
i),x497(i),x498(i),x499(i),x500(i)];
    end

    O1=numel(find(z1<=limit12));
    O2=numel(find(z2>limit12));
```

```
    %Step 4
    chi=((O1-E)^2+(O2-E)^2)/75;
    %eval(['chi_' num2str(i) '=[chi]']);
    chi_vector(i)=chi;
end

%chi_vector=[chi_1,chi_2,chi_3,chi_4,chi_5,chi_6,chi_7,chi_8,chi
_9,chi_10,chi_11,chi_12,chi_13,chi_14,chi_15,chi_16,chi_17,chi_1
8,chi_19,chi_20,chi_21,chi_22,chi_23,chi_24,chi_25,chi_26,chi_27
,chi_28,chi_29,chi_30,chi_31,chi_32,chi_33,chi_34,chi_35,chi_36,
chi_37,chi_38,chi_39,chi_40,chi_41,chi_42,chi_43,chi_44,chi_45,c
hi_46,chi_47,chi_48,chi_49,chi_50,chi_51,chi_52,chi_53,chi_54,ch
i_55,chi_56,chi_57,chi_58,chi_59,chi_60,chi_61,chi_62,chi_63,chi
_64,chi_65,chi_66,chi_67,chi_68,chi_69,chi_70,chi_71,chi_72,chi_
73,chi_74,chi_75,chi_76,chi_77,chi_78,chi_79,chi_80,chi_81,chi_8
2,chi_83,chi_84,chi_85,chi_86,chi_87,chi_88,chi_89,chi_90,chi_91
,chi_92,chi_93,chi_94,chi_95,chi_96,chi_97,chi_98,chi_99,chi_100
,chi_101,chi_102,chi_103,chi_104,chi_105,chi_106,chi_107,chi_108
,chi_109,chi_110,chi_111,chi_112,chi_113,chi_114,chi_115,chi_116
,chi_117,chi_118,chi_119,chi_120,chi_121,chi_122,chi_123,chi_124
,chi_125,chi_126,chi_127,chi_128,chi_129,chi_130,chi_131,chi_132
,chi_133,chi_134,chi_135,chi_136,chi_137,chi_138,chi_139,chi_140
,chi_141,chi_142,chi_143,chi_144,chi_145,chi_146,chi_147,chi_148
,chi_149,chi_150,chi_151,chi_152,chi_153,chi_154,chi_155,chi_156
,chi_157,chi_158,chi_159,chi_160,chi_161,chi_162,chi_163,chi_164
,chi_165,chi_166,chi_167,chi_168,chi_169,chi_170,chi_171,chi_172
,chi_173,chi_174,chi_175,chi_176,chi_177,chi_178,chi_179,chi_180
,chi_181,chi_182,chi_183,chi_184,chi_185,chi_186,chi_187,chi_188
,chi_189,chi_190,chi_191,chi_192,chi_193,chi_194,chi_195,chi_196
,chi_197,chi_198,chi_199,chi_200,chi_201,chi_202,chi_203,chi_204
,chi_205,chi_206,chi_207,chi_208,chi_209,chi_210,chi_211,chi_212
,chi_213,chi_214,chi_215,chi_216,chi_217,chi_218,chi_219,chi_220
,chi_221,chi_222,chi_223,chi_224,chi_225,chi_226,chi_227,chi_228
,chi_229,chi_230,chi_231,chi_232,chi_233,chi_234,chi_235,chi_236
,chi_237,chi_238,chi_239,chi_240,chi_241,chi_242,chi_243,chi_244
,chi_245,chi_246,chi_247,chi_248,chi_249,chi_250,chi_251,chi_252
,chi_253,chi_254,chi_255,chi_256]

[chi_sort,chi_sort2]=sort(chi_vector);

chi_result=chi_sort(1:40)
chi_index=chi_sort2(1:40)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASSIFICATION
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
disp('Start classification ...');

disp('...reading input image...');
I= imread('./Imatgesprova/60-Male/rei_75.jpg');%%image that we
want to avaluate

if size(I,3)>1
    I=rgb2gray(I);
end
```

```
disp('...computing features...');
imagevector=Function(I);
evalimage=imagevector;


% Probabilities
% IMPORTANT NOTE: the number of the features is worng and must
be changed.
% The best idea is to use an automatic numbering.
finalprob1=FeatureManorWoman(evalimage(chi_index(1)),chi_index(1
),E,numimage);
finalprob2=FeatureManorWoman(evalimage(chi_index(2)),chi_index(2
),E,numimage);
finalprob3=FeatureManorWoman(evalimage(chi_index(3)),chi_index(3
),E,numimage);
finalprob4=FeatureManorWoman(evalimage(chi_index(4)),chi_index(4
),E,numimage);
finalprob5=FeatureManorWoman(evalimage(chi_index(5)),chi_index(5
),E,numimage);
%
finalprob6=FeatureManorWoman(evalimage(chi_index(6)),chi_index(6
),E,numimage);
%
finalprob7=FeatureManorWoman(evalimage(chi_index(7)),chi_index(7
),E,numimage);
%
finalprob8=FeatureManorWoman(evalimage(chi_index(8)),chi_index(8
),E,numimage);
%
finalprob9=FeatureManorWoman(evalimage(chi_index(9)),chi_index(9
),E,numimage);
%
finalprob10=FeatureManorWoman(evalimage(chi_index(10)),chi_index
(10),E,numimage);
%
finalprob11=FeatureManorWoman(evalimage(chi_index(11)),chi_index
(11),E,numimage);
%
finalprob12=FeatureManorWoman(evalimage(chi_index(12)),chi_index
(12),E,numimage);
%
finalprob13=FeatureManorWoman(evalimage(chi_index(13)),chi_index
(13),E,numimage);
%
finalprob14=FeatureManorWoman(evalimage(chi_index(14)),chi_index
(14),E,numimage);
%
finalprob15=FeatureManorWoman(evalimage(chi_index(15)),chi_index
(15),E,numimage);
%
finalprob16=FeatureManorWoman(evalimage(chi_index(16)),chi_index
(16),E,numimage);
%
finalprob17=FeatureManorWoman(evalimage(chi_index(17)),chi_index
(17),E,numimage);
```

```
%
finalprob18=FeatureManorWoman(evalimage(chi_index(18)),chi_index
(18),E,numimage);
%
finalprob19=FeatureManorWoman(evalimage(chi_index(19)),chi_index
(19),E,numimage);
%
finalprob20=FeatureManorWoman(evalimage(chi_index(20)),chi_index
(20),E,numimage);
%
finalprob21=FeatureManorWoman(evalimage(chi_index(21)),chi_index
(21),E,numimage);
%
finalprob22=FeatureManorWoman(evalimage(chi_index(22)),chi_index
(22),E,numimage);
%
finalprob23=FeatureManorWoman(evalimage(chi_index(23)),chi_index
(23),E,numimage);
%
finalprob24=FeatureManorWoman(evalimage(chi_index(24)),chi_index
(24),E,numimage);
%
finalprob25=FeatureManorWoman(evalimage(chi_index(25)),chi_index
(25),E,numimage);
%
finalprob26=FeatureManorWoman(evalimage(chi_index(26)),chi_index
(26),E,numimage);
%
finalprob27=FeatureManorWoman(evalimage(chi_index(27)),chi_index
(27),E,numimage);
%
finalprob28=FeatureManorWoman(evalimage(chi_index(28)),chi_index
(28),E,numimage);
%
finalprob29=FeatureManorWoman(evalimage(chi_index(29)),chi_index
(29),E,numimage);
%
finalprob30=FeatureManorWoman(evalimage(chi_index(30)),chi_index
(30),E,numimage);
%
finalprob31=FeatureManorWoman(evalimage(chi_index(31)),chi_index
(31),E,numimage);
%
finalprob32=FeatureManorWoman(evalimage(chi_index(32)),chi_index
(32),E,numimage);
%
finalprob33=FeatureManorWoman(evalimage(chi_index(33)),chi_index
(33),E,numimage);
%
finalprob34=FeatureManorWoman(evalimage(chi_index(34)),chi_index
(34),E,numimage);
%
finalprob35=FeatureManorWoman(evalimage(chi_index(35)),chi_index
(35),E,numimage);
```

```
%
finalprob36=FeatureManorWoman(evalimage(chi_index(36)),chi_index
(36),E,numimage);
%
finalprob37=FeatureManorWoman(evalimage(chi_index(37)),chi_index
(37),E,numimage);
%
finalprob38=FeatureManorWoman(evalimage(chi_index(38)),chi_index
(38),E,numimage);
%
finalprob39=FeatureManorWoman(evalimage(chi_index(39)),chi_index
(39),E,numimage);
%
finalprob40=FeatureManorWoman(evalimage(chi_index(40)),chi_index
(40),E,numimage);

%For class woman
class=1;
p_woman=250/numimage;
finalprob_woman=p_woman*finalprob1(class)*finalprob2(class)*fina
lprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(cl
ass)*finalprob7(class)*finalprob8(class)*finalprob9(class)*final
prob10(class)*finalprob11(class)*finalprob12(class)*finalprob13(
class)*finalprob14(class)*finalprob15(class)*finalprob16(class)*
finalprob17(class)*finalprob18(class)*finalprob19(class)*finalpr
ob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23(c
lass)*finalprob24(class)*finalprob25(class)*finalprob26(class)*f
inalprob27(class)*finalprob28(class)*finalprob29(class)*finalpro
b30(class)*finalprob31(class)*finalprob32(class)*finalprob33(cla
ss)*finalprob34(class)*finalprob35(class)*finalprob36(class)*fin
alprob37(class)*finalprob38(class)*finalprob39(class)*finalprob4
0(class);

%For class man
class=2;
p_man=250/numimage;
finalprob_man=p_man*finalprob1(class)*finalprob2(class)*finalpro
b3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(class)
*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalprob
10(class)*finalprob11(class)*finalprob12(class)*finalprob13(clas
s)*finalprob14(class)*finalprob15(class)*finalprob16(class)*fina
lprob17(class)*finalprob18(class)*finalprob19(class)*finalprob20
(class)%*finalprob21(class)*finalprob22(class)*finalprob23(class
)*finalprob24(class)*finalprob25(class)*finalprob26(class)*final
prob27(class)*finalprob28(class)*finalprob29(class)*finalprob30(
class)*finalprob31(class)*finalprob32(class)*finalprob33(class)*
finalprob34(class)*finalprob35(class)*finalprob36(class)*finalpr
ob37(class)*finalprob38(class)*finalprob39(class)*finalprob40(cl
ass);

all_prob=[finalprob_woman,finalprob_man];
if finalprob_woman>finalprob_man
    disp('Image is a woman');
else
    disp('Image is a man');
end
```

'More or less 30' program

```
numimage=500;

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

[median_vector_less30]=FunctionLess30();
med2030=median_vector_less30;

[median_vector_more30]=FunctionMore30();
med3040=median_vector_more30;

for i=1:256

    %Step 1
    b1=med2030(i); % median value for 20-30 in (i) posicion
    b2=med3040(i); % median value for 30-40 in (i) posicion
    c=[b1,b2]; % xe do a vector of median values
    [e,index]=sort(c); % xe sort de median values
    limit12=(b1+b2)/2;

    %Step 3
    %z1 - for class 1
     if index(1)==1

z1=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
     else

z1=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204
(i),x205(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212
(i),x213(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220
```

```
(i),x221(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228
(i),x229(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236
(i),x237(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244
(i),x245(i),x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252
(i),x253(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260
(i),x261(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268
(i),x269(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276
(i),x277(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284
(i),x285(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292
(i),x293(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300
(i),x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i),x401(i),x402(i),x403(i),x404
(i),x405(i),x406(i),x407(i),x408(i),x409(i),x410(i),x411(i),x412
(i),x413(i),x414(i),x415(i),x416(i),x417(i),x418(i),x419(i),x420
(i),x421(i),x422(i),x423(i),x424(i),x425(i),x426(i),x427(i),x428
(i),x429(i),x430(i),x431(i),x432(i),x433(i),x434(i),x435(i),x436
(i),x437(i),x438(i),x439(i),x440(i),x441(i),x442(i),x443(i),x444
(i),x445(i),x446(i),x447(i),x448(i),x449(i),x450(i),x451(i),x452
(i),x453(i),x454(i),x455(i),x456(i),x457(i),x458(i),x459(i),x460
(i),x461(i),x462(i),x463(i),x464(i),x465(i),x466(i),x467(i),x468
(i),x469(i),x470(i),x471(i),x472(i),x473(i),x474(i),x475(i),x476
(i),x477(i),x478(i),x479(i),x480(i),x481(i),x482(i),x483(i),x484
(i),x485(i),x486(i),x487(i),x488(i),x489(i),x490(i),x491(i),x492
(i),x493(i),x494(i),x495(i),x496(i),x497(i),x498(i),x499(i),x500
(i)];
    end
    %z2 - for class 2
    if index(2)==1

z2=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
     else

z2=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108
(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116
(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124
```

```
(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132
(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140
(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148
(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156
(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164
(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172
(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180
(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188
(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196
(i),x197(i),x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204
(i),x205(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212
(i),x213(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220
(i),x221(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228
(i),x229(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236
(i),x237(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244
(i),x245(i),x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252
(i),x253(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260
(i),x261(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268
(i),x269(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276
(i),x277(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284
(i),x285(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292
(i),x293(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300
(i),x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i),x401(i),x402(i),x403(i),x404
(i),x405(i),x406(i),x407(i),x408(i),x409(i),x410(i),x411(i),x412
(i),x413(i),x414(i),x415(i),x416(i),x417(i),x418(i),x419(i),x420
(i),x421(i),x422(i),x423(i),x424(i),x425(i),x426(i),x427(i),x428
(i),x429(i),x430(i),x431(i),x432(i),x433(i),x434(i),x435(i),x436
(i),x437(i),x438(i),x439(i),x440(i),x441(i),x442(i),x443(i),x444
(i),x445(i),x446(i),x447(i),x448(i),x449(i),x450(i),x451(i),x452
(i),x453(i),x454(i),x455(i),x456(i),x457(i),x458(i),x459(i),x460
(i),x461(i),x462(i),x463(i),x464(i),x465(i),x466(i),x467(i),x468
(i),x469(i),x470(i),x471(i),x472(i),x473(i),x474(i),x475(i),x476
(i),x477(i),x478(i),x479(i),x480(i),x481(i),x482(i),x483(i),x484
(i),x485(i),x486(i),x487(i),x488(i),x489(i),x490(i),x491(i),x492
(i),x493(i),x494(i),x495(i),x496(i),x497(i),x498(i),x499(i),x500
(i)];
    end

    O1=numel(find(z1<=limit12));
    O2=numel(find(z2>limit12));

    %Step 4
     chi=(((O1-30)^2)/30)+(((O2-120)^2)/120);
    %eval(['chi_' num2str(i) '=[chi]']);
```

```
    chi_vector(i)=chi;
end

%chi_vector=[chi_1,chi_2,chi_3,chi_4,chi_5,chi_6,chi_7,chi_8,chi
_9,chi_10,chi_11,chi_12,chi_13,chi_14,chi_15,chi_16,chi_17,chi_1
8,chi_19,chi_20,chi_21,chi_22,chi_23,chi_24,chi_25,chi_26,chi_27
,chi_28,chi_29,chi_30,chi_31,chi_32,chi_33,chi_34,chi_35,chi_36,
chi_37,chi_38,chi_39,chi_40,chi_41,chi_42,chi_43,chi_44,chi_45,c
hi_46,chi_47,chi_48,chi_49,chi_50,chi_51,chi_52,chi_53,chi_54,ch
i_55,chi_56,chi_57,chi_58,chi_59,chi_60,chi_61,chi_62,chi_63,chi
_64,chi_65,chi_66,chi_67,chi_68,chi_69,chi_70,chi_71,chi_72,chi_
73,chi_74,chi_75,chi_76,chi_77,chi_78,chi_79,chi_80,chi_81,chi_8
2,chi_83,chi_84,chi_85,chi_86,chi_87,chi_88,chi_89,chi_90,chi_91
,chi_92,chi_93,chi_94,chi_95,chi_96,chi_97,chi_98,chi_99,chi_100
,chi_101,chi_102,chi_103,chi_104,chi_105,chi_106,chi_107,chi_108
,chi_109,chi_110,chi_111,chi_112,chi_113,chi_114,chi_115,chi_116
,chi_117,chi_118,chi_119,chi_120,chi_121,chi_122,chi_123,chi_124
,chi_125,chi_126,chi_127,chi_128,chi_129,chi_130,chi_131,chi_132
,chi_133,chi_134,chi_135,chi_136,chi_137,chi_138,chi_139,chi_140
,chi_141,chi_142,chi_143,chi_144,chi_145,chi_146,chi_147,chi_148
,chi_149,chi_150,chi_151,chi_152,chi_153,chi_154,chi_155,chi_156
,chi_157,chi_158,chi_159,chi_160,chi_161,chi_162,chi_163,chi_164
,chi_165,chi_166,chi_167,chi_168,chi_169,chi_170,chi_171,chi_172
,chi_173,chi_174,chi_175,chi_176,chi_177,chi_178,chi_179,chi_180
,chi_181,chi_182,chi_183,chi_184,chi_185,chi_186,chi_187,chi_188
,chi_189,chi_190,chi_191,chi_192,chi_193,chi_194,chi_195,chi_196
,chi_197,chi_198,chi_199,chi_200,chi_201,chi_202,chi_203,chi_204
,chi_205,chi_206,chi_207,chi_208,chi_209,chi_210,chi_211,chi_212
,chi_213,chi_214,chi_215,chi_216,chi_217,chi_218,chi_219,chi_220
,chi_221,chi_222,chi_223,chi_224,chi_225,chi_226,chi_227,chi_228
,chi_229,chi_230,chi_231,chi_232,chi_233,chi_234,chi_235,chi_236
,chi_237,chi_238,chi_239,chi_240,chi_241,chi_242,chi_243,chi_244
,chi_245,chi_246,chi_247,chi_248,chi_249,chi_250,chi_251,chi_252
,chi_253,chi_254,chi_255,chi_256]

[chi_sort,chi_sort2]=sort(chi_vector);

chi_result=chi_sort(1:40)
chi_index=chi_sort2(1:40)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASSIFICATION
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
disp('Start classification ...');

disp('...reading input image...');
I= imread('./Imatgesprova/60-Male/rei_75.jpg');%%image that xe
xant to avaluate

if size(I,3)>1
    I=rgb2gray(I);
end
disp('...computing features...');
imagevector=Function(I);
evalimage=imagevector;
```

```
% Probabilities
% IMPORTANT NOTE: the number of the features is wrong and must
be changed.
% The best idea is to use an automatic numbering.
finalprob1=FeatureMoreOrLess30(evalimage(chi_index(1)),chi_index
(1),numimage);
finalprob2=FeatureMoreOrLess30(evalimage(chi_index(2)),chi_index
(2),numimage);
finalprob3=FeatureMoreOrLess30(evalimage(chi_index(3)),chi_index
(3),numimage);
finalprob4=FeatureMoreOrLess30(evalimage(chi_index(4)),chi_index
(4),numimage);
finalprob5=FeatureMoreOrLess30(evalimage(chi_index(5)),chi_index
(5),numimage);
%
finalprob6=FeatureMoreOrLess30(evalimage(chi_index(6)),chi_index
(6),numimage);
%
finalprob7=FeatureMoreOrLess30(evalimage(chi_index(7)),chi_index
(7),numimage);
%
finalprob8=FeatureMoreOrLess30(evalimage(chi_index(8)),chi_index
(8),numimage);
%
finalprob9=FeatureMoreOrLess30(evalimage(chi_index(9)),chi_index
(9),numimage);
%
finalprob10=FeatureMoreOrLess30(evalimage(chi_index(10)),chi_ind
ex(10),numimage);
%
finalprob11=FeatureMoreOrLess30(evalimage(chi_index(11)),chi_ind
ex(11),numimage);
%
finalprob12=FeatureMoreOrLess30(evalimage(chi_index(12)),chi_ind
ex(12),numimage);
%
finalprob13=FeatureMoreOrLess30(evalimage(chi_index(13)),chi_ind
ex(13),numimage);
%
finalprob14=FeatureMoreOrLess30(evalimage(chi_index(14)),chi_ind
ex(14),numimage);
%
finalprob15=FeatureMoreOrLess30(evalimage(chi_index(15)),chi_ind
ex(15),numimage);
%
finalprob16=FeatureMoreOrLess30(evalimage(chi_index(16)),chi_ind
ex(16),numimage);
%
finalprob17=FeatureMoreOrLess30(evalimage(chi_index(17)),chi_ind
ex(17),numimage);
%
finalprob18=FeatureMoreOrLess30(evalimage(chi_index(18)),chi_ind
ex(18),numimage);
```

```
%
finalprob19=FeatureMoreOrLess30(evalimage(chi_index(19)),chi_ind
ex(19),numimage);
%
finalprob20=FeatureMoreOrLess30(evalimage(chi_index(20)),chi_ind
ex(20),numimage);
%
finalprob21=FeatureMoreOrLess30(evalimage(chi_index(21)),chi_ind
ex(21),numimage);
%
finalprob22=FeatureMoreOrLess30(evalimage(chi_index(22)),chi_ind
ex(22),numimage);
%
finalprob23=FeatureMoreOrLess30(evalimage(chi_index(23)),chi_ind
ex(23),numimage);
%
finalprob24=FeatureMoreOrLess30(evalimage(chi_index(24)),chi_ind
ex(24),numimage);
%
finalprob25=FeatureMoreOrLess30(evalimage(chi_index(25)),chi_ind
ex(25),numimage);
%
finalprob26=FeatureMoreOrLess30(evalimage(chi_index(26)),chi_ind
ex(26),numimage);
%
finalprob27=FeatureMoreOrLess30(evalimage(chi_index(27)),chi_ind
ex(27),numimage);
%
finalprob28=FeatureMoreOrLess30(evalimage(chi_index(28)),chi_ind
ex(28),numimage);
%
finalprob29=FeatureMoreOrLess30(evalimage(chi_index(29)),chi_ind
ex(29),numimage);
%
finalprob30=FeatureMoreOrLess30(evalimage(chi_index(30)),chi_ind
ex(30),numimage);
%
finalprob31=FeatureMoreOrLess30(evalimage(chi_index(31)),chi_ind
ex(31),numimage);
%
finalprob32=FeatureMoreOrLess30(evalimage(chi_index(32)),chi_ind
ex(32),numimage);
%
finalprob33=FeatureMoreOrLess30(evalimage(chi_index(33)),chi_ind
ex(33),numimage);
%
finalprob34=FeatureMoreOrLess30(evalimage(chi_index(34)),chi_ind
ex(34),numimage);
%
finalprob35=FeatureMoreOrLess30(evalimage(chi_index(35)),chi_ind
ex(35),numimage);
%
finalprob36=FeatureMoreOrLess30(evalimage(chi_index(36)),chi_ind
ex(36),numimage);
```

```
%
finalprob37=FeatureMoreOrLess30(evalimage(chi_index(37)),chi_ind
ex(37),numimage);
%
finalprob38=FeatureMoreOrLess30(evalimage(chi_index(38)),chi_ind
ex(38),numimage);
%
finalprob39=FeatureMoreOrLess30(evalimage(chi_index(39)),chi_ind
ex(39),numimage);
%
finalprob40=FeatureMoreOrLess30(evalimage(chi_index(40)),chi_ind
ex(40),numimage);

%For class less30
class=1;
p_less30=100/numimage;
finalprob_less30=p_less30*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);

%For class more30
class=2;
p_more30=400/numimage;
finalprob_more30=p_more30*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);


all_prob=[finalprob_less30,finalprob_more30];
if finalprob_less30>finalprob_more30
    disp('Image is a less than 30 image');
else
    disp('Image is a more than 30 image');
end
```

'More or less 40' program

```
numimage=500;

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

[median_vector_less40]=FunctionLess40();
med2030=median_vector_less40;

[median_vector_more40]=FunctionMore40();
med3040=median_vector_more40;

for i=1:256

    %Step 1
    b1=med2030(i); % median value for 20-30 in (i) posicion
    b2=med3040(i); % median value for 30-40 in (i) posicion
    c=[b1,b2]; % xe do a vector of median values
    [e,index]=sort(c); % xe sort de median values
    limit12=(b1+b2)/2;

    %Step 3

z=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i),
x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),x
20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x2
9(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38
(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(
i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i
),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i)
,x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i),
x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),x
84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x9
3(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),x
102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),x
110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),x
118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),x
126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),x
134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),x
142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),x
150(i)];

    %z1 - for class 1
     if index(1)==1

z1=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
```

```
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),
x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),
x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),
x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),
x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),
x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),
x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),
x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157(i),
x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165(i),
x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173(i),
x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181(i),
x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189(i),
x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197(i),
x198(i),x199(i),x200(i)];
    else

z1=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i),x301(i),x302(i),x303(i),x304
(i),x305(i),x306(i),x307(i),x308(i),x309(i),x310(i),x311(i),x312
(i),x313(i),x314(i),x315(i),x316(i),x317(i),x318(i),x319(i),x320
(i),x321(i),x322(i),x323(i),x324(i),x325(i),x326(i),x327(i),x328
(i),x329(i),x330(i),x331(i),x332(i),x333(i),x334(i),x335(i),x336
(i),x337(i),x338(i),x339(i),x340(i),x341(i),x342(i),x343(i),x344
(i),x345(i),x346(i),x347(i),x348(i),x349(i),x350(i),x351(i),x352
(i),x353(i),x354(i),x355(i),x356(i),x357(i),x358(i),x359(i),x360
(i),x361(i),x362(i),x363(i),x364(i),x365(i),x366(i),x367(i),x368
(i),x369(i),x370(i),x371(i),x372(i),x373(i),x374(i),x375(i),x376
(i),x377(i),x378(i),x379(i),x380(i),x381(i),x382(i),x383(i),x384
(i),x385(i),x386(i),x387(i),x388(i),x389(i),x390(i),x391(i),x392
(i),x393(i),x394(i),x395(i),x396(i),x397(i),x398(i),x399(i),x400
(i),x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
```

```
    end
    %z2 - for class 2
    if index(2)==1

z2=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),
x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),
x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),
x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),
x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),
x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),
x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),
x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157(i),
x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165(i),
x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173(i),
x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181(i),
x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189(i),
x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197(i),
x198(i),x199(i),x200(i)];
     else

%%z1=[%%x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38(i),
x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(i),x
48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x5
7(i),x58(i),x59(i),x60(i)];%%,

z2=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),x208
(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),x216
(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),x224
(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),x232
(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),x240
(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),x248
(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),x256
(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),x264
(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),x272
(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),x280
(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),x288
(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),x296
(i),x297(i),x298(i),x299(i),x300(i),x301(i),x302(i),x303(i),x304
(i),x305(i),x306(i),x307(i),x308(i),x309(i),x310(i),x311(i),x312
(i),x313(i),x314(i),x315(i),x316(i),x317(i),x318(i),x319(i),x320
(i),x321(i),x322(i),x323(i),x324(i),x325(i),x326(i),x327(i),x328
(i),x329(i),x330(i),x331(i),x332(i),x333(i),x334(i),x335(i),x336
(i),x337(i),x338(i),x339(i),x340(i),x341(i),x342(i),x343(i),x344
(i),x345(i),x346(i),x347(i),x348(i),x349(i),x350(i),x351(i),x352
(i),x353(i),x354(i),x355(i),x356(i),x357(i),x358(i),x359(i),x360
(i),x361(i),x362(i),x363(i),x364(i),x365(i),x366(i),x367(i),x368
```

```
(i),x369(i),x370(i),x371(i),x372(i),x373(i),x374(i),x375(i),x376
(i),x377(i),x378(i),x379(i),x380(i),x381(i),x382(i),x383(i),x384
(i),x385(i),x386(i),x387(i),x388(i),x389(i),x390(i),x391(i),x392
(i),x393(i),x394(i),x395(i),x396(i),x397(i),x398(i),x399(i),x400
(i),x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end

    O1=numel(find(z1<=limit12));
    O2=numel(find(z2>limit12));

    %Step 4
    chi=(((O1-60)^2)/60)+(((O2-90)^2)/90);
    %eval(['chi_' num2str(i) '=[chi]']);
    chi_vector(i)=chi;
end

%chi_vector=[chi_1,chi_2,chi_3,chi_4,chi_5,chi_6,chi_7,chi_8,chi
_9,chi_10,chi_11,chi_12,chi_13,chi_14,chi_15,chi_16,chi_17,chi_1
8,chi_19,chi_20,chi_21,chi_22,chi_23,chi_24,chi_25,chi_26,chi_27
,chi_28,chi_29,chi_30,chi_31,chi_32,chi_33,chi_34,chi_35,chi_36,
chi_37,chi_38,chi_39,chi_40,chi_41,chi_42,chi_43,chi_44,chi_45,c
hi_46,chi_47,chi_48,chi_49,chi_50,chi_51,chi_52,chi_53,chi_54,ch
i_55,chi_56,chi_57,chi_58,chi_59,chi_60,chi_61,chi_62,chi_63,chi
_64,chi_65,chi_66,chi_67,chi_68,chi_69,chi_70,chi_71,chi_72,chi_
73,chi_74,chi_75,chi_76,chi_77,chi_78,chi_79,chi_80,chi_81,chi_8
2,chi_83,chi_84,chi_85,chi_86,chi_87,chi_88,chi_89,chi_90,chi_91
,chi_92,chi_93,chi_94,chi_95,chi_96,chi_97,chi_98,chi_99,chi_100
,chi_101,chi_102,chi_103,chi_104,chi_105,chi_106,chi_107,chi_108
,chi_109,chi_110,chi_111,chi_112,chi_113,chi_114,chi_115,chi_116
,chi_117,chi_118,chi_119,chi_120,chi_121,chi_122,chi_123,chi_124
,chi_125,chi_126,chi_127,chi_128,chi_129,chi_130,chi_131,chi_132
,chi_133,chi_134,chi_135,chi_136,chi_137,chi_138,chi_139,chi_140
,chi_141,chi_142,chi_143,chi_144,chi_145,chi_146,chi_147,chi_148
,chi_149,chi_150,chi_151,chi_152,chi_153,chi_154,chi_155,chi_156
,chi_157,chi_158,chi_159,chi_160,chi_161,chi_162,chi_163,chi_164
,chi_165,chi_166,chi_167,chi_168,chi_169,chi_170,chi_171,chi_172
,chi_173,chi_174,chi_175,chi_176,chi_177,chi_178,chi_179,chi_180
,chi_181,chi_182,chi_183,chi_184,chi_185,chi_186,chi_187,chi_188
,chi_189,chi_190,chi_191,chi_192,chi_193,chi_194,chi_195,chi_196
,chi_197,chi_198,chi_199,chi_200,chi_201,chi_202,chi_203,chi_204
,chi_205,chi_206,chi_207,chi_208,chi_209,chi_210,chi_211,chi_212
,chi_213,chi_214,chi_215,chi_216,chi_217,chi_218,chi_219,chi_220
,chi_221,chi_222,chi_223,chi_224,chi_225,chi_226,chi_227,chi_228
,chi_229,chi_230,chi_231,chi_232,chi_233,chi_234,chi_235,chi_236
```

```
,chi_237,chi_238,chi_239,chi_240,chi_241,chi_242,chi_243,chi_244
,chi_245,chi_246,chi_247,chi_248,chi_249,chi_250,chi_251,chi_252
,chi_253,chi_254,chi_255,chi_256]

[chi_sort,chi_sort2]=sort(chi_vector);

chi_result=chi_sort(1:40)
chi_index=chi_sort2(1:40)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASSIFICATION
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
disp('Start classification ...');

disp('...reading input image...');
I= imread('./Imatgesprova/60-Male/rei_75.jpg');%%image that xe
xant to avaluate

if size(I,3)>1
    I=rgb2gray(I);
end
disp('...computing features...');
imagevector=Function(I);
evalimage=imagevector;


% Probabilities
% IMPORTANT NOTE: the number of the features is wrong and must
be changed.
% The best idea is to use an automatic numbering.
finalprob1=FeatureMoreOrLess40(evalimage(chi_index(1)),chi_index
(1),numimage);
finalprob2=FeatureMoreOrLess40(evalimage(chi_index(2)),chi_index
(2),numimage);
finalprob3=FeatureMoreOrLess40(evalimage(chi_index(3)),chi_index
(3),numimage);
finalprob4=FeatureMoreOrLess40(evalimage(chi_index(4)),chi_index
(4),numimage);
finalprob5=FeatureMoreOrLess40(evalimage(chi_index(5)),chi_index
(5),numimage);
%
finalprob6=FeatureMoreOrLess40(evalimage(chi_index(6)),chi_index
(6),numimage);
%
finalprob7=FeatureMoreOrLess40(evalimage(chi_index(7)),chi_index
(7),numimage);
%
finalprob8=FeatureMoreOrLess40(evalimage(chi_index(8)),chi_index
(8),numimage);
%
finalprob9=FeatureMoreOrLess40(evalimage(chi_index(9)),chi_index
(9),numimage);
%
finalprob10=FeatureMoreOrLess40(evalimage(chi_index(10)),chi_ind
ex(10),numimage);
```

```
%
finalprob11=FeatureMoreOrLess40(evalimage(chi_index(11)),chi_ind
ex(11),numimage);
%
finalprob12=FeatureMoreOrLess40(evalimage(chi_index(12)),chi_ind
ex(12),numimage);
%
finalprob13=FeatureMoreOrLess40(evalimage(chi_index(13)),chi_ind
ex(13),numimage);
%
finalprob14=FeatureMoreOrLess40(evalimage(chi_index(14)),chi_ind
ex(14),numimage);
%
finalprob15=FeatureMoreOrLess40(evalimage(chi_index(15)),chi_ind
ex(15),numimage);
%
finalprob16=FeatureMoreOrLess40(evalimage(chi_index(16)),chi_ind
ex(16),numimage);
%
finalprob17=FeatureMoreOrLess40(evalimage(chi_index(17)),chi_ind
ex(17),numimage);
%
finalprob18=FeatureMoreOrLess40(evalimage(chi_index(18)),chi_ind
ex(18),numimage);
%
finalprob19=FeatureMoreOrLess40(evalimage(chi_index(19)),chi_ind
ex(19),numimage);
%
finalprob20=FeatureMoreOrLess40(evalimage(chi_index(20)),chi_ind
ex(20),numimage);
%
finalprob21=FeatureMoreOrLess40(evalimage(chi_index(21)),chi_ind
ex(21),numimage);
%
finalprob22=FeatureMoreOrLess40(evalimage(chi_index(22)),chi_ind
ex(22),numimage);
%
finalprob23=FeatureMoreOrLess40(evalimage(chi_index(23)),chi_ind
ex(23),numimage);
%
finalprob24=FeatureMoreOrLess40(evalimage(chi_index(24)),chi_ind
ex(24),numimage);
%
finalprob25=FeatureMoreOrLess40(evalimage(chi_index(25)),chi_ind
ex(25),numimage);
%
finalprob26=FeatureMoreOrLess40(evalimage(chi_index(26)),chi_ind
ex(26),numimage);
%
finalprob27=FeatureMoreOrLess40(evalimage(chi_index(27)),chi_ind
ex(27),numimage);
%
finalprob28=FeatureMoreOrLess40(evalimage(chi_index(28)),chi_ind
ex(28),numimage);
```

```
%
finalprob29=FeatureMoreOrLess40(evalimage(chi_index(29)),chi_ind
ex(29),numimage);
%
finalprob30=FeatureMoreOrLess40(evalimage(chi_index(30)),chi_ind
ex(30),numimage);
%
finalprob31=FeatureMoreOrLess40(evalimage(chi_index(31)),chi_ind
ex(31),numimage);
%
finalprob32=FeatureMoreOrLess40(evalimage(chi_index(32)),chi_ind
ex(32),numimage);
%
finalprob33=FeatureMoreOrLess40(evalimage(chi_index(33)),chi_ind
ex(33),numimage);
%
finalprob34=FeatureMoreOrLess40(evalimage(chi_index(34)),chi_ind
ex(34),numimage);
%
finalprob35=FeatureMoreOrLess40(evalimage(chi_index(35)),chi_ind
ex(35),numimage);
%
finalprob36=FeatureMoreOrLess40(evalimage(chi_index(36)),chi_ind
ex(36),numimage);
%
finalprob37=FeatureMoreOrLess40(evalimage(chi_index(37)),chi_ind
ex(37),numimage);
%
finalprob38=FeatureMoreOrLess40(evalimage(chi_index(38)),chi_ind
ex(38),numimage);
%
finalprob39=FeatureMoreOrLess40(evalimage(chi_index(39)),chi_ind
ex(39),numimage);
%
finalprob40=FeatureMoreOrLess40(evalimage(chi_index(40)),chi_ind
ex(40),numimage);

%For class less40
class=1;
p_less40=200/numimage;
finalprob_less40=p_less40*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);

%For class more30
class=2;
```

```
p_more40=300/numimage;
finalprob_more40=p_more40*finalprob1(class)*finalprob2(class)*finalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*finalprob10(class)*finalprob11(class)*finalprob12(class)*finalprob13(class)*finalprob14(class)*finalprob15(class)*finalprob16(class)*finalprob17(class)*finalprob18(class)*finalprob19(class)*finalprob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalprob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(class)*finalprob34(class)*finalprob35(class)*finalprob36(class)*finalprob37(class)*finalprob38(class)*finalprob39(class)*finalprob40(class);


all_prob=[finalprob_less40,finalprob_more40];
if finalprob_less40>finalprob_more40
    disp('Image is a less than 40 image');
else
    disp('Image is a more than 40 image');
end
```

'More or less 50' program

```
numimage=500;

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

[median_vector_less50]=FunctionLess50();
med2030=median_vector_less50;

[median_vector_more50]=FunctionMore50();
med3040=median_vector_more50;

for i=1:256

    %Step 1
    b1=med2030(i); % median value for 20-30 in (i) posicion
    b2=med3040(i); % median value for 30-40 in (i) posicion
    c=[b1,b2]; % xe do a vector of median values
    [e,index]=sort(c); % xe sort de median values
    limit12=(b1+b2)/2;

    %Step 3

z=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i),
x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),x
20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x2
9(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38
(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(
i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i
),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i)
,x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i),
x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),x
84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x9
3(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),x
102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),x
110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),x
118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),x
126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),x
134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),x
142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),x
150(i)];

    %z1 - for class 1
     if index(1)==1

z1=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
```

```
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),
x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),
x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),
x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),
x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),
x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),
x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),
x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157(i),
x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165(i),
x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173(i),
x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181(i),
x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189(i),
x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197(i),
x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204(i),x205(i),
x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212(i),x213(i),
x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220(i),x221(i),
x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228(i),x229(i),
x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236(i),x237(i),
x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244(i),x245(i),
x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252(i),x253(i),
x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(i),x261(i),
x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(i),x269(i),
x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(i),x277(i),
x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(i),x285(i),
x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(i),x293(i),
x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(i)];
     else

%%z1=[%%x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38(i),
x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(i),x
48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x5
7(i),x58(i),x59(i),x60(i)];%%,

z1=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i),x401(i),x402(i),x403(i),x404
(i),x405(i),x406(i),x407(i),x408(i),x409(i),x410(i),x411(i),x412
(i),x413(i),x414(i),x415(i),x416(i),x417(i),x418(i),x419(i),x420
(i),x421(i),x422(i),x423(i),x424(i),x425(i),x426(i),x427(i),x428
(i),x429(i),x430(i),x431(i),x432(i),x433(i),x434(i),x435(i),x436
(i),x437(i),x438(i),x439(i),x440(i),x441(i),x442(i),x443(i),x444
(i),x445(i),x446(i),x447(i),x448(i),x449(i),x450(i),x451(i),x452
(i),x453(i),x454(i),x455(i),x456(i),x457(i),x458(i),x459(i),x460
(i),x461(i),x462(i),x463(i),x464(i),x465(i),x466(i),x467(i),x468
```

```
(i),x469(i),x470(i),x471(i),x472(i),x473(i),x474(i),x475(i),x476
(i),x477(i),x478(i),x479(i),x480(i),x481(i),x482(i),x483(i),x484
(i),x485(i),x486(i),x487(i),x488(i),x489(i),x490(i),x491(i),x492
(i),x493(i),x494(i),x495(i),x496(i),x497(i),x498(i),x499(i),x500
(i)];
    end
    %z2 - for class 2
    if index(2)==1

z2=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),
x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),
x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),
x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),
x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),
x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),
x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),
x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157(i),
x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165(i),
x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173(i),
x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181(i),
x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189(i),
x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197(i),
x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204(i),x205(i),
x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212(i),x213(i),
x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220(i),x221(i),
x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228(i),x229(i),
x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236(i),x237(i),
x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244(i),x245(i),
x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252(i),x253(i),
x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(i),x261(i),
x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(i),x269(i),
x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(i),x277(i),
x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(i),x285(i),
x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(i),x293(i),
x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(i)];
     else

%%z1=[%%x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38(i),
x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(i),x
48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x5
7(i),x58(i),x59(i),x60(i)];%%,

z2=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308
(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316
(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324
(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332
```

```
(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340
(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348
(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356
(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364
(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372
(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380
(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388
(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396
(i),x397(i),x398(i),x399(i),x400(i),x401(i),x402(i),x403(i),x404
(i),x405(i),x406(i),x407(i),x408(i),x409(i),x410(i),x411(i),x412
(i),x413(i),x414(i),x415(i),x416(i),x417(i),x418(i),x419(i),x420
(i),x421(i),x422(i),x423(i),x424(i),x425(i),x426(i),x427(i),x428
(i),x429(i),x430(i),x431(i),x432(i),x433(i),x434(i),x435(i),x436
(i),x437(i),x438(i),x439(i),x440(i),x441(i),x442(i),x443(i),x444
(i),x445(i),x446(i),x447(i),x448(i),x449(i),x450(i),x451(i),x452
(i),x453(i),x454(i),x455(i),x456(i),x457(i),x458(i),x459(i),x460
(i),x461(i),x462(i),x463(i),x464(i),x465(i),x466(i),x467(i),x468
(i),x469(i),x470(i),x471(i),x472(i),x473(i),x474(i),x475(i),x476
(i),x477(i),x478(i),x479(i),x480(i),x481(i),x482(i),x483(i),x484
(i),x485(i),x486(i),x487(i),x488(i),x489(i),x490(i),x491(i),x492
(i),x493(i),x494(i),x495(i),x496(i),x497(i),x498(i),x499(i),x500
(i)];
    end

    O1=numel(find(z1<=limit12));
    O2=numel(find(z2>limit12));

    %Step 4
    chi=(((O1-60)^2)/60)+(((O2-90)^2)/90);
    %eval(['chi_' num2str(i) '=[chi]']);
    chi_vector(i)=chi;
end

%chi_vector=[chi_1,chi_2,chi_3,chi_4,chi_5,chi_6,chi_7,chi_8,chi
_9,chi_10,chi_11,chi_12,chi_13,chi_14,chi_15,chi_16,chi_17,chi_1
8,chi_19,chi_20,chi_21,chi_22,chi_23,chi_24,chi_25,chi_26,chi_27
,chi_28,chi_29,chi_30,chi_31,chi_32,chi_33,chi_34,chi_35,chi_36,
chi_37,chi_38,chi_39,chi_40,chi_41,chi_42,chi_43,chi_44,chi_45,c
hi_46,chi_47,chi_48,chi_49,chi_50,chi_51,chi_52,chi_53,chi_54,ch
i_55,chi_56,chi_57,chi_58,chi_59,chi_60,chi_61,chi_62,chi_63,chi
_64,chi_65,chi_66,chi_67,chi_68,chi_69,chi_70,chi_71,chi_72,chi_
73,chi_74,chi_75,chi_76,chi_77,chi_78,chi_79,chi_80,chi_81,chi_8
2,chi_83,chi_84,chi_85,chi_86,chi_87,chi_88,chi_89,chi_90,chi_91
,chi_92,chi_93,chi_94,chi_95,chi_96,chi_97,chi_98,chi_99,chi_100
,chi_101,chi_102,chi_103,chi_104,chi_105,chi_106,chi_107,chi_108
,chi_109,chi_110,chi_111,chi_112,chi_113,chi_114,chi_115,chi_116
,chi_117,chi_118,chi_119,chi_120,chi_121,chi_122,chi_123,chi_124
,chi_125,chi_126,chi_127,chi_128,chi_129,chi_130,chi_131,chi_132
,chi_133,chi_134,chi_135,chi_136,chi_137,chi_138,chi_139,chi_140
,chi_141,chi_142,chi_143,chi_144,chi_145,chi_146,chi_147,chi_148
,chi_149,chi_150,chi_151,chi_152,chi_153,chi_154,chi_155,chi_156
,chi_157,chi_158,chi_159,chi_160,chi_161,chi_162,chi_163,chi_164
,chi_165,chi_166,chi_167,chi_168,chi_169,chi_170,chi_171,chi_172
,chi_173,chi_174,chi_175,chi_176,chi_177,chi_178,chi_179,chi_180
,chi_181,chi_182,chi_183,chi_184,chi_185,chi_186,chi_187,chi_188
,chi_189,chi_190,chi_191,chi_192,chi_193,chi_194,chi_195,chi_196
```

```
,chi_197,chi_198,chi_199,chi_200,chi_201,chi_202,chi_203,chi_204
,chi_205,chi_206,chi_207,chi_208,chi_209,chi_210,chi_211,chi_212
,chi_213,chi_214,chi_215,chi_216,chi_217,chi_218,chi_219,chi_220
,chi_221,chi_222,chi_223,chi_224,chi_225,chi_226,chi_227,chi_228
,chi_229,chi_230,chi_231,chi_232,chi_233,chi_234,chi_235,chi_236
,chi_237,chi_238,chi_239,chi_240,chi_241,chi_242,chi_243,chi_244
,chi_245,chi_246,chi_247,chi_248,chi_249,chi_250,chi_251,chi_252
,chi_253,chi_254,chi_255,chi_256]

[chi_sort,chi_sort2]=sort(chi_vector);

chi_result=chi_sort(1:40)
chi_index=chi_sort2(1:40)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASSIFICATION
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
disp('Start classification ...');

disp('...reading input image...');
I= imread('./Imatgesprova/60-Male/rei_75.jpg');%%image that xe
xant to avaluate

if size(I,3)>1
    I=rgb2gray(I);
end
disp('...computing features...');
imagevector=Function(I);
evalimage=imagevector;


% Probabilities
% IMPORTANT NOTE: the number of the features is wrong and must
be changed.
% The best idea is to use an automatic numbering.
finalprob1=FeatureMoreOrLess50(evalimage(chi_index(1)),chi_index
(1),numimage);
finalprob2=FeatureMoreOrLess50(evalimage(chi_index(2)),chi_index
(2),numimage);
finalprob3=FeatureMoreOrLess50(evalimage(chi_index(3)),chi_index
(3),numimage);
finalprob4=FeatureMoreOrLess50(evalimage(chi_index(4)),chi_index
(4),numimage);
finalprob5=FeatureMoreOrLess50(evalimage(chi_index(5)),chi_index
(5),numimage);
%
finalprob6=FeatureMoreOrLess50(evalimage(chi_index(6)),chi_index
(6),numimage);
%
finalprob7=FeatureMoreOrLess50(evalimage(chi_index(7)),chi_index
(7),numimage);
%
finalprob8=FeatureMoreOrLess50(evalimage(chi_index(8)),chi_index
(8),numimage);
```

```
%
finalprob9=FeatureMoreOrLess50(evalimage(chi_index(9)),chi_index
(9),numimage);
%
finalprob10=FeatureMoreOrLess50(evalimage(chi_index(10)),chi_ind
ex(10),numimage);
%
finalprob11=FeatureMoreOrLess50(evalimage(chi_index(11)),chi_ind
ex(11),numimage);
%
finalprob12=FeatureMoreOrLess50(evalimage(chi_index(12)),chi_ind
ex(12),numimage);
%
finalprob13=FeatureMoreOrLess50(evalimage(chi_index(13)),chi_ind
ex(13),numimage);
%
finalprob14=FeatureMoreOrLess50(evalimage(chi_index(14)),chi_ind
ex(14),numimage);
%
finalprob15=FeatureMoreOrLess50(evalimage(chi_index(15)),chi_ind
ex(15),numimage);
%
finalprob16=FeatureMoreOrLess50(evalimage(chi_index(16)),chi_ind
ex(16),numimage);
%
finalprob17=FeatureMoreOrLess50(evalimage(chi_index(17)),chi_ind
ex(17),numimage);
%
finalprob18=FeatureMoreOrLess50(evalimage(chi_index(18)),chi_ind
ex(18),numimage);
%
finalprob19=FeatureMoreOrLess50(evalimage(chi_index(19)),chi_ind
ex(19),numimage);
%
finalprob20=FeatureMoreOrLess50(evalimage(chi_index(20)),chi_ind
ex(20),numimage);
%
finalprob21=FeatureMoreOrLess50(evalimage(chi_index(21)),chi_ind
ex(21),numimage);
%
finalprob22=FeatureMoreOrLess50(evalimage(chi_index(22)),chi_ind
ex(22),numimage);
%
finalprob24=FeatureMoreOrLess50(evalimage(chi_index(24)),chi_ind
ex(24),numimage);
%
finalprob25=FeatureMoreOrLess50(evalimage(chi_index(25)),chi_ind
ex(25),numimage);
%
finalprob26=FeatureMoreOrLess50(evalimage(chi_index(26)),chi_ind
ex(26),numimage);
%
finalprob27=FeatureMoreOrLess50(evalimage(chi_index(27)),chi_ind
ex(27),numimage);
```

```
%
finalprob28=FeatureMoreOrLess50(evalimage(chi_index(28)),chi_ind
ex(28),numimage);
%
finalprob29=FeatureMoreOrLess50(evalimage(chi_index(29)),chi_ind
ex(29),numimage);
%
finalprob30=FeatureMoreOrLess50(evalimage(chi_index(30)),chi_ind
ex(30),numimage);
%
finalprob31=FeatureMoreOrLess50(evalimage(chi_index(31)),chi_ind
ex(31),numimage);
%
finalprob32=FeatureMoreOrLess50(evalimage(chi_index(32)),chi_ind
ex(32),numimage);
%
finalprob33=FeatureMoreOrLess50(evalimage(chi_index(33)),chi_ind
ex(33),numimage);
%
finalprob34=FeatureMoreOrLess50(evalimage(chi_index(34)),chi_ind
ex(34),numimage);
%
finalprob35=FeatureMoreOrLess50(evalimage(chi_index(35)),chi_ind
ex(35),numimage);
%
finalprob36=FeatureMoreOrLess50(evalimage(chi_index(36)),chi_ind
ex(36),numimage);
%
finalprob37=FeatureMoreOrLess50(evalimage(chi_index(37)),chi_ind
ex(37),numimage);
%
finalprob38=FeatureMoreOrLess50(evalimage(chi_index(38)),chi_ind
ex(38),numimage);
%
finalprob39=FeatureMoreOrLess50(evalimage(chi_index(39)),chi_ind
ex(39),numimage);
%
finalprob40=FeatureMoreOrLess50(evalimage(chi_index(40)),chi_ind
ex(40),numimage);

%For class less50
class=1;
p_less50=300/numimage;
finalprob_less50=p_less50*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);
```

```
%For class more50
class=2;
p_more50=200/numimage;
finalprob_more50=p_more50*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);


all_prob=[finalprob_less50,finalprob_more50];
if finalprob_less50>finalprob_more50
    disp('Image is a less than 50 image');
else
    disp('Image is a more than 50 image');
end
```

'More or less 60' program

```
numimage=500;

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

[median_vector_less60]=FunctionLess60();
med2030=median_vector_less60;

[median_vector_more60]=FunctionMore60();
med3040=median_vector_more60;

for i=1:256

    %Step 1
    b1=med2030(i); % median value for 20-30 in (i) posicion
    b2=med3040(i); % median value for 30-40 in (i) posicion
    c=[b1,b2]; % xe do a vector of median values
    [e,index]=sort(c); % xe sort de median values
    limit12=(b1+b2)/2;

    %Step 3

z=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i),
x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),x
20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x2
9(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38
(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(
i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i
),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i)
,x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i),
x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),x
84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x9
3(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),x
102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),x
110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),x
118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),x
126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),x
134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),x
142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),x
150(i)];

    %z1 - for class 1
     if index(1)==1

z1=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
```

```
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),
x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),
x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),
x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),
x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),
x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),
x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),
x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157(i),
x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165(i),
x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173(i),
x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181(i),
x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189(i),
x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197(i),
x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204(i),x205(i),
x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212(i),x213(i),
x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220(i),x221(i),
x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228(i),x229(i),
x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236(i),x237(i),
x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244(i),x245(i),
x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252(i),x253(i),
x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(i),x261(i),
x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(i),x269(i),
x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(i),x277(i),
x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(i),x285(i),
x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(i),x293(i),
x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(i),x301(i),
x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308(i),x309(i),
x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316(i),x317(i),
x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324(i),x325(i),
x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332(i),x333(i),
x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340(i),x341(i),
x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348(i),x349(i),
x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356(i),x357(i),
x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364(i),x365(i),
x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372(i),x373(i),
x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380(i),x381(i),
x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388(i),x389(i),
x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396(i),x397(i),
x398(i),x399(i),x400(i)];
     else

%%z1=[%%x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38(i),
x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(i),x
48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x5
7(i),x58(i),x59(i),x60(i)];%%,

z1=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
```

```
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end
    %z2 - for class 2
    if index(2)==1

z2=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x10(i)
,x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19(i),
x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(i),x
29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x3
8(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47
(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(
i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i
),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i)
,x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),
x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x
93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101(i),
x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109(i),
x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117(i),
x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125(i),
x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133(i),
x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141(i),
x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149(i),
x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157(i),
x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165(i),
x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173(i),
x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181(i),
x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189(i),
x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197(i),
x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204(i),x205(i),
x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212(i),x213(i),
x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220(i),x221(i),
x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228(i),x229(i),
x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236(i),x237(i),
x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244(i),x245(i),
x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252(i),x253(i),
x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(i),x261(i),
x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(i),x269(i),
x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(i),x277(i),
x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(i),x285(i),
x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(i),x293(i),
x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(i),x301(i),
x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308(i),x309(i),
x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316(i),x317(i),
x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324(i),x325(i),
x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332(i),x333(i),
x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340(i),x341(i),
x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348(i),x349(i),
x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356(i),x357(i),
x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364(i),x365(i),
x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372(i),x373(i),
x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380(i),x381(i),
x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388(i),x389(i),
```

```
x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396(i),x397(i),
x398(i),x399(i),x400(i)];
     else

%%z1=[%%x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i),x38(i),
x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i),x47(i),x
48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x5
7(i),x58(i),x59(i),x60(i)];%%,

z2=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),x408
(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),x416
(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),x424
(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),x432
(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),x440
(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),x448
(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),x456
(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x464
(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x472
(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x480
(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x488
(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x496
(i),x497(i),x498(i),x499(i),x500(i)];
    end

    O1=numel(find(z1<=limit12));
    O2=numel(find(z2>limit12));

    %Step 4
    chi=(((O1-120)^2)/120)+(((O2-30)^2)/30);
    %eval(['chi_' num2str(i) '=[chi]']);
    chi_vector(i)=chi;
end

%chi_vector=[chi_1,chi_2,chi_3,chi_4,chi_5,chi_6,chi_7,chi_8,chi
_9,chi_10,chi_11,chi_12,chi_13,chi_14,chi_15,chi_16,chi_17,chi_1
8,chi_19,chi_20,chi_21,chi_22,chi_23,chi_24,chi_25,chi_26,chi_27
,chi_28,chi_29,chi_30,chi_31,chi_32,chi_33,chi_34,chi_35,chi_36,
chi_37,chi_38,chi_39,chi_40,chi_41,chi_42,chi_43,chi_44,chi_45,c
hi_46,chi_47,chi_48,chi_49,chi_50,chi_51,chi_52,chi_53,chi_54,ch
i_55,chi_56,chi_57,chi_58,chi_59,chi_60,chi_61,chi_62,chi_63,chi
_64,chi_65,chi_66,chi_67,chi_68,chi_69,chi_70,chi_71,chi_72,chi_
73,chi_74,chi_75,chi_76,chi_77,chi_78,chi_79,chi_80,chi_81,chi_8
2,chi_83,chi_84,chi_85,chi_86,chi_87,chi_88,chi_89,chi_90,chi_91
,chi_92,chi_93,chi_94,chi_95,chi_96,chi_97,chi_98,chi_99,chi_100
,chi_101,chi_102,chi_103,chi_104,chi_105,chi_106,chi_107,chi_108
,chi_109,chi_110,chi_111,chi_112,chi_113,chi_114,chi_115,chi_116
,chi_117,chi_118,chi_119,chi_120,chi_121,chi_122,chi_123,chi_124
,chi_125,chi_126,chi_127,chi_128,chi_129,chi_130,chi_131,chi_132
,chi_133,chi_134,chi_135,chi_136,chi_137,chi_138,chi_139,chi_140
,chi_141,chi_142,chi_143,chi_144,chi_145,chi_146,chi_147,chi_148
,chi_149,chi_150,chi_151,chi_152,chi_153,chi_154,chi_155,chi_156
,chi_157,chi_158,chi_159,chi_160,chi_161,chi_162,chi_163,chi_164
,chi_165,chi_166,chi_167,chi_168,chi_169,chi_170,chi_171,chi_172
,chi_173,chi_174,chi_175,chi_176,chi_177,chi_178,chi_179,chi_180
,chi_181,chi_182,chi_183,chi_184,chi_185,chi_186,chi_187,chi_188
,chi_189,chi_190,chi_191,chi_192,chi_193,chi_194,chi_195,chi_196
```

```
,chi_197,chi_198,chi_199,chi_200,chi_201,chi_202,chi_203,chi_204
,chi_205,chi_206,chi_207,chi_208,chi_209,chi_210,chi_211,chi_212
,chi_213,chi_214,chi_215,chi_216,chi_217,chi_218,chi_219,chi_220
,chi_221,chi_222,chi_223,chi_224,chi_225,chi_226,chi_227,chi_228
,chi_229,chi_230,chi_231,chi_232,chi_233,chi_234,chi_235,chi_236
,chi_237,chi_238,chi_239,chi_240,chi_241,chi_242,chi_243,chi_244
,chi_245,chi_246,chi_247,chi_248,chi_249,chi_250,chi_251,chi_252
,chi_253,chi_254,chi_255,chi_256]

[chi_sort,chi_sort2]=sort(chi_vector);

chi_result=chi_sort(1:40)
chi_index=chi_sort2(1:40)


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASSIFICATION
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
disp('Start classification ...');

disp('...reading input image...');
I= imread('./Imatgesprova/60-Male/rei_75.jpg');%%image that we
want to avaluate

if size(I,3)>1
    I=rgb2gray(I);
end
disp('...computing features...');
imagevector=Function(I);
evalimage=imagevector;


% Probabilities
% IMPORTANT NOTE: the number of the features is wrong and must
be changed.
% The best idea is to use an automatic numbering.
finalprob1=FeatureMoreOrLess60(evalimage(chi_index(1)),chi_index
(1),numimage);
finalprob2=FeatureMoreOrLess60(evalimage(chi_index(2)),chi_index
(2),numimage);
finalprob3=FeatureMoreOrLess60(evalimage(chi_index(3)),chi_index
(3),numimage);
finalprob4=FeatureMoreOrLess60(evalimage(chi_index(4)),chi_index
(4),numimage);
finalprob5=FeatureMoreOrLess60(evalimage(chi_index(5)),chi_index
(5),numimage);
%
finalprob6=FeatureMoreOrLess60(evalimage(chi_index(6)),chi_index
(6),numimage);
%
finalprob7=FeatureMoreOrLess60(evalimage(chi_index(7)),chi_index
(7),numimage);
%
finalprob8=FeatureMoreOrLess60(evalimage(chi_index(8)),chi_index
(8),numimage);
```

```
%
finalprob9=FeatureMoreOrLess60(evalimage(chi_index(9)),chi_index
(9),numimage);
%
finalprob10=FeatureMoreOrLess60(evalimage(chi_index(10)),chi_ind
ex(10),numimage);
%
finalprob11=FeatureMoreOrLess60(evalimage(chi_index(11)),chi_ind
ex(11),numimage);
%
finalprob12=FeatureMoreOrLess60(evalimage(chi_index(12)),chi_ind
ex(12),numimage);
%
finalprob13=FeatureMoreOrLess60(evalimage(chi_index(13)),chi_ind
ex(13),numimage);
%
finalprob14=FeatureMoreOrLess60(evalimage(chi_index(14)),chi_ind
ex(14),numimage);
%
finalprob15=FeatureMoreOrLess60(evalimage(chi_index(15)),chi_ind
ex(15),numimage);
%
finalprob16=FeatureMoreOrLess60(evalimage(chi_index(16)),chi_ind
ex(16),numimage);
%
finalprob17=FeatureMoreOrLess60(evalimage(chi_index(17)),chi_ind
ex(17),numimage);
%
finalprob18=FeatureMoreOrLess60(evalimage(chi_index(18)),chi_ind
ex(18),numimage);
%
finalprob19=FeatureMoreOrLess60(evalimage(chi_index(19)),chi_ind
ex(19),numimage);
%
finalprob20=FeatureMoreOrLess60(evalimage(chi_index(20)),chi_ind
ex(20),numimage);
%
finalprob21=FeatureMoreOrLess60(evalimage(chi_index(21)),chi_ind
ex(21),numimage);
%
finalprob22=FeatureMoreOrLess60(evalimage(chi_index(22)),chi_ind
ex(22),numimage);
%
finalprob23=FeatureMoreOrLess60(evalimage(chi_index(23)),chi_ind
ex(23),numimage);
%
finalprob24=FeatureMoreOrLess60(evalimage(chi_index(24)),chi_ind
ex(24),numimage);
%
finalprob25=FeatureMoreOrLess60(evalimage(chi_index(25)),chi_ind
ex(25),numimage);
%
finalprob26=FeatureMoreOrLess60(evalimage(chi_index(26)),chi_ind
ex(26),numimage);
```

```
%
finalprob27=FeatureMoreOrLess60(evalimage(chi_index(27)),chi_ind
ex(27),numimage);
%
finalprob28=FeatureMoreOrLess60(evalimage(chi_index(28)),chi_ind
ex(28),numimage);
%
finalprob29=FeatureMoreOrLess60(evalimage(chi_index(29)),chi_ind
ex(29),numimage);
%
finalprob30=FeatureMoreOrLess60(evalimage(chi_index(30)),chi_ind
ex(30),numimage);
%
finalprob31=FeatureMoreOrLess60(evalimage(chi_index(31)),chi_ind
ex(31),numimage);
%
finalprob32=FeatureMoreOrLess60(evalimage(chi_index(32)),chi_ind
ex(32),numimage);
%
finalprob33=FeatureMoreOrLess60(evalimage(chi_index(33)),chi_ind
ex(33),numimage);
%
finalprob34=FeatureMoreOrLess60(evalimage(chi_index(34)),chi_ind
ex(34),numimage);
%
finalprob35=FeatureMoreOrLess60(evalimage(chi_index(35)),chi_ind
ex(35),numimage);
%
finalprob36=FeatureMoreOrLess60(evalimage(chi_index(36)),chi_ind
ex(36),numimage);
%
finalprob37=FeatureMoreOrLess60(evalimage(chi_index(37)),chi_ind
ex(37),numimage);
%
finalprob38=FeatureMoreOrLess60(evalimage(chi_index(38)),chi_ind
ex(38),numimage);
%
finalprob39=FeatureMoreOrLess60(evalimage(chi_index(39)),chi_ind
ex(39),numimage);
%
finalprob40=FeatureMoreOrLess60(evalimage(chi_index(40)),chi_ind
ex(40),numimage);

%For class less60
class=1;
p_less60=400/numimage;
finalprob_less60=p_less60*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
```

```
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);

%For class more60
class=2;
p_more60=100/numimage;
finalprob_more60=p_more60*finalprob1(class)*finalprob2(class)*fi
nalprob3(class)*finalprob4(class)*finalprob5(class)%*finalprob6(
class)*finalprob7(class)*finalprob8(class)*finalprob9(class)*fin
alprob10(class)*finalprob11(class)*finalprob12(class)*finalprob1
3(class)*finalprob14(class)*finalprob15(class)*finalprob16(class
)*finalprob17(class)*finalprob18(class)*finalprob19(class)*final
prob20(class)%*finalprob21(class)*finalprob22(class)*finalprob23
(class)*finalprob24(class)*finalprob25(class)*finalprob26(class)
*finalprob27(class)*finalprob28(class)*finalprob29(class)*finalp
rob30(class)*finalprob31(class)*finalprob32(class)*finalprob33(c
lass)*finalprob34(class)*finalprob35(class)*finalprob36(class)*f
inalprob37(class)*finalprob38(class)*finalprob39(class)*finalpro
b40(class);


all_prob=[finalprob_less60,finalprob_more60];
if finalprob_less60>finalprob_more60
    disp('Image is a less than 60 image');
else
    disp('Image is a more than 60 image');
end
```

'Age 2' program

```
image=imread('pacoleon.jpg'); %%Read the different images
figure,imshow(image) %%Show the original image
[x,y]=ginput(2) %%Read the two points (x1,y1)(x2,y2) that you point in the image

[image2]=age1(image,x,y); %%Call the function age1 and send to it image,x(x1,x2) and y(y1,y2). Recive image2 as a result
imwrite(image2,'./Grey2/pacoleon.jpg') %%Save the gray image with the name.jpg in the carpet grey
```

'Compute' function

```
function gabor_k = compute(x,y,f0,theta)
r = 1; g = 1;
x1 = x*cos(theta) + y*sin(theta);
y1 = -x*sin(theta) + y*cos(theta);
gabor_k = f0^2/(pi*r*g)*exp(-
(f0^2*x1^2/r^2+f0^2*y1^2/g^2))*exp(i*2*pi*f0*x1);
```

'Featurechi' function

```
function [finalprobk]=Featurechi(value,k,E,numimage)

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end


%%Vector for the feature k
vk_2030=
[x1(k),x2(k),x3(k),x4(k),x5(k),x6(k),x7(k),x8(k),x9(k),x10(k),x1
1(k),x12(k),x13(k),x14(k),x15(k),x16(k),x17(k),x18(k),x19(k),x20
(k),x21(k),x22(k),x23(k),x24(k),x25(k),x26(k),x27(k),x28(k),x29(
k),x30(k),x31(k),x32(k),x33(k),x34(k),x35(k),x36(k),x37(k),x38(k
),x39(k),x40(k),x41(k),x42(k),x43(k),x44(k),x45(k),x46(k),x47(k)
,x48(k),x49(k),x50(k),x51(k),x52(k),x53(k),x54(k),x55(k),x56(k),
x57(k),x58(k),x59(k),x60(k),x61(k),x62(k),x63(k),x64(k),x65(k),x
66(k),x67(k),x68(k),x69(k),x70(k),x71(k),x72(k),x73(k),x74(k),x7
5(k),x76(k),x77(k),x78(k),x79(k),x80(k),x81(k),x82(k),x83(k),x84
(k),x85(k),x86(k),x87(k),x88(k),x89(k),x90(k),x91(k),x92(k),x93(
k),x94(k),x95(k),x96(k),x97(k),x98(k),x99(k),x100(k)];
vk_3040=
[x101(k),x102(k),x103(k),x104(k),x105(k),x106(k),x107(k),x108(k)
,x109(k),x110(k),x111(k),x112(k),x113(k),x114(k),x115(k),x116(k)
,x117(k),x118(k),x119(k),x120(k),x121(k),x122(k),x123(k),x124(k)
,x125(k),x126(k),x127(k),x128(k),x129(k),x130(k),x131(k),x132(k)
,x133(k),x134(k),x135(k),x136(k),x137(k),x138(k),x139(k),x140(k)
,x141(k),x142(k),x143(k),x144(k),x145(k),x146(k),x147(k),x148(k)
,x149(k),x150(k),x151(k),x152(k),x153(k),x154(k),x155(k),x156(k)
,x157(k),x158(k),x159(k),x160(k),x161(k),x162(k),x163(k),x164(k)
,x165(k),x166(k),x167(k),x168(k),x169(k),x170(k),x171(k),x172(k)
,x173(k),x174(k),x175(k),x176(k),x177(k),x178(k),x179(k),x180(k)
,x181(k),x182(k),x183(k),x184(k),x185(k),x186(k),x187(k),x188(k)
,x189(k),x190(k),x191(k),x192(k),x193(k),x194(k),x195(k),x196(k)
,x197(k),x198(k),x199(k),x200(k)];
vk_4050=
[x201(k),x202(k),x203(k),x204(k),x205(k),x206(k),x207(k),x208(k)
,x209(k),x210(k),x211(k),x212(k),x213(k),x214(k),x215(k),x216(k)
,x217(k),x218(k),x219(k),x220(k),x221(k),x222(k),x223(k),x224(k)
,x225(k),x226(k),x227(k),x228(k),x229(k),x230(k),x231(k),x232(k)
,x233(k),x234(k),x235(k),x236(k),x237(k),x238(k),x239(k),x240(k)
,x241(k),x242(k),x243(k),x244(k),x245(k),x246(k),x247(k),x248(k)
,x249(k),x250(k),x251(k),x252(k),x253(k),x254(k),x255(k),x256(k)
,x257(k),x258(k),x259(k),x260(k),x261(k),x262(k),x263(k),x264(k)
,x265(k),x266(k),x267(k),x268(k),x269(k),x270(k),x271(k),x272(k)
,x273(k),x274(k),x275(k),x276(k),x277(k),x278(k),x279(k),x280(k)
,x281(k),x282(k),x283(k),x284(k),x285(k),x286(k),x287(k),x288(k)
,x289(k),x290(k),x291(k),x292(k),x293(k),x294(k),x295(k),x296(k)
,x297(k),x298(k),x299(k),x300(k)];
vk_5060=
[x301(k),x302(k),x303(k),x304(k),x305(k),x306(k),x307(k),x308(k)
,x309(k),x310(k),x311(k),x312(k),x313(k),x314(k),x315(k),x316(k)
,x317(k),x318(k),x319(k),x320(k),x321(k),x322(k),x323(k),x324(k)
,x325(k),x326(k),x327(k),x328(k),x329(k),x330(k),x331(k),x332(k)
```

```
,x333(k),x334(k),x335(k),x336(k),x337(k),x338(k),x339(k),x340(k)
,x341(k),x342(k),x343(k),x344(k),x345(k),x346(k),x347(k),x348(k)
,x349(k),x350(k),x351(k),x352(k),x353(k),x354(k),x355(k),x356(k)
,x357(k),x358(k),x359(k),x360(k),x361(k),x362(k),x363(k),x364(k)
,x365(k),x366(k),x367(k),x368(k),x369(k),x370(k),x371(k),x372(k)
,x373(k),x374(k),x375(k),x376(k),x377(k),x378(k),x379(k),x380(k)
,x381(k),x382(k),x383(k),x384(k),x385(k),x386(k),x387(k),x388(k)
,x389(k),x390(k),x391(k),x392(k),x393(k),x394(k),x395(k),x396(k)
,x397(k),x398(k),x399(k),x400(k)];
vk_60=
[x401(k),x402(k),x403(k),x404(k),x405(k),x406(k),x407(k),x408(k)
,x409(k),x410(k),x411(k),x412(k),x413(k),x414(k),x415(k),x416(k)
,x417(k),x418(k),x419(k),x420(k),x421(k),x422(k),x423(k),x424(k)
,x425(k),x426(k),x427(k),x428(k),x429(k),x430(k),x431(k),x432(k)
,x433(k),x434(k),x435(k),x436(k),x437(k),x438(k),x439(k),x440(k)
,x441(k),x442(k),x443(k),x444(k),x445(k),x446(k),x447(k),x448(k)
,x449(k),x450(k),x451(k),x452(k),x453(k),x454(k),x455(k),x456(k)
,x457(k),x458(k),x459(k),x460(k),x461(k),x462(k),x463(k),x464(k)
,x465(k),x466(k),x467(k),x468(k),x469(k),x470(k),x471(k),x472(k)
,x473(k),x474(k),x475(k),x476(k),x477(k),x478(k),x479(k),x480(k)
,x481(k),x482(k),x483(k),x484(k),x485(k),x486(k),x487(k),x488(k)
,x489(k),x490(k),x491(k),x492(k),x493(k),x494(k),x495(k),x496(k)
,x497(k),x498(k),x499(k),x500(k)];

%% Construct the normal distribution for the feature (k)
%%20-30 years
meank_2030= mean(vk_2030);
stdk_2030=std(vk_2030);
pk=E/numimage;
probk_2030=1/sqrt(2*pi*stdk_2030^2)*exp(-(value-
meank_2030)^2/(2*stdk_2030^2));

%%30-40 years
meank_3040= mean(vk_3040);
stdk_3040=std(vk_3040);
pk=E/numimage;
probk_3040=1/sqrt(2*pi*stdk_3040^2)*exp(-(value-
meank_3040)^2/(2*stdk_3040^2));

%%40-50 years
meank_4050= mean(vk_4050);
stdk_4050=std(vk_4050);
pk=E/numimage;
probk_4050=1/sqrt(2*pi*stdk_4050^2)*exp(-(value-
meank_4050)^2/(2*stdk_4050^2));

%%50-60 years
meank_5060= mean(vk_5060);
stdk_5060=std(vk_5060);
pk=E/numimage;
probk_5060=1/sqrt(2*pi*stdk_5060^2)*exp(-(value-
meank_5060)^2/(2*stdk_5060^2));

%%+60 years
meank_60= mean(vk_60);
stdk_60=std(vk_60);
```

```
pk=E/numimage;
probk_60=1/sqrt(2*pi*stdk_60^2)*exp(-(value-
meank_60)^2/(2*stdk_60^2));

finalprobk=[probk_2030,probk_3040,probk_4050,probk_5060,probk_60
]
```

'FeatureManorWoman' function

```
function [finalprobk]=FeatureManorWoman(value,k,E,numimage)

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

%%Vector for the feature k
woman=[x1(k),x2(k),x3(k),x4(k),x5(k),x6(k),x7(k),x8(k),x9(k),x10
(k),x11(k),x12(k),x13(k),x14(k),x15(k),x16(k),x17(k),x18(k),x19(
k),x20(k),x21(k),x22(k),x23(k),x24(k),x25(k),x26(k),x27(k),x28(k
),x29(k),x30(k),x31(k),x32(k),x33(k),x34(k),x35(k),x36(k),x37(k)
,x38(k),x39(k),x40(k),x41(k),x42(k),x43(k),x44(k),x45(k),x46(k),
x47(k),x48(k),x49(k),x50(k),x101(k),x102(k),x103(k),x104(k),x105
(k),x106(k),x107(k),x108(k),x109(k),x110(k),x111(k),x112(k),x113
(k),x114(k),x115(k),x116(k),x117(k),x118(k),x119(k),x120(k),x121
(k),x122(k),x123(k),x124(k),x125(k),x126(k),x127(k),x128(k),x129
(k),x130(k),x131(k),x132(k),x133(k),x134(k),x135(k),x136(k),x137
(k),x138(k),x139(k),x140(k),x141(k),x142(k),x143(k),x144(k),x145
(k),x146(k),x147(k),x148(k),x149(k),x150(k),x201(k),x202(k),x203
(k),x204(k),x205(k),x206(k),x207(k),x208(k),x209(k),x210(k),x211
(k),x212(k),x213(k),x214(k),x215(k),x216(k),x217(k),x218(k),x219
(k),x220(k),x221(k),x222(k),x223(k),x224(k),x225(k),x226(k),x227
(k),x228(k),x229(k),x230(k),x231(k),x232(k),x233(k),x234(k),x235
(k),x236(k),x237(k),x238(k),x239(k),x240(k),x241(k),x242(k),x243
(k),x244(k),x245(k),x246(k),x247(k),x248(k),x249(k),x250(k),x301
(k),x302(k),x303(k),x304(k),x305(k),x306(k),x307(k),x308(k),x309
(k),x310(k),x311(k),x312(k),x313(k),x314(k),x315(k),x316(k),x317
(k),x318(k),x319(k),x320(k),x321(k),x322(k),x323(k),x324(k),x325
(k),x326(k),x327(k),x328(k),x329(k),x330(k),x331(k),x332(k),x333
(k),x334(k),x335(k),x336(k),x337(k),x338(k),x339(k),x340(k),x341
(k),x342(k),x343(k),x344(k),x345(k),x346(k),x347(k),x348(k),x349
(k),x350(k),x401(k),x402(k),x403(k),x404(k),x405(k),x406(k),x407
(k),x408(k),x409(k),x410(k),x411(k),x412(k),x413(k),x414(k),x415
(k),x416(k),x417(k),x418(k),x419(k),x420(k),x421(k),x422(k),x423
(k),x424(k),x425(k),x426(k),x427(k),x428(k),x429(k),x430(k),x431
(k),x432(k),x433(k),x434(k),x435(k),x436(k),x437(k),x438(k),x439
(k),x440(k),x441(k),x442(k),x443(k),x444(k),x445(k),x446(k),x447
(k),x448(k),x449(k),x450(k)];
man=[x51(k),x52(k),x53(k),x54(k),x55(k),x56(k),x57(k),x58(k),x59
(k),x60(k),x61(k),x62(k),x63(k),x64(k),x65(k),x66(k),x67(k),x68(
k),x69(k),x70(k),x71(k),x72(k),x73(k),x74(k),x75(k),x76(k),x77(k
),x78(k),x79(k),x80(k),x81(k),x82(k),x83(k),x84(k),x85(k),x86(k)
,x87(k),x88(k),x89(k),x90(k),x91(k),x92(k),x93(k),x94(k),x95(k),
x96(k),x97(k),x98(k),x99(k),x100(k),x151(k),x152(k),x153(k),x154
(k),x155(k),x156(k),x157(k),x158(k),x159(k),x160(k),x161(k),x162
(k),x163(k),x164(k),x165(k),x166(k),x167(k),x168(k),x169(k),x170
(k),x171(k),x172(k),x173(k),x174(k),x175(k),x176(k),x177(k),x178
(k),x179(k),x180(k),x181(k),x182(k),x183(k),x184(k),x185(k),x186
(k),x187(k),x188(k),x189(k),x190(k),x191(k),x192(k),x193(k),x194
(k),x195(k),x196(k),x197(k),x198(k),x199(k),x200(k),x251(k),x252
(k),x253(k),x254(k),x255(k),x256(k),x257(k),x258(k),x259(k),x260
(k),x261(k),x262(k),x263(k),x264(k),x265(k),x266(k),x267(k),x268
(k),x269(k),x270(k),x271(k),x272(k),x273(k),x274(k),x275(k),x276
```

```
(k),x277(k),x278(k),x279(k),x280(k),x281(k),x282(k),x283(k),x284
(k),x285(k),x286(k),x287(k),x288(k),x289(k),x290(k),x291(k),x292
(k),x293(k),x294(k),x295(k),x296(k),x297(k),x298(k),x299(k),x300
(k),x351(k),x352(k),x353(k),x354(k),x355(k),x356(k),x357(k),x358
(k),x359(k),x360(k),x361(k),x362(k),x363(k),x364(k),x365(k),x366
(k),x367(k),x368(k),x369(k),x370(k),x371(k),x372(k),x373(k),x374
(k),x375(k),x376(k),x377(k),x378(k),x379(k),x380(k),x381(k),x382
(k),x383(k),x384(k),x385(k),x386(k),x387(k),x388(k),x389(k),x390
(k),x391(k),x392(k),x393(k),x394(k),x395(k),x396(k),x397(k),x398
(k),x399(k),x400(k),x451(k),x452(k),x453(k),x454(k),x455(k),x456
(k),x457(k),x458(k),x459(k),x460(k),x461(k),x462(k),x463(k),x464
(k),x465(k),x466(k),x467(k),x468(k),x469(k),x470(k),x471(k),x472
(k),x473(k),x474(k),x475(k),x476(k),x477(k),x478(k),x479(k),x480
(k),x481(k),x482(k),x483(k),x484(k),x485(k),x486(k),x487(k),x488
(k),x489(k),x490(k),x491(k),x492(k),x493(k),x494(k),x495(k),x496
(k),x497(k),x498(k),x499(k),x500(k)];

%% Construct the normal distribution for the feature (k)
%%man
meanman= mean(man);
stdk_man=std(man);
pk=E/numimage;
probk_man=1/sqrt(2*pi*stdk_man^2)*exp(-(value-
meanman)^2/(2*stdk_man^2));

%%woman
meank_woman= mean(woman);
stdk_woman=std(woman);
pk=E/numimage;
probk_woman=1/sqrt(2*pi*stdk_woman^2)*exp(-(value-
meank_woman)^2/(2*stdk_woman^2));

finalprobk=[probk_woman,probk_man]
```

'FeatureMoreOrLess30' function

```
function [finalprobk]=FeatureMoreOrLess30(value,k,numimage)

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

%%Vector for the feature k
less30=[x1(k),x2(k),x3(k),x4(k),x5(k),x6(k),x7(k),x8(k),x9(k),x1
0(k),x11(k),x12(k),x13(k),x14(k),x15(k),x16(k),x17(k),x18(k),x19
(k),x20(k),x21(k),x22(k),x23(k),x24(k),x25(k),x26(k),x27(k),x28(
k),x29(k),x30(k),x31(k),x32(k),x33(k),x34(k),x35(k),x36(k),x37(k
),x38(k),x39(k),x40(k),x41(k),x42(k),x43(k),x44(k),x45(k),x46(k)
,x47(k),x48(k),x49(k),x50(k),x51(k),x52(k),x53(k),x54(k),x55(k),
x56(k),x57(k),x58(k),x59(k),x60(k),x61(k),x62(k),x63(k),x64(k),x
65(k),x66(k),x67(k),x68(k),x69(k),x70(k),x71(k),x72(k),x73(k),x7
4(k),x75(k),x76(k),x77(k),x78(k),x79(k),x80(k),x81(k),x82(k),x83
(k),x84(k),x85(k),x86(k),x87(k),x88(k),x89(k),x90(k),x91(k),x92(
k),x93(k),x94(k),x95(k),x96(k),x97(k),x98(k),x99(k),x100(k)];
more30=[x101(k),x102(k),x103(k),x104(k),x105(k),x106(k),x107(k),
x108(k),x109(k),x110(k),x111(k),x112(k),x113(k),x114(k),x115(k),
x116(k),x117(k),x118(k),x119(k),x120(k),x121(k),x122(k),x123(k),
x124(k),x125(k),x126(k),x127(k),x128(k),x129(k),x130(k),x131(k),
x132(k),x133(k),x134(k),x135(k),x136(k),x137(k),x138(k),x139(k),
x140(k),x141(k),x142(k),x143(k),x144(k),x145(k),x146(k),x147(k),
x148(k),x149(k),x150(k),x151(k),x152(k),x153(k),x154(k),x155(k),
x156(k),x157(k),x158(k),x159(k),x160(k),x161(k),x162(k),x163(k),
x164(k),x165(k),x166(k),x167(k),x168(k),x169(k),x170(k),x171(k),
x172(k),x173(k),x174(k),x175(k),x176(k),x177(k),x178(k),x179(k),
x180(k),x181(k),x182(k),x183(k),x184(k),x185(k),x186(k),x187(k),
x188(k),x189(k),x190(k),x191(k),x192(k),x193(k),x194(k),x195(k),
x196(k),x197(k),x198(k),x199(k),x200(k),x201(k),x202(k),x203(k),
x204(k),x205(k),x206(k),x207(k),x208(k),x209(k),x210(k),x211(k),
x212(k),x213(k),x214(k),x215(k),x216(k),x217(k),x218(k),x219(k),
x220(k),x221(k),x222(k),x223(k),x224(k),x225(k),x226(k),x227(k),
x228(k),x229(k),x230(k),x231(k),x232(k),x233(k),x234(k),x235(k),
x236(k),x237(k),x238(k),x239(k),x240(k),x241(k),x242(k),x243(k),
x244(k),x245(k),x246(k),x247(k),x248(k),x249(k),x250(k),x251(k),
x252(k),x253(k),x254(k),x255(k),x256(k),x257(k),x258(k),x259(k),
x260(k),x261(k),x262(k),x263(k),x264(k),x265(k),x266(k),x267(k),
x268(k),x269(k),x270(k),x271(k),x272(k),x273(k),x274(k),x275(k),
x276(k),x277(k),x278(k),x279(k),x280(k),x281(k),x282(k),x283(k),
x284(k),x285(k),x286(k),x287(k),x288(k),x289(k),x290(k),x291(k),
x292(k),x293(k),x294(k),x295(k),x296(k),x297(k),x298(k),x299(k),
x300(k),x301(k),x302(k),x303(k),x304(k),x305(k),x306(k),x307(k),
x308(k),x309(k),x310(k),x311(k),x312(k),x313(k),x314(k),x315(k),
x316(k),x317(k),x318(k),x319(k),x320(k),x321(k),x322(k),x323(k),
x324(k),x325(k),x326(k),x327(k),x328(k),x329(k),x330(k),x331(k),
x332(k),x333(k),x334(k),x335(k),x336(k),x337(k),x338(k),x339(k),
x340(k),x341(k),x342(k),x343(k),x344(k),x345(k),x346(k),x347(k),
x348(k),x349(k),x350(k),x351(k),x352(k),x353(k),x354(k),x355(k),
x356(k),x357(k),x358(k),x359(k),x360(k),x361(k),x362(k),x363(k),
x364(k),x365(k),x366(k),x367(k),x368(k),x369(k),x370(k),x371(k),
x372(k),x373(k),x374(k),x375(k),x376(k),x377(k),x378(k),x379(k),
```

```
x380(k),x381(k),x382(k),x383(k),x384(k),x385(k),x386(k),x387(k),
x388(k),x389(k),x390(k),x391(k),x392(k),x393(k),x394(k),x395(k),
x396(k),x397(k),x398(k),x399(k),x400(k),x401(k),x402(k),x403(k),
x404(k),x405(k),x406(k),x407(k),x408(k),x409(k),x410(k),x411(k),
x412(k),x413(k),x414(k),x415(k),x416(k),x417(k),x418(k),x419(k),
x420(k),x421(k),x422(k),x423(k),x424(k),x425(k),x426(k),x427(k),
x428(k),x429(k),x430(k),x431(k),x432(k),x433(k),x434(k),x435(k),
x436(k),x437(k),x438(k),x439(k),x440(k),x441(k),x442(k),x443(k),
x444(k),x445(k),x446(k),x447(k),x448(k),x449(k),x450(k),x451(k),
x452(k),x453(k),x454(k),x455(k),x456(k),x457(k),x458(k),x459(k),
x460(k),x461(k),x462(k),x463(k),x464(k),x465(k),x466(k),x467(k),
x468(k),x469(k),x470(k),x471(k),x472(k),x473(k),x474(k),x475(k),
x476(k),x477(k),x478(k),x479(k),x480(k),x481(k),x482(k),x483(k),
x484(k),x485(k),x486(k),x487(k),x488(k),x489(k),x490(k),x491(k),
x492(k),x493(k),x494(k),x495(k),x496(k),x497(k),x498(k),x499(k),
x500(k)];

%% Construct the normal distribution for the feature (k)
%% more than 30
meanmore30= mean(more30);
stdk_more30=std(more30);

probk_more30=1/sqrt(2*pi*stdk_more30^2)*exp(-(value-
meanmore30)^2/(2*stdk_more30^2));

%% less than 30
meanless30= mean(less30);
stdk_less30=std(less30);

probk_less30=1/sqrt(2*pi*stdk_less30^2)*exp(-(value-
meanless30)^2/(2*stdk_less30^2));

finalprobk=[probk_less30,probk_more30]
```

'FeatureMoreOrLess40' function

```
function [finalprobk]=FeatureMoreOrLess40(value,k,numimage)

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

%%Vector for the feature k
less40=[x1(k),x2(k),x3(k),x4(k),x5(k),x6(k),x7(k),x8(k),x9(k),x1
0(k),x11(k),x12(k),x13(k),x14(k),x15(k),x16(k),x17(k),x18(k),x19
(k),x20(k),x21(k),x22(k),x23(k),x24(k),x25(k),x26(k),x27(k),x28(
k),x29(k),x30(k),x31(k),x32(k),x33(k),x34(k),x35(k),x36(k),x37(k
),x38(k),x39(k),x40(k),x41(k),x42(k),x43(k),x44(k),x45(k),x46(k)
,x47(k),x48(k),x49(k),x50(k),x51(k),x52(k),x53(k),x54(k),x55(k),
x56(k),x57(k),x58(k),x59(k),x60(k),x61(k),x62(k),x63(k),x64(k),x
65(k),x66(k),x67(k),x68(k),x69(k),x70(k),x71(k),x72(k),x73(k),x7
4(k),x75(k),x76(k),x77(k),x78(k),x79(k),x80(k),x81(k),x82(k),x83
(k),x84(k),x85(k),x86(k),x87(k),x88(k),x89(k),x90(k),x91(k),x92(
k),x93(k),x94(k),x95(k),x96(k),x97(k),x98(k),x99(k),x100(k),x101
(k),x102(k),x103(k),x104(k),x105(k),x106(k),x107(k),x108(k),x109
(k),x110(k),x111(k),x112(k),x113(k),x114(k),x115(k),x116(k),x117
(k),x118(k),x119(k),x120(k),x121(k),x122(k),x123(k),x124(k),x125
(k),x126(k),x127(k),x128(k),x129(k),x130(k),x131(k),x132(k),x133
(k),x134(k),x135(k),x136(k),x137(k),x138(k),x139(k),x140(k),x141
(k),x142(k),x143(k),x144(k),x145(k),x146(k),x147(k),x148(k),x149
(k),x150(k),x151(k),x152(k),x153(k),x154(k),x155(k),x156(k),x157
(k),x158(k),x159(k),x160(k),x161(k),x162(k),x163(k),x164(k),x165
(k),x166(k),x167(k),x168(k),x169(k),x170(k),x171(k),x172(k),x173
(k),x174(k),x175(k),x176(k),x177(k),x178(k),x179(k),x180(k),x181
(k),x182(k),x183(k),x184(k),x185(k),x186(k),x187(k),x188(k),x189
(k),x190(k),x191(k),x192(k),x193(k),x194(k),x195(k),x196(k),x197
(k),x198(k),x199(k),x200(k)];
more40=[x201(k),x202(k),x203(k),x204(k),x205(k),x206(k),x207(k),
x208(k),x209(k),x210(k),x211(k),x212(k),x213(k),x214(k),x215(k),
x216(k),x217(k),x218(k),x219(k),x220(k),x221(k),x222(k),x223(k),
x224(k),x225(k),x226(k),x227(k),x228(k),x229(k),x230(k),x231(k),
x232(k),x233(k),x234(k),x235(k),x236(k),x237(k),x238(k),x239(k),
x240(k),x241(k),x242(k),x243(k),x244(k),x245(k),x246(k),x247(k),
x248(k),x249(k),x250(k),x251(k),x252(k),x253(k),x254(k),x255(k),
x256(k),x257(k),x258(k),x259(k),x260(k),x261(k),x262(k),x263(k),
x264(k),x265(k),x266(k),x267(k),x268(k),x269(k),x270(k),x271(k),
x272(k),x273(k),x274(k),x275(k),x276(k),x277(k),x278(k),x279(k),
x280(k),x281(k),x282(k),x283(k),x284(k),x285(k),x286(k),x287(k),
x288(k),x289(k),x290(k),x291(k),x292(k),x293(k),x294(k),x295(k),
x296(k),x297(k),x298(k),x299(k),x300(k),x301(k),x302(k),x303(k),
x304(k),x305(k),x306(k),x307(k),x308(k),x309(k),x310(k),x311(k),
x312(k),x313(k),x314(k),x315(k),x316(k),x317(k),x318(k),x319(k),
x320(k),x321(k),x322(k),x323(k),x324(k),x325(k),x326(k),x327(k),
x328(k),x329(k),x330(k),x331(k),x332(k),x333(k),x334(k),x335(k),
x336(k),x337(k),x338(k),x339(k),x340(k),x341(k),x342(k),x343(k),
x344(k),x345(k),x346(k),x347(k),x348(k),x349(k),x350(k),x351(k),
x352(k),x353(k),x354(k),x355(k),x356(k),x357(k),x358(k),x359(k),
x360(k),x361(k),x362(k),x363(k),x364(k),x365(k),x366(k),x367(k),
x368(k),x369(k),x370(k),x371(k),x372(k),x373(k),x374(k),x375(k),
```

```
x376(k),x377(k),x378(k),x379(k),x380(k),x381(k),x382(k),x383(k),
x384(k),x385(k),x386(k),x387(k),x388(k),x389(k),x390(k),x391(k),
x392(k),x393(k),x394(k),x395(k),x396(k),x397(k),x398(k),x399(k),
x400(k),x401(k),x402(k),x403(k),x404(k),x405(k),x406(k),x407(k),
x408(k),x409(k),x410(k),x411(k),x412(k),x413(k),x414(k),x415(k),
x416(k),x417(k),x418(k),x419(k),x420(k),x421(k),x422(k),x423(k),
x424(k),x425(k),x426(k),x427(k),x428(k),x429(k),x430(k),x431(k),
x432(k),x433(k),x434(k),x435(k),x436(k),x437(k),x438(k),x439(k),
x440(k),x441(k),x442(k),x443(k),x444(k),x445(k),x446(k),x447(k),
x448(k),x449(k),x450(k),x451(k),x452(k),x453(k),x454(k),x455(k),
x456(k),x457(k),x458(k),x459(k),x460(k),x461(k),x462(k),x463(k),
x464(k),x465(k),x466(k),x467(k),x468(k),x469(k),x470(k),x471(k),
x472(k),x473(k),x474(k),x475(k),x476(k),x477(k),x478(k),x479(k),
x480(k),x481(k),x482(k),x483(k),x484(k),x485(k),x486(k),x487(k),
x488(k),x489(k),x490(k),x491(k),x492(k),x493(k),x494(k),x495(k),
x496(k),x497(k),x498(k),x499(k),x500(k)];

%% Construct the normal distribution for the feature (k)
%% more than 40
meanmore40= mean(more40);
stdk_more40=std(more40);

probk_more40=1/sqrt(2*pi*stdk_more40^2)*exp(-(value-
meanmore40)^2/(2*stdk_more40^2));

%% less than 40
meanless40= mean(less40);
stdk_less40=std(less40);

probk_less40=1/sqrt(2*pi*stdk_less40^2)*exp(-(value-
meanless40)^2/(2*stdk_less40^2));

finalprobk=[probk_less40,probk_more40]
```

'FeatureMoreOrLess50' function

```
function [finalprobk]=FeatureMoreOrLess50(value,k,numimage)

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

%%Vector for the feature k
less50=[x1(k),x2(k),x3(k),x4(k),x5(k),x6(k),x7(k),x8(k),x9(k),x1
0(k),x11(k),x12(k),x13(k),x14(k),x15(k),x16(k),x17(k),x18(k),x19
(k),x20(k),x21(k),x22(k),x23(k),x24(k),x25(k),x26(k),x27(k),x28(
k),x29(k),x30(k),x31(k),x32(k),x33(k),x34(k),x35(k),x36(k),x37(k
),x38(k),x39(k),x40(k),x41(k),x42(k),x43(k),x44(k),x45(k),x46(k)
,x47(k),x48(k),x49(k),x50(k),x51(k),x52(k),x53(k),x54(k),x55(k),
x56(k),x57(k),x58(k),x59(k),x60(k),x61(k),x62(k),x63(k),x64(k),x
65(k),x66(k),x67(k),x68(k),x69(k),x70(k),x71(k),x72(k),x73(k),x7
4(k),x75(k),x76(k),x77(k),x78(k),x79(k),x80(k),x81(k),x82(k),x83
(k),x84(k),x85(k),x86(k),x87(k),x88(k),x89(k),x90(k),x91(k),x92(
k),x93(k),x94(k),x95(k),x96(k),x97(k),x98(k),x99(k),x100(k),x101
(k),x102(k),x103(k),x104(k),x105(k),x106(k),x107(k),x108(k),x109
(k),x110(k),x111(k),x112(k),x113(k),x114(k),x115(k),x116(k),x117
(k),x118(k),x119(k),x120(k),x121(k),x122(k),x123(k),x124(k),x125
(k),x126(k),x127(k),x128(k),x129(k),x130(k),x131(k),x132(k),x133
(k),x134(k),x135(k),x136(k),x137(k),x138(k),x139(k),x140(k),x141
(k),x142(k),x143(k),x144(k),x145(k),x146(k),x147(k),x148(k),x149
(k),x150(k),x151(k),x152(k),x153(k),x154(k),x155(k),x156(k),x157
(k),x158(k),x159(k),x160(k),x161(k),x162(k),x163(k),x164(k),x165
(k),x166(k),x167(k),x168(k),x169(k),x170(k),x171(k),x172(k),x173
(k),x174(k),x175(k),x176(k),x177(k),x178(k),x179(k),x180(k),x181
(k),x182(k),x183(k),x184(k),x185(k),x186(k),x187(k),x188(k),x189
(k),x190(k),x191(k),x192(k),x193(k),x194(k),x195(k),x196(k),x197
(k),x198(k),x199(k),x200(k),x201(k),x202(k),x203(k),x204(k),x205
(k),x206(k),x207(k),x208(k),x209(k),x210(k),x211(k),x212(k),x213
(k),x214(k),x215(k),x216(k),x217(k),x218(k),x219(k),x220(k),x221
(k),x222(k),x223(k),x224(k),x225(k),x226(k),x227(k),x228(k),x229
(k),x230(k),x231(k),x232(k),x233(k),x234(k),x235(k),x236(k),x237
(k),x238(k),x239(k),x240(k),x241(k),x242(k),x243(k),x244(k),x245
(k),x246(k),x247(k),x248(k),x249(k),x250(k),x251(k),x252(k),x253
(k),x254(k),x255(k),x256(k),x257(k),x258(k),x259(k),x260(k),x261
(k),x262(k),x263(k),x264(k),x265(k),x266(k),x267(k),x268(k),x269
(k),x270(k),x271(k),x272(k),x273(k),x274(k),x275(k),x276(k),x277
(k),x278(k),x279(k),x280(k),x281(k),x282(k),x283(k),x284(k),x285
(k),x286(k),x287(k),x288(k),x289(k),x290(k),x291(k),x292(k),x293
(k),x294(k),x295(k),x296(k),x297(k),x298(k),x299(k),x300(k)];
more50=[x301(k),x302(k),x303(k),x304(k),x305(k),x306(k),x307(k),
x308(k),x309(k),x310(k),x311(k),x312(k),x313(k),x314(k),x315(k),
x316(k),x317(k),x318(k),x319(k),x320(k),x321(k),x322(k),x323(k),
x324(k),x325(k),x326(k),x327(k),x328(k),x329(k),x330(k),x331(k),
x332(k),x333(k),x334(k),x335(k),x336(k),x337(k),x338(k),x339(k),
x340(k),x341(k),x342(k),x343(k),x344(k),x345(k),x346(k),x347(k),
x348(k),x349(k),x350(k),x351(k),x352(k),x353(k),x354(k),x355(k),
x356(k),x357(k),x358(k),x359(k),x360(k),x361(k),x362(k),x363(k),
x364(k),x365(k),x366(k),x367(k),x368(k),x369(k),x370(k),x371(k),
x372(k),x373(k),x374(k),x375(k),x376(k),x377(k),x378(k),x379(k),
```

```
x380(k),x381(k),x382(k),x383(k),x384(k),x385(k),x386(k),x387(k),
x388(k),x389(k),x390(k),x391(k),x392(k),x393(k),x394(k),x395(k),
x396(k),x397(k),x398(k),x399(k),x400(k),x401(k),x402(k),x403(k),
x404(k),x405(k),x406(k),x407(k),x408(k),x409(k),x410(k),x411(k),
x412(k),x413(k),x414(k),x415(k),x416(k),x417(k),x418(k),x419(k),
x420(k),x421(k),x422(k),x423(k),x424(k),x425(k),x426(k),x427(k),
x428(k),x429(k),x430(k),x431(k),x432(k),x433(k),x434(k),x435(k),
x436(k),x437(k),x438(k),x439(k),x440(k),x441(k),x442(k),x443(k),
x444(k),x445(k),x446(k),x447(k),x448(k),x449(k),x450(k),x451(k),
x452(k),x453(k),x454(k),x455(k),x456(k),x457(k),x458(k),x459(k),
x460(k),x461(k),x462(k),x463(k),x464(k),x465(k),x466(k),x467(k),
x468(k),x469(k),x470(k),x471(k),x472(k),x473(k),x474(k),x475(k),
x476(k),x477(k),x478(k),x479(k),x480(k),x481(k),x482(k),x483(k),
x484(k),x485(k),x486(k),x487(k),x488(k),x489(k),x490(k),x491(k),
x492(k),x493(k),x494(k),x495(k),x496(k),x497(k),x498(k),x499(k),
x500(k)];

%% Construct the normal distribution for the feature (k)
%% more than 50
meanmore50= mean(more50);
stdk_more50=std(more50);

probk_more50=1/sqrt(2*pi*stdk_more50^2)*exp(-(value-
meanmore50)^2/(2*stdk_more50^2));

%% less than 50
meanless50= mean(less50);
stdk_less50=std(less50);

probk_less50=1/sqrt(2*pi*stdk_less50^2)*exp(-(value-
meanless50)^2/(2*stdk_less50^2));

finalprobk=[probk_less50,probk_more50]
```

'FeatureMoreOrLess60' function

```
function [finalprobk]=FeatureMoreOrLess60(value,k,numimage)

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

%%Vector for the feature k
less60=[x1(k),x2(k),x3(k),x4(k),x5(k),x6(k),x7(k),x8(k),x9(k),x1
0(k),x11(k),x12(k),x13(k),x14(k),x15(k),x16(k),x17(k),x18(k),x19
(k),x20(k),x21(k),x22(k),x23(k),x24(k),x25(k),x26(k),x27(k),x28(
k),x29(k),x30(k),x31(k),x32(k),x33(k),x34(k),x35(k),x36(k),x37(k
),x38(k),x39(k),x40(k),x41(k),x42(k),x43(k),x44(k),x45(k),x46(k)
,x47(k),x48(k),x49(k),x50(k),x51(k),x52(k),x53(k),x54(k),x55(k),
x56(k),x57(k),x58(k),x59(k),x60(k),x61(k),x62(k),x63(k),x64(k),x
65(k),x66(k),x67(k),x68(k),x69(k),x70(k),x71(k),x72(k),x73(k),x7
4(k),x75(k),x76(k),x77(k),x78(k),x79(k),x80(k),x81(k),x82(k),x83
(k),x84(k),x85(k),x86(k),x87(k),x88(k),x89(k),x90(k),x91(k),x92(
k),x93(k),x94(k),x95(k),x96(k),x97(k),x98(k),x99(k),x100(k),x101
(k),x102(k),x103(k),x104(k),x105(k),x106(k),x107(k),x108(k),x109
(k),x110(k),x111(k),x112(k),x113(k),x114(k),x115(k),x116(k),x117
(k),x118(k),x119(k),x120(k),x121(k),x122(k),x123(k),x124(k),x125
(k),x126(k),x127(k),x128(k),x129(k),x130(k),x131(k),x132(k),x133
(k),x134(k),x135(k),x136(k),x137(k),x138(k),x139(k),x140(k),x141
(k),x142(k),x143(k),x144(k),x145(k),x146(k),x147(k),x148(k),x149
(k),x150(k),x151(k),x152(k),x153(k),x154(k),x155(k),x156(k),x157
(k),x158(k),x159(k),x160(k),x161(k),x162(k),x163(k),x164(k),x165
(k),x166(k),x167(k),x168(k),x169(k),x170(k),x171(k),x172(k),x173
(k),x174(k),x175(k),x176(k),x177(k),x178(k),x179(k),x180(k),x181
(k),x182(k),x183(k),x184(k),x185(k),x186(k),x187(k),x188(k),x189
(k),x190(k),x191(k),x192(k),x193(k),x194(k),x195(k),x196(k),x197
(k),x198(k),x199(k),x200(k),x201(k),x202(k),x203(k),x204(k),x205
(k),x206(k),x207(k),x208(k),x209(k),x210(k),x211(k),x212(k),x213
(k),x214(k),x215(k),x216(k),x217(k),x218(k),x219(k),x220(k),x221
(k),x222(k),x223(k),x224(k),x225(k),x226(k),x227(k),x228(k),x229
(k),x230(k),x231(k),x232(k),x233(k),x234(k),x235(k),x236(k),x237
(k),x238(k),x239(k),x240(k),x241(k),x242(k),x243(k),x244(k),x245
(k),x246(k),x247(k),x248(k),x249(k),x250(k),x251(k),x252(k),x253
(k),x254(k),x255(k),x256(k),x257(k),x258(k),x259(k),x260(k),x261
(k),x262(k),x263(k),x264(k),x265(k),x266(k),x267(k),x268(k),x269
(k),x270(k),x271(k),x272(k),x273(k),x274(k),x275(k),x276(k),x277
(k),x278(k),x279(k),x280(k),x281(k),x282(k),x283(k),x284(k),x285
(k),x286(k),x287(k),x288(k),x289(k),x290(k),x291(k),x292(k),x293
(k),x294(k),x295(k),x296(k),x297(k),x298(k),x299(k),x300(k),x301
(k),x302(k),x303(k),x304(k),x305(k),x306(k),x307(k),x308(k),x309
(k),x310(k),x311(k),x312(k),x313(k),x314(k),x315(k),x316(k),x317
(k),x318(k),x319(k),x320(k),x321(k),x322(k),x323(k),x324(k),x325
(k),x326(k),x327(k),x328(k),x329(k),x330(k),x331(k),x332(k),x333
(k),x334(k),x335(k),x336(k),x337(k),x338(k),x339(k),x340(k),x341
(k),x342(k),x343(k),x344(k),x345(k),x346(k),x347(k),x348(k),x349
(k),x350(k),x351(k),x352(k),x353(k),x354(k),x355(k),x356(k),x357
(k),x358(k),x359(k),x360(k),x361(k),x362(k),x363(k),x364(k),x365
(k),x366(k),x367(k),x368(k),x369(k),x370(k),x371(k),x372(k),x373
(k),x374(k),x375(k),x376(k),x377(k),x378(k),x379(k),x380(k),x381
```

```
(k),x382(k),x383(k),x384(k),x385(k),x386(k),x387(k),x388(k),x389
(k),x390(k),x391(k),x392(k),x393(k),x394(k),x395(k),x396(k),x397
(k),x398(k),x399(k),x400(k)];
more60=[x401(k),x402(k),x403(k),x404(k),x405(k),x406(k),x407(k),
x408(k),x409(k),x410(k),x411(k),x412(k),x413(k),x414(k),x415(k),
x416(k),x417(k),x418(k),x419(k),x420(k),x421(k),x422(k),x423(k),
x424(k),x425(k),x426(k),x427(k),x428(k),x429(k),x430(k),x431(k),
x432(k),x433(k),x434(k),x435(k),x436(k),x437(k),x438(k),x439(k),
x440(k),x441(k),x442(k),x443(k),x444(k),x445(k),x446(k),x447(k),
x448(k),x449(k),x450(k),x451(k),x452(k),x453(k),x454(k),x455(k),
x456(k),x457(k),x458(k),x459(k),x460(k),x461(k),x462(k),x463(k),
x464(k),x465(k),x466(k),x467(k),x468(k),x469(k),x470(k),x471(k),
x472(k),x473(k),x474(k),x475(k),x476(k),x477(k),x478(k),x479(k),
x480(k),x481(k),x482(k),x483(k),x484(k),x485(k),x486(k),x487(k),
x488(k),x489(k),x490(k),x491(k),x492(k),x493(k),x494(k),x495(k),
x496(k),x497(k),x498(k),x499(k),x500(k)];

%% Construct the normal distribution for the feature (k)
%% more than 60
meanmore60= mean(more60);
stdk_more60=std(more60);

probk_more60=1/sqrt(2*pi*stdk_more60^2)*exp(-(value-
meanmore60)^2/(2*stdk_more60^2));

%% less than 60
meanless60= mean(less60);
stdk_less60=std(less60);

probk_less60=1/sqrt(2*pi*stdk_less60^2)*exp(-(value-
meanless60)^2/(2*stdk_less60^2));

finalprobk=[probk_less60,probk_more60]
```

'Function' function

```
function [imagevector]=Function(I)

%% Tamura part

%¼ÆËãTamuraÎÆÀíÌØÕ÷

t0=cputime;
[Nx,Ny] = size(I);
Ng=256;
G=double(I);
%¼ÆËã´Ö²ÚÓ¶È(coarseness)
Sbest=zeros(Nx,Ny);
E0h=zeros(Nx,Ny);
E0v=zeros(Nx,Ny);
E1h=zeros(Nx,Ny);
E1v=zeros(Nx,Ny);
E2h=zeros(Nx,Ny);
E2v=zeros(Nx,Ny);
E3h=zeros(Nx,Ny);
E3v=zeros(Nx,Ny);
E4h=zeros(Nx,Ny);
E4v=zeros(Nx,Ny);
E5h=zeros(Nx,Ny);
E5v=zeros(Nx,Ny);
flag=0;

for i=1:Nx
    for j=2:Ny
        E0h(i,j)=G(i,j)-G(i,j-1);
    end
end
E0h=E0h/2;

for i=1:Nx-1
    for j=1:Ny
        E0v(i,j)=G(i,j)-G(i+1,j);
    end
end
E0v=E0v/2;

%Í¼Æ¬´óÐ¡±ØÐë´óÓÚ4*4²ÅÄÜ¼ÆËãE1h¡¢E1v
if (Nx<4||Ny<4)
    flag=1;
end
if(flag==0)
    for i=1:Nx-1
        for j=3:Ny-1
            E1h(i,j)=sum(sum(G(i:i+1,j:j+1)))-sum(sum(G(i:i+1,j-
2:j-1)));
        end
    end
    for i=2:Nx-2
        for j=2:Ny
```

```
            E1v(i,j)=sum(sum(G(i-1:i,j-1:j)))-
sum(sum(G(i+1:i+2,j-1:j)));
        end
    end
    E1h=E1h/4;
    E1v=E1v/4;
end


%Í¼Æ¬´óÐ¡±ØÐë´óÓÚ8*8²ÅÄÜ¼ÆËãE2h¡¢E2v
if (Nx<8||Ny<8)
    flag=1;
end
if(flag==0)
    for i=2:Nx-2
        for j=5:Ny-3
            E2h(i,j)=sum(sum(G(i-1:i+2,j:j+3)))-sum(sum(G(i-
1:i+2,j-4:j-1)));
        end
    end
    for i=4:Nx-4
        for j=3:Ny-1
            E2v(i,j)=sum(sum(G(i-3:i,j-2:j+1)))-
sum(sum(G(i+1:i+4,j-2:j+1)));
        end
    end
    E2h=E2h/16;
    E2v=E2v/16;
end


%Í¼Æ¬´óÐ¡±ØÐë´óÓÚ16*16²ÅÄÜ¼ÆËãE3h¡¢E3v
if (Nx<16||Ny<16)
    flag=1
end
if(flag==0)
    for i=4:Nx-4
        for j=9:Ny-7
            E3h(i,j)=sum(sum(G(i-3:i+4,j:j+7)))-sum(sum(G(i-
3:i+4,j-8:j-1)));
        end
    end
    for i=8:Nx-8
        for j=5:Ny-3
            E3v(i,j)=sum(sum(G(i-7:i,j-4:j+3)))-
sum(sum(G(i+1:i+8,j-4:j+3)));
        end
    end
    E3h=E3h/64;
    E3v=E3v/64;
end


%Í¼Æ¬´óÐ¡±ØÐë´óÓÚ32*32²ÅÄÜ¼ÆËãE4h¡¢E4v
if (Nx<32||Ny<32)
    flag=1;
```

```
end
if(flag==0)
    for i=8:Nx-8
        for j=17:Ny-15
            E4h(i,j)=sum(sum(G(i-7:i+8,j:j+15)))-sum(sum(G(i-
7:i+8,j-16:j-1)));
        end
    end
    for i=16:Nx-16
        for j=9:Ny-7
            E4v(i,j)=sum(sum(G(i-15:i,j-8:j+7)))-
sum(sum(G(i+1:i+16,j-8:j+7)));
        end
    end
    E4h=E4h/256;
    E4v=E4v/256;
end


%Í¼Æ¬´óÐ¡±ØÐë´óÓÚ64*64²ÅÄÜ¼ÆËãE5h¡¢E5v
if (Nx<64||Ny<64)
    flag=1;
end
if(flag==0)
    for i=16:Nx-16
        for j=33:Ny-31
            E5h(i,j)=sum(sum(G(i-15:i+16,j:j+31)))-sum(sum(G(i-
15:i+16,j-32:j-31)));
        end
    end
    for i=32:Nx-32
        for j=17:Ny-15
            E5v(i,j)=sum(sum(G(i-31:i,j-16:j+15)))-
sum(sum(G(i+1:i+32,j-16:j+15)));
        end
    end
    E5h=E5h/1024;
    E5v=E5v/1024;
end

for i=1:Nx
    for j=1:Ny

[maxv,index]=max([E0h(i,j),E0v(i,j),E1h(i,j),E1v(i,j),E2h(i,j),E
2v(i,j),E3h(i,j),E3v(i,j),E4h(i,j),E4v(i,j),E5h(i,j),E5v(i,j)]);
        k=floor((index+1)/2);
        Sbest(i,j)=2.^k;
    end
end
Fcoarseness=sum(sum(Sbest))/(Nx*Ny);
%¼ÆËã¶Ô±È¶È
[counts,graylevels]=imhist(I);
PI=counts/(Nx*Ny);
averagevalue=sum(graylevels.*PI);
u4=sum((graylevels-repmat(averagevalue,[256,1])).^4.*PI);
```

```
standarddeviation=sum((graylevels-
repmat(averagevalue,[256,1])).^2.*PI);
alpha4=u4/standarddeviation^2;
Fcontrast=sqrt(standarddeviation)/alpha4.^(1/4);
%¼ÆËã·½ÏòÐÈ
PrewittH=[-1 0 1;-1 0 1;-1 0 1];
PrewittV=[1 1 1;0 0 0;-1 -1 -1];
%¼ÆËã°áÏòÌÝ¶È
deltaH=zeros(Nx,Ny);
for i=2:Nx-1
    for j=2:Ny-1
        deltaH(i,j)=sum(sum(G(i-1:i+1,j-1:j+1).*PrewittH));
    end
end
for j=2:Ny-1
    deltaH(1,j)=G(1,j+1)-G(1,j);
    deltaH(Nx,j)=G(Nx,j+1)-G(Nx,j);
end
for i=1:Nx
    deltaH(i,1)=G(i,2)-G(i,1);
    deltaH(i,Ny)=G(i,Ny)-G(i,Ny-1);
end
%¼ÆËãÊúÏòÌÝ¶È
deltaV=zeros(Nx,Ny);
for i=2:Nx-1
    for j=2:Ny-1
        deltaV(i,j)=sum(sum(G(i-1:i+1,j-1:j+1).*PrewittV));
    end
end
for j=1:Ny
    deltaV(1,j)=G(2,j)-G(1,j);
    deltaV(Nx,j)=G(Nx,j)-G(Nx-1,j);
end
for i=2:Nx-1
    deltaV(i,1)=G(i+1,1)-G(i,1);
    deltaV(i,Ny)=G(i+1,Ny)-G(i,Ny);
end
%ÌÝ¶ÈÏòÁ¿Ä£
deltaG=(abs(deltaH)+abs(deltaV))/2;
%ÌÝ¶ÈÏòÁ¿·½Ïò
theta=zeros(Nx,Ny);
for i=1:Nx
    for j=1:Ny
        if (deltaH(i,j)==0)&&(deltaV(i,j)==0)
        elseif deltaH(i,j)==0
            theta(i,j)=pi;
        else
            theta(i,j)=atan(deltaV(i,j)/deltaH(i,j))+pi/2;
        end
    end
end
theta1=reshape(theta,1,[]);
phai=0:0.0001:pi;
HD1=hist(theta1,phai);
HD1=HD1/(Nx*Ny);
HD2=zeros(size(HD1));
```

```
%¶¨ÒåÒ»¸öãÐÖµTHRESHOLD
THRESHOLD=0.01;
for m=1:length(HD2)
    if HD1(m)>=THRESHOLD
        HD2(m)=HD1(m);
    end
end
[c,index]=max(HD2);
phaiP=index*0.0001;
Fdirection=0;
for m=1:length(HD2)
    if HD2(m)~=0
        Fdirection=Fdirection+(phai(m)-phaiP)^2*HD2(m);
    end
end
disp('´Ö²Ú¶È£º');display(Fcoarseness)
disp('¶Ô±È¶È£º');display(Fcontrast)
disp('·½Ïò¶È£º');display(Fdirection)
deltaT=cputime-t0;
display(deltaT);

imhist(theta,16)
%% Directionality vector
vector_tamura=imhist(theta,16)

%% RGB part
vector_rgb=imhist(I,32)

%% Edge part
[fil col]=size(I)
j=col/4;
i=fil/4;
x=1;
t=0;
while i<=fil
    while j<=col
        c=I(i-((fil/4)-1):i,j-((col/4)-1):j);
        j=j+(col/4);
        BW1=edge(c,'sobel',[],'horizontal');
        x1=nnz(BW1);

        BW2=edge(c,'sobel',[],'vertical');
        x2=nnz(BW2);

        BW3=edge(c,'sobel',[],'both');
        x3=nnz(BW3);

        BW5=edge(c,'roberts');
        g45=imfilter(BW5,[1 0; 0 -1]/2,'replicate');
        x4=nnz(g45);

        BW5=edge(c,'roberts');
        g135=imfilter(BW5,[0 1;-1  0]/2,'replicate');
        x5=nnz(g135);
        t=t+1;
        eval(['xe_' num2str(t) '=[x1 x2 x3 x4 x5]']);
```

```
    end
    j=(col/4);
    i=i+(fil/4);
end
vector_edge=[xe_1,xe_2,xe_3,xe_4,xe_5,xe_6,xe_7,xe_8,xe_9,xe_10,
xe_11,xe_12,xe_13,xe_14,xe_15,xe_16]

%% Gabor part

%4¸ö·½ÏòµÄGaborÂË²¨Æ÷¶Ôlena½øÐÐÂË²¨

f0 = 0.2;
count = 1;
t=0;
for theta =
[0,pi/16,2*pi/16,3*pi/16,4*pi/16,5*pi/16,6*pi/16,7*pi/16,8*pi/16
,9*pi/16,10*pi/16,11*pi/16,12*pi/16,13*pi/16,14*pi/16,15*pi/16];
    count = count + 1;
    x = 0;
    for i = linspace(-8,8,11)
        x = x + 1;
        y = 0;
        for j = linspace(-8,8,11)
            y = y + 1;
            z(y,x)=compute(i,j,f0,theta);
        end
    end
    filtered = filter2(z,I,'valid');
    f = abs(filtered);
    w= imhist(f/max(f(:)),8);
    t=t+1;
    eval(['xg_' num2str(t) '=[w]']);
end
vector_gabor=
[xg_1',xg_2',xg_3',xg_4',xg_5',xg_6',xg_7',xg_8',xg_9',xg_10',xg
_11',xg_12',xg_13',xg_14',xg_15',xg_16']

%% Final vector

imagevector =[vector_rgb', vector_edge, vector_gabor,
vector_tamura']
```

'Function2030' function

```
function [median_vector_2030]=Function2030()

for i=1:100
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_2030=zeros(256,1);
for i=1:256

vector=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x1
0(i),x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19
(i),x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(
i),x29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i
),x38(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i)
,x47(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),
x56(i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x
65(i),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x7
4(i),x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83
(i),x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(
i),x93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    median_vector_2030(i)=median(vector);
end
```

'Function3040' function

```
function [median_vector_3040]= Function3040()

for i=101:200
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_3040=zeros(256,1);
for i=1:256

vector=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),
x108(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),
x116(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),
x124(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),
x132(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),
x140(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),
x148(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),
x156(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),
x164(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),
x172(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),
x180(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),
x188(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),
x196(i),x197(i),x198(i),x199(i),x200(i)];
    median_vector_3040(i)=median(vector);
end
```

'Function4050' function

```
function [median_vector_4050]= Function4050()

for i=201:300
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_4050=zeros(256,1);
for i=1:256

vector=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),
x208(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),
x216(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),
x224(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),
x232(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),
x240(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),
x248(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),
x256(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),
x264(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),
x272(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),
x280(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),
x288(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),
x296(i),x297(i),x298(i),x299(i),x300(i)];
    median_vector_4050(i)=median(vector);
end
```

'Function5060' function

```
function [median_vector_5060]= Function5060

for i=301:400
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_5060=zeros(256,1);
for i=1:256

vector=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),
x308(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),
x316(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),
x324(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),
x332(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),
x340(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),
x348(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),
x356(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),
x364(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),
x372(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),
x380(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),
x388(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),
x396(i),x397(i),x398(i),x399(i),x400(i)];
    median_vector_5060(i)=median(vector);
end
```

'Function60ormore' function

```
function [median_vector_60ormore]= Function60ormore

for i=401:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_60ormore=zeros(256,1);
for i=1:256

vector=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),
x408(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),
x416(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),
x424(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),
x432(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),
x440(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),
x448(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),
x456(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),
x464(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),
x472(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),
x480(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),
x488(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),
x496(i),x497(i),x498(i),x499(i),x500(i)];
    median_vector_60ormore(i)=median(vector);
end
```

'FunctionLess30' function

```
function [median_vector_less30]=FunctionLess30()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_less30=zeros(256,1);
for i=1:256

vector=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x1
0(i),x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19
(i),x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(
i),x29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i
),x38(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i)
,x47(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),
x56(i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x
65(i),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x7
4(i),x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83
(i),x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(
i),x93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i)];
    median_vector_less30(i)=median(vector);
end
```

'FunctionLess40' function

```
function [median_vector_less40]=FunctionLess40()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_less40=zeros(256,1);
for i=1:256

vector=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x1
0(i),x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19
(i),x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(
i),x29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i
),x38(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i)
,x47(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),
x56(i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x
65(i),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x7
4(i),x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83
(i),x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(
i),x93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101
(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109
(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117
(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125
(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133
(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141
(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149
(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157
(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165
(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173
(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181
(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189
(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197
(i),x198(i),x199(i),x200(i)];
    median_vector_less40(i)=median(vector);
end
```

'FunctionLess50' function

```
function [median_vector_less50]=FunctionLess50()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_less50=zeros(256,1);
for i=1:256

vector=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x1
0(i),x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19
(i),x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(
i),x29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i
),x38(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i)
,x47(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),
x56(i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x
65(i),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x7
4(i),x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83
(i),x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(
i),x93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101
(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109
(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117
(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125
(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133
(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141
(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149
(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157
(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165
(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173
(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181
(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189
(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197
(i),x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204(i),x205
(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212(i),x213
(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220(i),x221
(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228(i),x229
(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236(i),x237
(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244(i),x245
(i),x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252(i),x253
(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(i),x261
(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(i),x269
(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(i),x277
(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(i),x285
(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(i),x293
(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(i)];
    median_vector_less50(i)=median(vector);
end
```

'FunctionLess60' function

```
function [median_vector_less60]=FunctionLess60()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_less60=zeros(256,1);
for i=1:256

vector=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x1
0(i),x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19
(i),x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(
i),x29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i
),x38(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i)
,x47(i),x48(i),x49(i),x50(i),x51(i),x52(i),x53(i),x54(i),x55(i),
x56(i),x57(i),x58(i),x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x
65(i),x66(i),x67(i),x68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x7
4(i),x75(i),x76(i),x77(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83
(i),x84(i),x85(i),x86(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(
i),x93(i),x94(i),x95(i),x96(i),x97(i),x98(i),x99(i),x100(i),x101
(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),x108(i),x109
(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),x116(i),x117
(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),x124(i),x125
(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),x132(i),x133
(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),x140(i),x141
(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),x148(i),x149
(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),x156(i),x157
(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),x164(i),x165
(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),x172(i),x173
(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),x180(i),x181
(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),x188(i),x189
(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),x196(i),x197
(i),x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),x204(i),x205
(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),x212(i),x213
(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),x220(i),x221
(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),x228(i),x229
(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),x236(i),x237
(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),x244(i),x245
(i),x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),x252(i),x253
(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x260(i),x261
(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x268(i),x269
(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x276(i),x277
(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x284(i),x285
(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x292(i),x293
(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x300(i),x301
(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308(i),x309
(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316(i),x317
(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324(i),x325
(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332(i),x333
(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340(i),x341
(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348(i),x349
(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356(i),x357
(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364(i),x365
```

```
(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372(i),x373
(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380(i),x381
(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388(i),x389
(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396(i),x397
(i),x398(i),x399(i),x400(i)];
    median_vector_less60(i)=median(vector);
end
```

'FunctionMore30' function

```
function [median_vector_more30]=FunctionMore30()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_more30=zeros(256,1);
for i=1:256

vector=[x101(i),x102(i),x103(i),x104(i),x105(i),x106(i),x107(i),
x108(i),x109(i),x110(i),x111(i),x112(i),x113(i),x114(i),x115(i),
x116(i),x117(i),x118(i),x119(i),x120(i),x121(i),x122(i),x123(i),
x124(i),x125(i),x126(i),x127(i),x128(i),x129(i),x130(i),x131(i),
x132(i),x133(i),x134(i),x135(i),x136(i),x137(i),x138(i),x139(i),
x140(i),x141(i),x142(i),x143(i),x144(i),x145(i),x146(i),x147(i),
x148(i),x149(i),x150(i),x151(i),x152(i),x153(i),x154(i),x155(i),
x156(i),x157(i),x158(i),x159(i),x160(i),x161(i),x162(i),x163(i),
x164(i),x165(i),x166(i),x167(i),x168(i),x169(i),x170(i),x171(i),
x172(i),x173(i),x174(i),x175(i),x176(i),x177(i),x178(i),x179(i),
x180(i),x181(i),x182(i),x183(i),x184(i),x185(i),x186(i),x187(i),
x188(i),x189(i),x190(i),x191(i),x192(i),x193(i),x194(i),x195(i),
x196(i),x197(i),x198(i),x199(i),x200(i),x201(i),x202(i),x203(i),
x204(i),x205(i),x206(i),x207(i),x208(i),x209(i),x210(i),x211(i),
x212(i),x213(i),x214(i),x215(i),x216(i),x217(i),x218(i),x219(i),
x220(i),x221(i),x222(i),x223(i),x224(i),x225(i),x226(i),x227(i),
x228(i),x229(i),x230(i),x231(i),x232(i),x233(i),x234(i),x235(i),
x236(i),x237(i),x238(i),x239(i),x240(i),x241(i),x242(i),x243(i),
x244(i),x245(i),x246(i),x247(i),x248(i),x249(i),x250(i),x251(i),
x252(i),x253(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),
x260(i),x261(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),
x268(i),x269(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),
x276(i),x277(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),
x284(i),x285(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),
x292(i),x293(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),
x300(i),x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),
x308(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),
x316(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),
x324(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),
x332(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),
x340(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),
x348(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),
x356(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),
x364(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),
x372(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),
x380(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),
x388(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),
x396(i),x397(i),x398(i),x399(i),x400(i),x401(i),x402(i),x403(i),
x404(i),x405(i),x406(i),x407(i),x408(i),x409(i),x410(i),x411(i),
x412(i),x413(i),x414(i),x415(i),x416(i),x417(i),x418(i),x419(i),
x420(i),x421(i),x422(i),x423(i),x424(i),x425(i),x426(i),x427(i),
x428(i),x429(i),x430(i),x431(i),x432(i),x433(i),x434(i),x435(i),
x436(i),x437(i),x438(i),x439(i),x440(i),x441(i),x442(i),x443(i),
x444(i),x445(i),x446(i),x447(i),x448(i),x449(i),x450(i),x451(i),
```

```
x452(i),x453(i),x454(i),x455(i),x456(i),x457(i),x458(i),x459(i),
x460(i),x461(i),x462(i),x463(i),x464(i),x465(i),x466(i),x467(i),
x468(i),x469(i),x470(i),x471(i),x472(i),x473(i),x474(i),x475(i),
x476(i),x477(i),x478(i),x479(i),x480(i),x481(i),x482(i),x483(i),
x484(i),x485(i),x486(i),x487(i),x488(i),x489(i),x490(i),x491(i),
x492(i),x493(i),x494(i),x495(i),x496(i),x497(i),x498(i),x499(i),
x500(i)];
    median_vector_more30(i)=median(vector);
end
```

'FunctionMore40' function

```
function [median_vector_more40]=FunctionMore40()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_more40=zeros(256,1);
for i=1:256

vector=[x201(i),x202(i),x203(i),x204(i),x205(i),x206(i),x207(i),
x208(i),x209(i),x210(i),x211(i),x212(i),x213(i),x214(i),x215(i),
x216(i),x217(i),x218(i),x219(i),x220(i),x221(i),x222(i),x223(i),
x224(i),x225(i),x226(i),x227(i),x228(i),x229(i),x230(i),x231(i),
x232(i),x233(i),x234(i),x235(i),x236(i),x237(i),x238(i),x239(i),
x240(i),x241(i),x242(i),x243(i),x244(i),x245(i),x246(i),x247(i),
x248(i),x249(i),x250(i),x251(i),x252(i),x253(i),x254(i),x255(i),
x256(i),x257(i),x258(i),x259(i),x260(i),x261(i),x262(i),x263(i),
x264(i),x265(i),x266(i),x267(i),x268(i),x269(i),x270(i),x271(i),
x272(i),x273(i),x274(i),x275(i),x276(i),x277(i),x278(i),x279(i),
x280(i),x281(i),x282(i),x283(i),x284(i),x285(i),x286(i),x287(i),
x288(i),x289(i),x290(i),x291(i),x292(i),x293(i),x294(i),x295(i),
x296(i),x297(i),x298(i),x299(i),x300(i),x301(i),x302(i),x303(i),
x304(i),x305(i),x306(i),x307(i),x308(i),x309(i),x310(i),x311(i),
x312(i),x313(i),x314(i),x315(i),x316(i),x317(i),x318(i),x319(i),
x320(i),x321(i),x322(i),x323(i),x324(i),x325(i),x326(i),x327(i),
x328(i),x329(i),x330(i),x331(i),x332(i),x333(i),x334(i),x335(i),
x336(i),x337(i),x338(i),x339(i),x340(i),x341(i),x342(i),x343(i),
x344(i),x345(i),x346(i),x347(i),x348(i),x349(i),x350(i),x351(i),
x352(i),x353(i),x354(i),x355(i),x356(i),x357(i),x358(i),x359(i),
x360(i),x361(i),x362(i),x363(i),x364(i),x365(i),x366(i),x367(i),
x368(i),x369(i),x370(i),x371(i),x372(i),x373(i),x374(i),x375(i),
x376(i),x377(i),x378(i),x379(i),x380(i),x381(i),x382(i),x383(i),
x384(i),x385(i),x386(i),x387(i),x388(i),x389(i),x390(i),x391(i),
x392(i),x393(i),x394(i),x395(i),x396(i),x397(i),x398(i),x399(i),
x400(i),x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),
x408(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),
x416(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),
x424(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),
x432(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),
x440(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),
x448(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),
x456(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),
x464(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),
x472(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),
x480(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),
x488(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),
x496(i),x497(i),x498(i),x499(i),x500(i)];
    median_vector_more40(i)=median(vector);
end
```

'FunctionMore50' function

```
function [median_vector_more50]=FunctionMore50()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_more50=zeros(256,1);
for i=1:256

vector=[x301(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),
x308(i),x309(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),
x316(i),x317(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),
x324(i),x325(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),
x332(i),x333(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),
x340(i),x341(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),
x348(i),x349(i),x350(i),x351(i),x352(i),x353(i),x354(i),x355(i),
x356(i),x357(i),x358(i),x359(i),x360(i),x361(i),x362(i),x363(i),
x364(i),x365(i),x366(i),x367(i),x368(i),x369(i),x370(i),x371(i),
x372(i),x373(i),x374(i),x375(i),x376(i),x377(i),x378(i),x379(i),
x380(i),x381(i),x382(i),x383(i),x384(i),x385(i),x386(i),x387(i),
x388(i),x389(i),x390(i),x391(i),x392(i),x393(i),x394(i),x395(i),
x396(i),x397(i),x398(i),x399(i),x400(i),x401(i),x402(i),x403(i),
x404(i),x405(i),x406(i),x407(i),x408(i),x409(i),x410(i),x411(i),
x412(i),x413(i),x414(i),x415(i),x416(i),x417(i),x418(i),x419(i),
x420(i),x421(i),x422(i),x423(i),x424(i),x425(i),x426(i),x427(i),
x428(i),x429(i),x430(i),x431(i),x432(i),x433(i),x434(i),x435(i),
x436(i),x437(i),x438(i),x439(i),x440(i),x441(i),x442(i),x443(i),
x444(i),x445(i),x446(i),x447(i),x448(i),x449(i),x450(i),x451(i),
x452(i),x453(i),x454(i),x455(i),x456(i),x457(i),x458(i),x459(i),
x460(i),x461(i),x462(i),x463(i),x464(i),x465(i),x466(i),x467(i),
x468(i),x469(i),x470(i),x471(i),x472(i),x473(i),x474(i),x475(i),
x476(i),x477(i),x478(i),x479(i),x480(i),x481(i),x482(i),x483(i),
x484(i),x485(i),x486(i),x487(i),x488(i),x489(i),x490(i),x491(i),
x492(i),x493(i),x494(i),x495(i),x496(i),x497(i),x498(i),x499(i),
x500(i)];
    median_vector_more50(i)=median(vector);
end
```

'FunctionMore60' function

```
function [median_vector_more60]=FunctionMore60()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_more60=zeros(256,1);
for i=1:256

vector=[x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x407(i),
x408(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x415(i),
x416(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x423(i),
x424(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x431(i),
x432(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x439(i),
x440(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x447(i),
x448(i),x449(i),x450(i),x451(i),x452(i),x453(i),x454(i),x455(i),
x456(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),
x464(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),
x472(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),
x480(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),
x488(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),
x496(i),x497(i),x498(i),x499(i),x500(i)];
    median_vector_more60(i)=median(vector);
end
```

'FunctionMan' function

```
function [median_vector_man]=FunctionMan()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_man=zeros(256,1);
for i=1:256

vector=[x51(i),x52(i),x53(i),x54(i),x55(i),x56(i),x57(i),x58(i),
x59(i),x60(i),x61(i),x62(i),x63(i),x64(i),x65(i),x66(i),x67(i),x
68(i),x69(i),x70(i),x71(i),x72(i),x73(i),x74(i),x75(i),x76(i),x7
7(i),x78(i),x79(i),x80(i),x81(i),x82(i),x83(i),x84(i),x85(i),x86
(i),x87(i),x88(i),x89(i),x90(i),x91(i),x92(i),x93(i),x94(i),x95(
i),x96(i),x97(i),x98(i),x99(i),x100(i),x151(i),x152(i),x153(i),x
154(i),x155(i),x156(i),x157(i),x158(i),x159(i),x160(i),x161(i),x
162(i),x163(i),x164(i),x165(i),x166(i),x167(i),x168(i),x169(i),x
170(i),x171(i),x172(i),x173(i),x174(i),x175(i),x176(i),x177(i),x
178(i),x179(i),x180(i),x181(i),x182(i),x183(i),x184(i),x185(i),x
186(i),x187(i),x188(i),x189(i),x190(i),x191(i),x192(i),x193(i),x
194(i),x195(i),x196(i),x197(i),x198(i),x199(i),x200(i),x251(i),x
252(i),x253(i),x254(i),x255(i),x256(i),x257(i),x258(i),x259(i),x
260(i),x261(i),x262(i),x263(i),x264(i),x265(i),x266(i),x267(i),x
268(i),x269(i),x270(i),x271(i),x272(i),x273(i),x274(i),x275(i),x
276(i),x277(i),x278(i),x279(i),x280(i),x281(i),x282(i),x283(i),x
284(i),x285(i),x286(i),x287(i),x288(i),x289(i),x290(i),x291(i),x
292(i),x293(i),x294(i),x295(i),x296(i),x297(i),x298(i),x299(i),x
300(i),x351(i),x352(i),x353(i),x354(i),x355(i),x356(i),x357(i),x
358(i),x359(i),x360(i),x361(i),x362(i),x363(i),x364(i),x365(i),x
366(i),x367(i),x368(i),x369(i),x370(i),x371(i),x372(i),x373(i),x
374(i),x375(i),x376(i),x377(i),x378(i),x379(i),x380(i),x381(i),x
382(i),x383(i),x384(i),x385(i),x386(i),x387(i),x388(i),x389(i),x
390(i),x391(i),x392(i),x393(i),x394(i),x395(i),x396(i),x397(i),x
398(i),x399(i),x400(i),x451(i),x452(i),x453(i),x454(i),x455(i),x
456(i),x457(i),x458(i),x459(i),x460(i),x461(i),x462(i),x463(i),x
464(i),x465(i),x466(i),x467(i),x468(i),x469(i),x470(i),x471(i),x
472(i),x473(i),x474(i),x475(i),x476(i),x477(i),x478(i),x479(i),x
480(i),x481(i),x482(i),x483(i),x484(i),x485(i),x486(i),x487(i),x
488(i),x489(i),x490(i),x491(i),x492(i),x493(i),x494(i),x495(i),x
496(i),x497(i),x498(i),x499(i),x500(i)];
    median_vector_man(i)=median(vector);
end
```

'FunctionWoman' function

```
function [median_vector_woman]=FunctionWoman()

for i=1:500
    str_to_load=sprintf('x%d=load(''x%d.txt'');',i,i);
    eval(str_to_load);
end

median_vector_woman=zeros(256,1);
for i=1:256

vector=[x1(i),x2(i),x3(i),x4(i),x5(i),x6(i),x7(i),x8(i),x9(i),x1
0(i),x11(i),x12(i),x13(i),x14(i),x15(i),x16(i),x17(i),x18(i),x19
(i),x20(i),x21(i),x22(i),x23(i),x24(i),x25(i),x26(i),x27(i),x28(
i),x29(i),x30(i),x31(i),x32(i),x33(i),x34(i),x35(i),x36(i),x37(i
),x38(i),x39(i),x40(i),x41(i),x42(i),x43(i),x44(i),x45(i),x46(i)
,x47(i),x48(i),x49(i),x50(i),x101(i),x102(i),x103(i),x104(i),x10
5(i),x106(i),x107(i),x108(i),x109(i),x110(i),x111(i),x112(i),x11
3(i),x114(i),x115(i),x116(i),x117(i),x118(i),x119(i),x120(i),x12
1(i),x122(i),x123(i),x124(i),x125(i),x126(i),x127(i),x128(i),x12
9(i),x130(i),x131(i),x132(i),x133(i),x134(i),x135(i),x136(i),x13
7(i),x138(i),x139(i),x140(i),x141(i),x142(i),x143(i),x144(i),x14
5(i),x146(i),x147(i),x148(i),x149(i),x150(i),x201(i),x202(i),x20
3(i),x204(i),x205(i),x206(i),x207(i),x208(i),x209(i),x210(i),x21
1(i),x212(i),x213(i),x214(i),x215(i),x216(i),x217(i),x218(i),x21
9(i),x220(i),x221(i),x222(i),x223(i),x224(i),x225(i),x226(i),x22
7(i),x228(i),x229(i),x230(i),x231(i),x232(i),x233(i),x234(i),x23
5(i),x236(i),x237(i),x238(i),x239(i),x240(i),x241(i),x242(i),x24
3(i),x244(i),x245(i),x246(i),x247(i),x248(i),x249(i),x250(i),x30
1(i),x302(i),x303(i),x304(i),x305(i),x306(i),x307(i),x308(i),x30
9(i),x310(i),x311(i),x312(i),x313(i),x314(i),x315(i),x316(i),x31
7(i),x318(i),x319(i),x320(i),x321(i),x322(i),x323(i),x324(i),x32
5(i),x326(i),x327(i),x328(i),x329(i),x330(i),x331(i),x332(i),x33
3(i),x334(i),x335(i),x336(i),x337(i),x338(i),x339(i),x340(i),x34
1(i),x342(i),x343(i),x344(i),x345(i),x346(i),x347(i),x348(i),x34
9(i),x350(i),x401(i),x402(i),x403(i),x404(i),x405(i),x406(i),x40
7(i),x408(i),x409(i),x410(i),x411(i),x412(i),x413(i),x414(i),x41
5(i),x416(i),x417(i),x418(i),x419(i),x420(i),x421(i),x422(i),x42
3(i),x424(i),x425(i),x426(i),x427(i),x428(i),x429(i),x430(i),x43
1(i),x432(i),x433(i),x434(i),x435(i),x436(i),x437(i),x438(i),x43
9(i),x440(i),x441(i),x442(i),x443(i),x444(i),x445(i),x446(i),x44
7(i),x448(i),x449(i),x450(i)];
    median_vector_woman(i)=median(vector);
end
```

'Age1' function

```
function [imagefaceage]=age2(image,x,y)
[f,c]=size(image) %%f=number of rows; c=number of columns
t=(c/3); %%it solve the problem that the rows appears
multiplied by 3 (256x3)
x1=x(1); %%save the value of x1
x2=x(2); %%save the value of x2
y1=y(1); %%save the value of y1
y2=y(2); %%save the value of y2

imageface=imcrop(image,[x1 y1 (y2-y1) (y2-y1)]);
%%It cuts the image in the dimensions defined by [initial x ,
initial y,
%%high,width]
%%The original images are more wide than high, so it is
necessary to
%%convert the dimensions of the cut to adapt the image in to
a square image (and then adapt to 256x256)

imageface_age=rgb2gray(imageface); %%Convert to shades of
gray

imagefaceage=imresize(imageface_age, [256 256]);%%Reconvert
to 256x256 pixel image
figure, imshow(imagefaceage); %%Show the image
```

'Agegray' function

```
function [imagefaceage]=agegrey(image,x,y)
[f,c]=size(image) %%f=number of rows; c=number of columns
t=(c/3); %%it solve the problem that the rows appears
multiplied by 3 (256x3)
x1=x(1); %%save the value of x1
x2=x(2); %%save the value of x2
y1=y(1); %%save the value of y1
y2=y(2); %%save the value of y2

imageface=imcrop(image,[x1 y1 (y2-y1) (y2-y1)]);
%%It cuts the image in the dimensions defined by [initial x ,
initial y,
%%high,width]
%%The original images are more wide than high, so it is
necessary to
%%convert the dimensions of the cut to adapt the image in to
a square image (and then adapt to 256x256)

imagefaceage=imresize(imageface, [256 256]);%%Reconvert to
256x256 pixel image
figure, imshow(imagefaceage); %%Show the image
```

'Main100big' program

```
I1 = imread('./FaceAging/20-29Female/ainhoaface_29.jpg');
imagevector=Function(I1);
x1=imagevector

I2 = imread('./FaceAging/20-29Female/alabau28.jpg');
imagevector=Function(I2);
x2=imagevector

I3 = imread('./FaceAging/20-29Female/andrea27.jpg');
imagevector=Function(I3);
x3=imagevector

I4 = imread('./FaceAging/20-29Female/annalena28.jpg');
imagevector=Function(I4);
x4=imagevector

I5 = imread('./FaceAging/20-29Female/arranzface_25.jpg');
imagevector=Function(I5);
x5=imagevector

I6 = imread('./FaceAging/20-29Female/arrua21.jpg');
imagevector=Function(I6);
x6=imagevector

I7 = imread('./FaceAging/20-29Female/azarenka24.jpg');
imagevector=Function(I7);
x7=imagevector

I8 = imread('./FaceAging/20-29Female/barbora27.jpg');
imagevector=Function(I8);
x8=imagevector

I9 = imread('./FaceAging/20-29Female/bartoli29.jpg');
imagevector=Function(I9);
x9=imagevector

I10 = imread('./FaceAging/20-29Female/begu23.jpg');
imagevector=Function(I10);
x10=imagevector

I11 = imread('./FaceAging/20-29Female/bertens22.jpg');
imagevector=Function(I11);
x11=imagevector

I12 = imread('./FaceAging/20-29Female/burdette22.jpg');
imagevector=Function(I12);
x12=imagevector

I13 = imread('./FaceAging/20-29Female/campos25.jpg');
imagevector=Function(I13);
x13=imagevector

I14 = imread('./FaceAging/20-29Female/caroline20.jpg');
imagevector=Function(I14);
```

```
x14=imagevector

I15 = imread('./FaceAging/20-29Female/casey28.jpg');
imagevector=Function(I15);
x15=imagevector

I16 = imread('./FaceAging/20-29Female/cepelova20.jpg');
imagevector=Function(I16);
x16=imagevector

I17 = imread('./FaceAging/20-29Female/cibulkova24.jpg');
imagevector=Function(I17);
x17=imagevector

I18 = imread('./FaceAging/20-29Female/cornet23.jpg');
imagevector=Function(I18);
x18=imagevector

I19 = imread('./FaceAging/20-29Female/doi22.jpg');
imagevector=Function(I19);
x19=imagevector

I20 = imread('./FaceAging/20-29Female/dolonc24.jpg');
imagevector=Function(I20);
x20=imagevector

I21 = imread('./FaceAging/20-29Female/Emma23.jpg');
imagevector=Function(I21);
x21=imagevector

I22 = imread('./FaceAging/20-29Female/erakovic25.jpg');
imagevector=Function(I22);
x22=imagevector

I23 = imread('./FaceAging/20-29Female/erika29.jpg');
imagevector=Function(I23);
x23=imagevector

I24 = imread('./FaceAging/20-29Female/erikaface_30.jpg');
imagevector=Function(I24);
x24=imagevector

I25 = imread('./FaceAging/20-29Female/errani26.jpg');
imagevector=Function(I25);
x25=imagevector

I26 = imread('./FaceAging/20-29Female/eunateface_22.jpg');
imagevector=Function(I26);
x26=imagevector

I27 = imread('./FaceAging/20-29Female/flavianoface_23.jpg');
imagevector=Function(I27);
x27=imagevector

I28 = imread('./FaceAging/20-29Female/flipkens27.jpg');
imagevector=Function(I28);
```

```
x28=imagevector

I29 = imread('./FaceAging/20-29Female/goerges25.jpg');
imagevector=Function(I29);
x29=imagevector

I30 = imread('./FaceAging/20-29Female/guarrotxena_20.jpg');
imagevector=Function(I30);
x30=imagevector

I31 = imread('./FaceAging/20-29Female/halep22.jpg');
imagevector=Function(I31);
x31=imagevector

I32 = imread('./FaceAging/20-29Female/hampton23.jpg');
imagevector=Function(I32);
x32=imagevector

I33 = imread('./FaceAging/20-29Female/iraiaface_28.jpg');
imagevector=Function(I33);
x33=imagevector

I34 = imread('./FaceAging/20-29Female/ireneface_22.jpg');
imagevector=Function(I34);
x34=imagevector

I35 = imread('./FaceAging/20-29Female/johansson28.jpg');
imagevector=Function(I35);
x35=imagevector

I36 = imread('./FaceAging/20-29Female/kanepi28.jpg');
imagevector=Function(I36);
x36=imagevector

I37 = imread('./FaceAging/20-29Female/kirilenko26.jpg');
imagevector=Function(I37);
x37=imagevector

I38 = imread('./FaceAging/20-29Female/knapp26.jpg');
imagevector=Function(I38);
x38=imagevector

I39 = imread('./FaceAging/20-29Female/leireface_27.jpg');
imagevector=Function(I39);
x39=imagevector

I40 = imread('./FaceAging/20-29Female/lisicki24.jpg');
imagevector=Function(I40);
x40=imagevector

I41 = imread('./FaceAging/20-29Female/lucie28.jpg');
imagevector=Function(I41);
x41=imagevector

I42 = imread('./FaceAging/20-29Female/mariana24.jpg');
imagevector=Function(I42);
```

```
x42=imagevector

I43= imread('./FaceAging/20-29Female/merinoface_21.jpg');
imagevector=Function(I43);
x43=imagevector

I44 = imread('./FaceAging/20-29Female/muruaface_27.jpg');
imagevector=Function(I44);
x44=imagevector

I45 = imread('./FaceAging/20-29Female/Natalie29.jpg');
imagevector=Function(I45);
x45=imagevector

I46 = imread('./FaceAging/20-29Female/navarro25.jpg');
imagevector=Function(I46);
x46=imagevector

I47 = imread('./FaceAging/20-29Female/nekaneface_22.jpg');
imagevector=Function(I47);
x47=imagevector

I48 = imread('./FaceAging/20-29Female/onya27.jpg');
imagevector=Function(I48);
x48=imagevector

I49 = imread('./FaceAging/20-29Female/oruretaface_29.jpg');
imagevector=Function(I49);
x49=imagevector

I50 = imread('./FaceAging/20-29Female/patriface_22.jpg');
imagevector=Function(I50);
x50=imagevector

I51 = imread('./FaceAging/20-29male/adrainoface_29.jpg');
imagevector=Function(I51);
x51=imagevector

I52 = imread('./FaceAging/20-29male/aguirretxe26.jpg');
imagevector=Function(I52);
x52=imagevector

I53 = imread('./FaceAging/20-29male/albaface_24.jpg');
imagevector=Function(I53);
x53=imagevector

I54 = imread('./FaceAging/20-29male/alexisface_25.jpg');
imagevector=Function(I54);
x54=imagevector

I55 = imread('./FaceAging/20-29male/bartraface_22.jpg');
imagevector=Function(I55);
x55=imagevector

I56 = imread('./FaceAging/20-29male/benitez26.jpg');
imagevector=Function(I56);
```

```
x56=imagevector

I57 = imread('./FaceAging/20-29male/bergara27.jpg');
imagevector=Function(I57);
x57=imagevector

I58 = imread('./FaceAging/20-29male/borja25.jpg');
imagevector=Function(I58);
x58=imagevector

I59 = imread('./FaceAging/20-29male/bounannotte25.jpg');
imagevector=Function(I59);
x59=imagevector

I60 = imread('./FaceAging/20-29male/brayan24.jpg');
imagevector=Function(I60);
x60=imagevector

I61 = imread('./FaceAging/20-29male/brhimi23.jpg');
imagevector=Function(I61);
x61=imagevector

I62 = imread('./FaceAging/20-29male/busquetsface_25.jpg');
imagevector=Function(I62);
x62=imagevector

I63 = imread('./FaceAging/20-29male/cadamuro25.jpg');
imagevector=Function(I63);
x63=imagevector

I64 = imread('./FaceAging/20-29male/carlosmartinez27.jpg');
imagevector=Function(I64);
x64=imagevector

I65 = imread('./FaceAging/20-29male/castro29.jpg');
imagevector=Function(I65);
x65=imagevector

I66 = imread('./FaceAging/20-29male/cescface_26.jpg');
imagevector=Function(I66);
x66=imagevector

I67 = imread('./FaceAging/20-29male/delabella28.jpg');
imagevector=Function(I67);
x67=imagevector

I68 = imread('./FaceAging/20-29male/diakhate29.jpg');
imagevector=Function(I68);
x68=imagevector

I69 = imread('./FaceAging/20-29male/dossantosface_23.jpg');
imagevector=Function(I69);
x69=imagevector

I70 = imread('./FaceAging/20-29male/elarabi26.jpg');
imagevector=Function(I70);
```

```
x70=imagevector

I71 = imread('./FaceAging/20-29male/elustondo26.jpg');
imagevector=Function(I71);
x71=imagevector

I72 = imread('./FaceAging/20-29male/estrada26.jpg');
imagevector=Function(I72);
x72=imagevector

I73 = imread('./FaceAging/20-29male/falcaoface_27.jpg');
imagevector=Function(I73);
x73=imagevector

I74 = imread('./FaceAging/20-29male/garabato24.jpg');
imagevector=Function(I74);
x74=imagevector

I75 = imread('./FaceAging/20-29male/griezmann22.jpg');
imagevector=Function(I75);
x75=imagevector

I76 = imread('./FaceAging/20-29male/ifran26.jpg');
imagevector=Function(I76);
x76=imagevector

I77 = imread('./FaceAging/20-29male/ighalo24.jpg');
imagevector=Function(I77);
x77=imagevector

I78 = imread('./FaceAging/20-29male/illarra23.jpg');
imagevector=Function(I78);
x78=imagevector

I79 = imread('./FaceAging/20-29male/iniestaface_28.jpg');
imagevector=Function(I79);
x79=imagevector

I80 = imread('./FaceAging/20-29male/iñigo22.jpg');
imagevector=Function(I80);
x80=imagevector

I81 = imread('./FaceAging/20-29male/joseangel24.jpg');
imagevector=Function(I81);
x81=imagevector

I82 = imread('./FaceAging/20-29male/marioface_26.jpg');
imagevector=Function(I82);
x82=imagevector

I83 = imread('./FaceAging/20-29male/mascheranoface_29.jpg');
imagevector=Function(I83);
x83=imagevector

I84 = imread('./FaceAging/20-29male/messiface_26.jpg');
imagevector=Function(I84);
```

```
x84=imagevector

I85 = imread('./FaceAging/20-29male/mikel29.jpg');
imagevector=Function(I85);
x85=imagevector

I86 = imread('./FaceAging/20-29male/mikelgon28.jpg');
imagevector=Function(I86);
x86=imagevector

I87 = imread('./FaceAging/20-29male/montoyaface_22.jpg');
imagevector=Function(I87);
x87=imagevector

I88 = imread('./FaceAging/20-29male/nyom23.jpg');
imagevector=Function(I88);
x88=imagevector

I89 = imread('./FaceAging/20-29male/pardo21.jpg');
imagevector=Function(I89);
x89=imagevector

I90 = imread('./FaceAging/20-29male/pedroface_26.jpg');
imagevector=Function(I90);
x90=imagevector

I91 = imread('./FaceAging/20-29male/piqueface_26.jpg');
imagevector=Function(I91);
x91=imagevector

I92 = imread('./FaceAging/20-29male/recio22.jpg');
imagevector=Function(I92);
x92=imagevector

I93 = imread('./FaceAging/20-29male/rico26.jpg');
imagevector=Function(I93);
x93=imagevector

I94 = imread('./FaceAging/20-29male/ros23.jpg');
imagevector=Function(I94);
x94=imagevector

I95 = imread('./FaceAging/20-29male/royo22.jpg');
imagevector=Function(I95);
x95=imagevector

I96 = imread('./FaceAging/20-29male/siqueira27.jpg');
imagevector=Function(I96);
x96=imagevector

I97 = imread('./FaceAging/20-29male/songface_26.jpg');
imagevector=Function(I97);
x97=imagevector

I98 = imread('./FaceAging/20-29male/stranovskiface_28.jpg');
imagevector=Function(I98);
```

```
x98=imagevector

I99 = imread('./FaceAging/20-29male/telloface_22.jpg');
imagevector=Function(I99);
x99=imagevector

I100 = imread('./FaceAging/20-29male/thiagoface_22.jpg');
imagevector=Function(I100);
x100=imagevector

for i=1:100
    str_to_save=sprintf('save x%d.txt -ASCII -DOUBLE x%d;',i,i);
    eval(str_to_save);
end
```

'Main200big' program

```
I101 = imread('./FaceAging/30-39Female/agnes31.jpg');
imagevector=Function(I101);
x101=imagevector

I102 = imread('./FaceAging/30-39Female/alessandra35.jpg');
imagevector=Function(I102);
x102=imagevector

I103 = imread('./FaceAging/30-39Female/Azkarate34.jpg');
imagevector=Function(I103);
x103=imagevector

I104 = imread('./FaceAging/30-39Female/beatriz31.jpg');
imagevector=Function(I104);
x104=imagevector

I105 = imread('./FaceAging/30-39Female/checa31.jpg');
imagevector=Function(I105);
x105=imagevector

I106 = imread('./FaceAging/30-39Female/cobos35.jpg');
imagevector=Function(I106);
x106=imagevector

I107 = imread('./FaceAging/30-39Female/concha32.jpg');
imagevector=Function(I107);
x107=imagevector

I108 = imread('./FaceAging/30-39Female/danilidou31.jpg');
imagevector=Function(I108);
x108=imagevector

I109 = imread('./FaceAging/30-39Female/Drew38.jpg');
imagevector=Function(I109);
x109=imagevector

I110 = imread('./FaceAging/30-39Female/erikaface_30.jpg');
imagevector=Function(I110);
x110=imagevector

I111 = imread('./FaceAging/30-39Female/forcadell31.jpg');
imagevector=Function(I111);
x111=imagevector

I112 = imread('./FaceAging/30-39Female/gema39.jpg');
imagevector=Function(I112);
x112=imagevector

I113 = imread('./FaceAging/30-39Female/heredia34.jpg');
imagevector=Function(I113);
x113=imagevector

I114 = imread('./FaceAging/30-39Female/hernandez33.jpg');
imagevector=Function(I114);
```

```
x114=imagevector

I115 = imread('./FaceAging/30-39Female/Ibarra34.jpg');
imagevector=Function(I115);
x115=imagevector

I116 = imread('./FaceAging/30-39Female/irisfuentes33.jpg');
imagevector=Function(I116);
x116=imagevector

I117 = imread('./FaceAging/30-39Female/isabelcheca31.jpg');
imagevector=Function(I117);
x117=imagevector

I118 = imread('./FaceAging/30-39Female/Jessica32.jpg');
imagevector=Function(I118);
x118=imagevector

I119 = imread('./FaceAging/30-39Female/kops31.jpg');
imagevector=Function(I119);
x119=imagevector

I120 = imread('./FaceAging/30-39Female/lago38.jpg');
imagevector=Function(I120);
x120=imagevector

I121 = imread('./FaceAging/30-39Female/laiaortiz34.jpg');
imagevector=Function(I121);
x121=imagevector

I122 = imread('./FaceAging/30-39Female/lino32.jpg');
imagevector=Function(I122);
x122=imagevector

I123 = imread('./FaceAging/30-39Female/Liv36.jpg');
imagevector=Function(I123);
x123=imagevector

I124 = imread('./FaceAging/30-39Female/Maite30.jpg');
imagevector=Function(I124);
x124=imagevector

I125 = imread('./FaceAging/30-39Female/maribel32.jpg');
imagevector=Function(I125);
x125=imagevector

I126 = imread('./FaceAging/30-39Female/martadominguez38.jpg');
imagevector=Function(I126);
x126=imagevector

I127 = imread('./FaceAging/30-39Female/monton37.jpg');
imagevector=Function(I127);
x127=imagevector

I128 = imread('./FaceAging/30-39Female/morato34.jpg');
imagevector=Function(I128);
```

```
x128=imagevector

I129 = imread('./FaceAging/30-39Female/na31.jpg');
imagevector=Function(I129);
x129=imagevector

I130 = imread('./FaceAging/30-39Female/naroa34.jpg');
imagevector=Function(I130);
x130=imagevector

I131 = imread('./FaceAging/30-39Female/Olabarrieta31.jpg');
imagevector=Function(I131);
x131=imagevector

I132 = imread('./FaceAging/30-39Female/Olivia33.jpg');
imagevector=Function(I132);
x132=imagevector

I133 = imread('./FaceAging/30-39Female/Paz36.jpg');
imagevector=Function(I133);
x133=imagevector

I134 = imread('./FaceAging/30-39Female/Penelope39.jpg');
imagevector=Function(I134);
x134=imagevector

I135 = imread('./FaceAging/30-39Female/pisonero31.jpg');
imagevector=Function(I135);
x135=imagevector

I136 = imread('./FaceAging/30-39Female/quintanal35.jpg');
imagevector=Function(I136);
x136=imagevector

I137 = imread('./FaceAging/30-39Female/rocio39.jpg');
imagevector=Function(I137);
x137=imagevector

I138 = imread('./FaceAging/30-39Female/rodriguez32.jpg');
imagevector=Function(I138);
x138=imagevector

I139 = imread('./FaceAging/30-39Female/seara38.jpg');
imagevector=Function(I139);
x139=imagevector

I140 = imread('./FaceAging/30-39Female/serena32.jpg');
imagevector=Function(I140);
x140=imagevector

I141 = imread('./FaceAging/30-39Female/Shakira36.jpg');
imagevector=Function(I141);
x141=imagevector

I142 = imread('./FaceAging/30-39Female/Silvia34.jpg');
imagevector=Function(I142);
```

```
x142=imagevector

I143= imread('./FaceAging/30-39Female/spears32.jpg');
imagevector=Function(I143);
x143=imagevector

I144 = imread('./FaceAging/30-39Female/surroca39.jpg');
imagevector=Function(I144);
x144=imagevector

I145 = imread('./FaceAging/30-39Female/torres34.jpg');
imagevector=Function(I145);
x145=imagevector

I146 = imread('./FaceAging/30-39Female/Tzibi39.jpg');
imagevector=Function(I146);
x146=imagevector

I147 = imread('./FaceAging/30-39Female/unda36.jpg');
imagevector=Function(I147);
x147=imagevector

I148 = imread('./FaceAging/30-39Female/valdenebro36.jpg');
imagevector=Function(I148);
x148=imagevector

I149 = imread('./FaceAging/30-39Female/vasco38.jpg');
imagevector=Function(I149);
x149=imagevector

I150 = imread('./FaceAging/30-39Female/zakopalova31.jpg');
imagevector=Function(I150);
x150=imagevector

I151 = imread('./FaceAging/30-39Male/abidalface_33.jpg');
imagevector=Function(I151);
x151=imagevector

I152 = imread('./FaceAging/30-39Male/adurizface_32.jpg');
imagevector=Function(I152);
x152=imagevector

I153 = imread('./FaceAging/30-39Male/alberto32.jpg');
imagevector=Function(I153);
x153=imagevector

I154 = imread('./FaceAging/30-39Male/alvesface_32.jpg');
imagevector=Function(I154);
x154=imagevector

I155 = imread('./FaceAging/30-39Male/ansotegui31.jpg');
imagevector=Function(I155);
x155=imagevector

I156 = imread('./FaceAging/30-39Male/aranda33.jpg');
imagevector=Function(I156);
```

```
x156=imagevector

I157 = imread('./FaceAging/30-39Male/ayad32.jpg');
imagevector=Function(I157);
x157=imagevector

I158 = imread('./FaceAging/30-39Male/bermejo35.jpg');
imagevector=Function(I158);
x158=imagevector

I159 = imread('./FaceAging/30-39Male/carrasco35.jpg');
imagevector=Function(I159);
x159=imagevector

I160 = imread('./FaceAging/30-39Male/casado30.jpg');
imagevector=Function(I160);
x160=imagevector

I161 = imread('./FaceAging/30-39Male/castillejo35.jpg');
imagevector=Function(I161);
x161=imagevector

I162 = imread('./FaceAging/30-39Male/cataface_34.jpg');
imagevector=Function(I162);
x162=imagevector

I163 = imread('./FaceAging/30-39Male/coloma32.jpg');
imagevector=Function(I163);
x163=imagevector

I164 = imread('./FaceAging/30-39Male/contador31.jpg');
imagevector=Function(I164);
x164=imagevector

I165 = imread('./FaceAging/30-39Male/Delibasic32.jpg');
imagevector=Function(I165);
x165=imagevector

I166 = imread('./FaceAging/30-39Male/entrerriosface_37.jpg');
imagevector=Function(I166);
x166=imagevector

I167 = imread('./FaceAging/30-39Male/estevez37.jpg');
imagevector=Function(I167);
x167=imagevector

I168 = imread('./FaceAging/30-39Male/frank35.jpg');
imagevector=Function(I168);
x168=imagevector

I169 = imread('./FaceAging/30-39Male/gallego38.jpg');
imagevector=Function(I169);
x169=imagevector

I170 = imread('./FaceAging/30-39Male/gurpeguiface_33.jpg');
imagevector=Function(I170);
```

```
x170=imagevector

I171 = imread('./FaceAging/30-39Male/higuero35.jpg');
imagevector=Function(I171);
x171=imagevector

I172 = imread('./FaceAging/30-39Male/hugo38.jpg');
imagevector=Function(I172);
x172=imagevector

I173 = imread('./FaceAging/30-39Male/ibon37.jpg');
imagevector=Function(I173);
x173=imagevector

I174 = imread('./FaceAging/30-39Male/iñigo31.jpg');
imagevector=Function(I174);
x174=imagevector

I175 = imread('./FaceAging/30-39Male/Iriney32.jpg');
imagevector=Function(I175);
x175=imagevector

I176 = imread('./FaceAging/30-39Male/israel39.jpg');
imagevector=Function(I176);
x176=imagevector

I177 = imread('./FaceAging/30-39Male/jasikeviciusface_37.jpg');
imagevector=Function(I177);
x177=imagevector

I178 = imread('./FaceAging/30-39Male/Jesus37.jpg');
imagevector=Function(I178);
x178=imagevector

I179 = imread('./FaceAging/30-39Male/jon36.jpg');
imagevector=Function(I179);
x179=imagevector

I180 = imread('./FaceAging/30-39Male/joseluis38.jpg');
imagevector=Function(I180);
x180=imagevector

I181 = imread('./FaceAging/30-39Male/juaninface_36.jpg');
imagevector=Function(I181);
x181=imagevector

I182 = imread('./FaceAging/30-39Male/Juanma31.jpg');
imagevector=Function(I182);
x182=imagevector

I183 = imread('./FaceAging/30-39Male/Kiko36.jpg');
imagevector=Function(I183);
x183=imagevector

I184 = imread('./FaceAging/30-39Male/Labaka33.jpg');
imagevector=Function(I184);
```

```
x184=imagevector

I185 = imread('./FaceAging/30-39Male/lejarreta30.jpg');
imagevector=Function(I185);
x185=imagevector

I186 = imread('./FaceAging/30-39Male/lolo39.jpg');
imagevector=Function(I186);
x186=imagevector

I187 = imread('./FaceAging/30-39Male/lucena31.jpg');
imagevector=Function(I187);
x187=imagevector

I188 = imread('./FaceAging/30-39Male/mainz31.jpg');
imagevector=Function(I188);
x188=imagevector

I189 = imread('./FaceAging/30-39Male/marcelinhoface_30.jpg');
imagevector=Function(I189);
x189=imagevector

I190 = imread('./FaceAging/30-39Male/marco39.jpg');
imagevector=Function(I190);
x190=imagevector

I191 = imread('./FaceAging/30-39Male/meliz34.jpg');
imagevector=Function(I191);
x191=imagevector

I192 = imread('./FaceAging/30-39Male/Michel38.jpg');
imagevector=Function(I192);
x192=imagevector

I193 = imread('./FaceAging/30-39Male/Miguel36.jpg');
imagevector=Function(I193);
x193=imagevector

I194 = imread('./FaceAging/30-39Male/munozface_35.jpg');
imagevector=Function(I194);
x194=imagevector

I195 = imread('./FaceAging/30-39Male/navarroface_33.jpg');
imagevector=Function(I195);
x195=imagevector

I196 = imread('./FaceAging/30-39Male/nodesboface_33.jpg');
imagevector=Function(I196);
x196=imagevector

I197 = imread('./FaceAging/30-39Male/olmedo30.jpg');
imagevector=Function(I197);
x197=imagevector

I198 = imread('./FaceAging/30-39Male/ortiz31.jpg');
imagevector=Function(I198);
```

```
x198=imagevector

I199 = imread('./FaceAging/30-39Male/palomeque33.jpg');
imagevector=Function(I199);
x199=imagevector

I200 = imread('./FaceAging/30-39Male/paquillo36.jpg');
imagevector=Function(I200);
x200=imagevector

for i=101:200
    str_to_save=sprintf('save x%d.txt -ASCII -DOUBLE x%d;',i,i);
    eval(str_to_save);
end
```

'Main300big' program

```
I201 = imread('./FaceAging/40-49Female/aitana44.jpg');
imagevector=Function(I201);
x201=imagevector

I202 = imread('./FaceAging/40-49Female/alyssa41.jpg');
imagevector=Function(I202);
x202=imagevector

I203 = imread('./FaceAging/40-49Female/anabelen48.jpg');
imagevector=Function(I203);
x203=imagevector

I204 = imread('./FaceAging/40-49Female/arrimadas42.jpg');
imagevector=Function(I204);
x204=imagevector

I205 = imread('./FaceAging/40-49Female/azon40.jpg');
imagevector=Function(I205);
x205=imagevector

I206 = imread('./FaceAging/40-49Female/azon41.jpg');
imagevector=Function(I206);
x206=imagevector

I207 = imread('./FaceAging/40-49Female/BelenRueda48.jpg');
imagevector=Function(I207);
x207=imagevector

I208 = imread('./FaceAging/40-49Female/Cameron41.jpg');
imagevector=Function(I208);
x208=imagevector

I209 = imread('./FaceAging/40-49Female/Carmen41.jpg');
imagevector=Function(I209);
x209=imagevector

I210 = imread('./FaceAging/40-49Female/castrejana40.jpg');
imagevector=Function(I210);
x210=imagevector

I211 = imread('./FaceAging/40-49Female/Catherine44.jpg');
imagevector=Function(I211);
x211=imagevector

I212 = imread('./FaceAging/40-49Female/centeno42.jpg');
imagevector=Function(I212);
x212=imagevector

I213 = imread('./FaceAging/40-49Female/Christina40.jpg');
imagevector=Function(I213);
x213=imagevector

I214 = imread('./FaceAging/40-49Female/concepcion40.jpg');
imagevector=Function(I214);
```

```
x214=imagevector

I215 = imread('./FaceAging/40-49Female/Courtney49.jpg');
imagevector=Function(I215);
x215=imagevector

I216 = imread('./FaceAging/40-49Female/elvira47.jpg');
imagevector=Function(I216);
x216=imagevector

I217 = imread('./FaceAging/40-49Female/encarna47.jpg');
imagevector=Function(I217);
x217=imagevector

I218 = imread('./FaceAging/40-49Female/Gwyneth40.jpg');
imagevector=Function(I218);
x218=imagevector

I219 = imread('./FaceAging/40-49Female/Halle46.jpg');
imagevector=Function(I219);
x219=imagevector

I220 = imread('./FaceAging/40-49Female/hernanz43.jpg');
imagevector=Function(I220);
x220=imagevector

I221 = imread('./FaceAging/40-49Female/iglesias42.jpg');
imagevector=Function(I221);
x221=imagevector

I222 = imread('./FaceAging/40-49Female/Jennifer44.jpg');
imagevector=Function(I222);
x222=imagevector

I223 = imread('./FaceAging/40-49Female/jorda41.jpg');
imagevector=Function(I223);
x223=imagevector

I224 = imread('./FaceAging/40-49Female/Julia46.jpg');
imagevector=Function(I224);
x224=imagevector

I225 = imread('./FaceAging/40-49Female/kimiko40.jpg');
imagevector=Function(I225);
x225=imagevector

I226 = imread('./FaceAging/40-49Female/lozano42.jpg');
imagevector=Function(I226);
x226=imagevector

I227 = imread('./FaceAging/40-49Female/lucio41.jpg');
imagevector=Function(I227);
x227=imagevector

I228 = imread('./FaceAging/40-49Female/maniega49.jpg');
imagevector=Function(I228);
```

```
x228=imagevector

I229 = imread('./FaceAging/40-49Female/mariajose40.jpg');
imagevector=Function(I229);
x229=imagevector

I230 = imread('./FaceAging/40-49Female/Maribel43.jpg');
imagevector=Function(I230);
x230=imagevector

I231 = imread('./FaceAging/40-49Female/marra47.jpg');
imagevector=Function(I231);
x231=imagevector

I232 = imread('./FaceAging/40-49Female/martin47.jpg');
imagevector=Function(I232);
x232=imagevector

I233 = imread('./FaceAging/40-49Female/mcsanchez45.jpg');
imagevector=Function(I233);
x233=imagevector

I234 = imread('./FaceAging/40-49Female/micheo40.jpg');
imagevector=Function(I234);
x234=imagevector

I235 = imread('./FaceAging/40-49Female/moneo44.jpg');
imagevector=Function(I235);
x235=imagevector

I236 = imread('./FaceAging/40-49Female/Monica49.jpg');
imagevector=Function(I236);
x236=imagevector

I237 = imread('./FaceAging/40-49Female/montserrat40.jpg');
imagevector=Function(I237);
x237=imagevector

I238 = imread('./FaceAging/40-49Female/moraleja42.jpg');
imagevector=Function(I238);
x238=imagevector

I239 = imread('./FaceAging/40-49Female/moreno42.jpg');
imagevector=Function(I239);
x239=imagevector

I240 = imread('./FaceAging/40-49Female/perez49.jpg');
imagevector=Function(I240);
x240=imagevector

I241 = imread('./FaceAging/40-49Female/pueyo43.jpg');
imagevector=Function(I241);
x241=imagevector

I242 = imread('./FaceAging/40-49Female/puyuelo48.jpg');
imagevector=Function(I242);
```

```
x242=imagevector

I243= imread('./FaceAging/40-49Female/romero43.jpg');
imagevector=Function(I243);
x243=imagevector

I244 = imread('./FaceAging/40-49Female/ros44.jpg');
imagevector=Function(I244);
x244=imagevector

I245 = imread('./FaceAging/40-49Female/rosaromero43.jpg');
imagevector=Function(I245);
x245=imagevector

I246 = imread('./FaceAging/40-49Female/ruano40.jpg');
imagevector=Function(I246);
x246=imagevector

I247 = imread('./FaceAging/40-49Female/saenz42.jpg');
imagevector=Function(I247);
x247=imagevector

I248 = imread('./FaceAging/40-49Female/Salma47.jpg');
imagevector=Function(I248);
x248=imagevector

I249 = imread('./FaceAging/40-49Female/Sandra49.jpg');
imagevector=Function(I249);
x249=imagevector

I250 = imread('./FaceAging/40-49Female/sumelzo44.jpg');
imagevector=Function(I250);
x250=imagevector

I251 = imread('./FaceAging/40-49Male/alonso44.jpg');
imagevector=Function(I251);
x251=imagevector

I252 = imread('./FaceAging/40-49Male/amartinez47.jpg');
imagevector=Function(I252);
x252=imagevector

I253 = imread('./FaceAging/40-49Male/anderson46.jpg');
imagevector=Function(I253);
x253=imagevector

I254 = imread('./FaceAging/40-49Male/cañete44.jpg');
imagevector=Function(I254);
x254=imagevector

I255 = imread('./FaceAging/40-49Male/carrillo40.jpg');
imagevector=Function(I255);
x255=imagevector

I256 = imread('./FaceAging/40-49Male/chema42.jpg');
imagevector=Function(I256);
```

```
x256=imagevector

I257 = imread('./FaceAging/40-49Male/cuspinera43.jpg');
imagevector=Function(I257);
x257=imagevector

I258 = imread('./FaceAging/40-49Male/eliseo40.jpg');
imagevector=Function(I258);
x258=imagevector

I259 = imread('./FaceAging/40-49Male/Ewan42.jpg');
imagevector=Function(I259);
x259=imagevector

I260 = imread('./FaceAging/40-49Male/fotis46.jpg');
imagevector=Function(I260);
x260=imagevector

I261 = imread('./FaceAging/40-49Male/gonzalez45.jpg');
imagevector=Function(I261);
x261=imagevector

I262 = imread('./FaceAging/40-49Male/hernando46.jpg');
imagevector=Function(I262);
x262=imagevector

I263 = imread('./FaceAging/40-49Male/julbe41.jpg');
imagevector=Function(I263);
x263=imagevector

I264 = imread('./FaceAging/40-49Male/larburuface_45.jpg');
imagevector=Function(I264);
x264=imagevector

I265 = imread('./FaceAging/40-49Male/laso46.jpg');
imagevector=Function(I265);
x265=imagevector

I266 = imread('./FaceAging/40-49Male/lorenzo43.jpg');
imagevector=Function(I266);
x266=imagevector

I267 = imread('./FaceAging/40-49Male/marquez49.jpg');
imagevector=Function(I267);
x267=imagevector

I268 = imread('./FaceAging/40-49Male/miguel45.jpg');
imagevector=Function(I268);
x268=imagevector

I269 = imread('./FaceAging/40-49Male/moncho44.jpg');
imagevector=Function(I269);
x269=imagevector

I270 = imread('./FaceAging/40-49Male/mora44.jpg');
imagevector=Function(I270);
```

```
x270=imagevector

I271 = imread('./FaceAging/40-49Male/moragas48.jpg');
imagevector=Function(I271);
x271=imagevector

I272 = imread('./FaceAging/40-49Male/moreno47.jpg');
imagevector=Function(I272);
x272=imagevector

I273 = imread('./FaceAging/40-49Male/moscoso47.jpg');
imagevector=Function(I273);
x273=imagevector

I274 = imread('./FaceAging/40-49Male/mulero45.jpg');
imagevector=Function(I274);
x274=imagevector

I275 = imread('./FaceAging/40-49Male/muñoz44.jpg');
imagevector=Function(I275);
x275=imagevector

I276 = imread('./FaceAging/40-49Male/navajasface_45.jpg');
imagevector=Function(I276);
x276=imagevector

I277 = imread('./FaceAging/40-49Male/nuet49.jpg');
imagevector=Function(I277);
x277=imagevector

I278 = imread('./FaceAging/40-49Male/olano43.jpg');
imagevector=Function(I278);
x278=imagevector

I279 = imread('./FaceAging/40-49Male/pacojemez43.jpg');
imagevector=Function(I279);
x279=imagevector

I280 = imread('./FaceAging/40-49Male/palopface_40.jpg');
imagevector=Function(I280);
x280=imagevector

I281 = imread('./FaceAging/40-
49Male/pascualhandballface_45.jpg');
imagevector=Function(I281);
x281=imagevector

I282 = imread('./FaceAging/40-49Male/pedro47.jpg');
imagevector=Function(I282);
x282=imagevector

I283 = imread('./FaceAging/40-49Male/perasovic48.jpg');
imagevector=Function(I283);
x283=imagevector

I284 = imread('./FaceAging/40-49Male/pico43.jpg');
```

```
imagevector=Function(I284);
x284=imagevector

I285 = imread('./FaceAging/40-49Male/pozancoface_43.jpg');
imagevector=Function(I285);
x285=imagevector

I286 = imread('./FaceAging/40-49Male/quintana46.jpg');
imagevector=Function(I286);
x286=imagevector

I287 = imread('./FaceAging/40-49Male/roman48.jpg');
imagevector=Function(I287);
x287=imagevector

I288 = imread('./FaceAging/40-49Male/romero48.jpg');
imagevector=Function(I288);
x288=imagevector

I289 = imread('./FaceAging/40-49Male/ruano49.jpg');
imagevector=Function(I289);
x289=imagevector

I290 = imread('./FaceAging/40-49Male/saez44.jpg');
imagevector=Function(I290);
x290=imagevector

I291 = imread('./FaceAging/40-49Male/salvador47.jpg');
imagevector=Function(I291);
x291=imagevector

I292 = imread('./FaceAging/40-49Male/samaniego47.jpg');
imagevector=Function(I292);
x292=imagevector

I293 = imread('./FaceAging/40-49Male/santiperez41.jpg');
imagevector=Function(I293);
x293=imagevector

I294 = imread('./FaceAging/40-49Male/tabak43.jpg');
imagevector=Function(I294);
x294=imagevector

I295 = imread('./FaceAging/40-49Male/titoface_45.jpg');
imagevector=Function(I295);
x295=imagevector

I296 = imread('./FaceAging/40-49Male/valverdeface_49.jpg');
imagevector=Function(I296);
x296=imagevector

I297 = imread('./FaceAging/40-49Male/vidorreta47.jpg');
imagevector=Function(I297);
x297=imagevector

I298 = imread('./FaceAging/40-49Male/Will45.jpg');
```

```
imagevector=Function(I298);
x298=imagevector

I299 = imread('./FaceAging/40-49Male/yañez40.jpg');
imagevector=Function(I299);
x299=imagevector

I300 = imread('./FaceAging/40-49Male/zorzano40.jpg');
imagevector=Function(I300);
x300=imagevector

for i=201:300
    str_to_save=sprintf('save x%d.txt -ASCII -DOUBLE x%d;',i,i);
    eval(str_to_save);
end
```

'Main400big' program

```
I301 = imread('./FaceAging/50-59Female/aguilar56.jpg');
imagevector=Function(I301);
x301=imagevector

I302 = imread('./FaceAging/50-59Female/ahuja50.jpg');
imagevector=Function(I302);
x302=imagevector

I303 = imread('./FaceAging/50-59Female/alvarez52.jpg');
imagevector=Function(I303);
x303=imagevector

I304 = imread('./FaceAging/50-59Female/amoros50.jpg');
imagevector=Function(I304);
x304=imagevector

I305 = imread('./FaceAging/50-59Female/andie55.jpg');
imagevector=Function(I305);
x305=imagevector

I306 = imread('./FaceAging/50-59Female/anne50.jpg');
imagevector=Function(I306);
x306=imagevector

I307 = imread('./FaceAging/50-59Female/ariztegui51.jpg');
imagevector=Function(I307);
x307=imagevector

I308 = imread('./FaceAging/50-59Female/asian58.jpg');
imagevector=Function(I308);
x308=imagevector

I309 = imread('./FaceAging/50-59Female/barea55.jpg');
imagevector=Function(I309);
x309=imagevector

I310 = imread('./FaceAging/50-59Female/barreiro58.jpg');
imagevector=Function(I310);
x310=imagevector

I311 = imread('./FaceAging/50-59Female/blasco50.jpg');
imagevector=Function(I311);
x311=imagevector

I312 = imread('./FaceAging/50-59Female/bravo59.jpg');
imagevector=Function(I312);
x312=imagevector

I313 = imread('./FaceAging/50-59Female/capella50.jpg');
imagevector=Function(I313);
x313=imagevector

I314 = imread('./FaceAging/50-59Female/cobaleda51.jpg');
```

```
imagevector=Function(I314);
x314=imagevector

I315 = imread('./FaceAging/50-59Female/davila59.jpg');
imagevector=Function(I315);
x315=imagevector

I316 = imread('./FaceAging/50-59Female/Demi51.jpg');
imagevector=Function(I316);
x316=imagevector

I317 = imread('./FaceAging/50-59Female/dolors55.jpg');
imagevector=Function(I317);
x317=imagevector

I318 = imread('./FaceAging/50-59Female/duran59.jpg');
imagevector=Function(I318);
x318=imagevector

I319 = imread('./FaceAging/50-59Female/figueres51.jpg');
imagevector=Function(I319);
x319=imagevector

I320 = imread('./FaceAging/50-59Female/gallego50.jpg');
imagevector=Function(I320);
x320=imagevector

I321 = imread('./FaceAging/50-59Female/garrido53.jpg');
imagevector=Function(I321);
x321=imagevector

I322 = imread('./FaceAging/50-59Female/grande55.jpg');
imagevector=Function(I322);
x322=imagevector

I323 = imread('./FaceAging/50-59Female/herrera51.jpg');
imagevector=Function(I323);
x323=imagevector

I324 = imread('./FaceAging/50-59Female/juste55.jpg');
imagevector=Function(I324);
x324=imagevector

I325 = imread('./FaceAging/50-59Female/kim52.jpg');
imagevector=Function(I325);
x325=imagevector

I326 = imread('./FaceAging/50-59Female/madrazo52.jpg');
imagevector=Function(I326);
x326=imagevector

I327 = imread('./FaceAging/50-59Female/marcos51.jpg');
imagevector=Function(I327);
x327=imagevector

I328 = imread('./FaceAging/50-59Female/martin53.jpg');
```

```
imagevector=Function(I328);
x328=imagevector

I329 = imread('./FaceAging/50-59Female/mary56.jpg');
imagevector=Function(I329);
x329=imagevector

I330 = imread('./FaceAging/50-59Female/mato54.jpg');
imagevector=Function(I330);
x330=imagevector

I331 = imread('./FaceAging/50-59Female/meius50.jpg');
imagevector=Function(I331);
x331=imagevector

I332 = imread('./FaceAging/50-59Female/Melanie55.jpg');
imagevector=Function(I332);
x332=imagevector

I333 = imread('./FaceAging/50-59Female/mendez56.jpg');
imagevector=Function(I333);
x333=imagevector

I334 = imread('./FaceAging/50-59Female/merceroca55.jpg');
imagevector=Function(I334);
x334=imagevector

I335 = imread('./FaceAging/50-59Female/michelle51.jpg');
imagevector=Function(I335);
x335=imagevector

I336 = imread('./FaceAging/50-59Female/miguelez50.jpg');
imagevector=Function(I336);
x336=imagevector

I337 = imread('./FaceAging/50-59Female/Miriam51.jpg');
imagevector=Function(I337);
x337=imagevector

I338 = imread('./FaceAging/50-59Female/montesinos52.jpg');
imagevector=Function(I338);
x338=imagevector

I339 = imread('./FaceAging/50-59Female/montesterin54.jpg');
imagevector=Function(I339);
x339=imagevector

I340 = imread('./FaceAging/50-59Female/moro52.jpg');
imagevector=Function(I340);
x340=imagevector

I341 = imread('./FaceAging/50-59Female/moya54.jpg');
imagevector=Function(I341);
x341=imagevector

I342 = imread('./FaceAging/50-59Female/navarro53.jpg');
```

```
imagevector=Function(I342);
x342=imagevector

I343= imread('./FaceAging/50-59Female/santin57.jpg');
imagevector=Function(I343);
x343=imagevector

I344 = imread('./FaceAging/50-59Female/Sharon55.jpg');
imagevector=Function(I344);
x344=imagevector

I345 = imread('./FaceAging/50-59Female/trinidad51.jpg');
imagevector=Function(I345);
x345=imagevector

I346 = imread('./FaceAging/50-59Female/trujillo53.jpg');
imagevector=Function(I346);
x346=imagevector

I347 = imread('./FaceAging/50-59Female/unzalu56.jpg');
imagevector=Function(I347);
x347=imagevector

I348 = imread('./FaceAging/50-59Female/valcarce57.jpg');
imagevector=Function(I348);
x348=imagevector

I349 = imread('./FaceAging/50-59Female/valenciano53.jpg');
imagevector=Function(I349);
x349=imagevector

I350 = imread('./FaceAging/50-59Female/villagrasa56.jpg');
imagevector=Function(I350);
x350=imagevector

I351 = imread('./FaceAging/50-59Male/abad57.jpg');
imagevector=Function(I351);
x351=imagevector

I352 = imread('./FaceAging/50-59Male/abalos54.jpg');
imagevector=Function(I352);
x352=imagevector

I353 = imread('./FaceAging/50-59Male/aguilar52.jpg');
imagevector=Function(I353);
x353=imagevector

I354 = imread('./FaceAging/50-59Male/aragones57.jpg');
imagevector=Function(I354);
x354=imagevector

I355 = imread('./FaceAging/50-59Male/araujo56.jpg');
imagevector=Function(I355);
x355=imagevector

I356 = imread('./FaceAging/50-59Male/artur57.jpg');
```

```
imagevector=Function(I356);
x356=imagevector

I357 = imread('./FaceAging/50-59Male/aspiazuface.jpg');
imagevector=Function(I357);
x357=imagevector

I358 = imread('./FaceAging/50-59Male/astarloa58.jpg');
imagevector=Function(I358);
x358=imagevector

I359 = imread('./FaceAging/50-59Male/badera56.jpg');
imagevector=Function(I359);
x359=imagevector

I360 = imread('./FaceAging/50-59Male/baldovi55.jpg');
imagevector=Function(I360);
x360=imagevector

I361 = imread('./FaceAging/50-59Male/barreda53.jpg');
imagevector=Function(I361);
x361=imagevector

I362 = imread('./FaceAging/50-59Male/beneyto57.jpg');
imagevector=Function(I362);
x362=imagevector

I363 = imread('./FaceAging/50-59Male/bermudez54.jpg');
imagevector=Function(I363);
x363=imagevector

I364 = imread('./FaceAging/50-59Male/bertomeu59.jpg');
imagevector=Function(I364);
x364=imagevector

I365 = imread('./FaceAging/50-59Male/bielsaface_58.jpg');
imagevector=Function(I365);
x365=imagevector

I366 = imread('./FaceAging/50-59Male/blanco51.jpg');
imagevector=Function(I366);
x366=imagevector

I367 = imread('./FaceAging/50-59Male/blatt54.jpg');
imagevector=Function(I367);
x367=imagevector

I368 = imread('./FaceAging/50-59Male/caamaño50.jpg');
imagevector=Function(I368);
x368=imagevector

I369 = imread('./FaceAging/50-59Male/cabrera55.jpg');
imagevector=Function(I369);
x369=imagevector

I370 = imread('./FaceAging/50-59Male/caicedo55.jpg');
```

```
imagevector=Function(I370);
x370=imagevector

I371 = imread('./FaceAging/50-59Male/caldera56.jpg');
imagevector=Function(I371);
x371=imagevector

I372 = imread('./FaceAging/50-59Male/camps50.jpg');
imagevector=Function(I372);
x372=imagevector

I373 = imread('./FaceAging/50-59Male/centella55.jpg');
imagevector=Function(I373);
x373=imagevector

I374 = imread('./FaceAging/50-59Male/Clooney52.jpg');
imagevector=Function(I374);
x374=imagevector

I375 = imread('./FaceAging/50-59Male/collet50.jpg');
imagevector=Function(I375);
x375=imagevector

I376 = imread('./FaceAging/50-59Male/cousillasface.jpg');
imagevector=Function(I376);
x376=imagevector

I377 = imread('./FaceAging/50-59Male/Denzel59.jpg');
imagevector=Function(I377);
x377=imagevector

I378 = imread('./FaceAging/50-59Male/elorriaga51.jpg');
imagevector=Function(I378);
x378=imagevector

I379 = imread('./FaceAging/50-59Male/elorza58.jpg');
imagevector=Function(I379);
x379=imagevector

I380 = imread('./FaceAging/50-59Male/esteban51.jpg');
imagevector=Function(I380);
x380=imagevector

I381 = imread('./FaceAging/50-59Male/fajarnes57.jpg');
imagevector=Function(I381);
x381=imagevector

I382 = imread('./FaceAging/50-59Male/ferrer54.jpg');
imagevector=Function(I382);
x382=imagevector

I383 = imread('./FaceAging/50-59Male/fidalgo57.jpg');
imagevector=Function(I383);
x383=imagevector

I384 = imread('./FaceAging/50-59Male/flores57.jpg');
```

```
imagevector=Function(I384);
x384=imagevector

I385 = imread('./FaceAging/50-59Male/francisco50.jpg');
imagevector=Function(I385);
x385=imagevector

I386 = imread('./FaceAging/50-59Male/franquis52.jpg');
imagevector=Function(I386);
x386=imagevector

I387 = imread('./FaceAging/50-59Male/garcia59.jpg');
imagevector=Function(I387);
x387=imagevector

I388 = imread('./FaceAging/50-59Male/GaryOldman55.jpg');
imagevector=Function(I388);
x388=imagevector

I389 = imread('./FaceAging/50-59Male/gil56.jpg');
imagevector=Function(I389);
x389=imagevector

I390 = imread('./FaceAging/50-59Male/gomez51.jpg');
imagevector=Function(I390);
x390=imagevector

I391 = imread('./FaceAging/50-59Male/gordo54.jpg');
imagevector=Function(I391);
x391=imagevector

I392 = imread('./FaceAging/50-59Male/grau54.jpg');
imagevector=Function(I392);
x392=imagevector

I393 = imread('./FaceAging/50-59Male/jordi56.jpg');
imagevector=Function(I393);
x393=imagevector

I394 = imread('./FaceAging/50-59Male/josep58.jpg');
imagevector=Function(I394);
x394=imagevector

I395 = imread('./FaceAging/50-59Male/josu53.jpg');
imagevector=Function(I395);
x395=imagevector

I396 = imread('./FaceAging/50-59Male/losada58.jpg');
imagevector=Function(I396);
x396=imagevector

I397 = imread('./FaceAging/50-59Male/maldonado54.jpg');
imagevector=Function(I397);
x397=imagevector

I398 = imread('./FaceAging/50-59Male/messina54.jpg');
```

```
imagevector=Function(I398);
x398=imagevector

I399 = imread('./FaceAging/50-59Male/obradovic53.jpg');
imagevector=Function(I399);
x399=imagevector

I400 = imread('./FaceAging/50-59Male/ochotorena.jpg');
imagevector=Function(I400);
x400=imagevector

for i=301:400
    str_to_save=sprintf('save x%d.txt -ASCII -DOUBLE x%d;',i,i);
    eval(str_to_save);
end
```

'Main500big' program

```
I401 = imread('./FaceAging/60-Female/abuela_100.jpg');
imagevector=Function(I401);
x401=imagevector

I402 = imread('./FaceAging/60-Female/agueda_106.jpg');
imagevector=Function(I402);
x402=imagevector

I403 = imread('./FaceAging/60-Female/alvarez65.jpg');
imagevector=Function(I403);
x403=imagevector

I404 = imread('./FaceAging/60-Female/ayuso71.jpg');
imagevector=Function(I404);
x404=imagevector

I405 = imread('./FaceAging/60-Female/beatriz_75.jpg');
imagevector=Function(I405);
x405=imagevector

I406 = imread('./FaceAging/60-Female/beatriz69.jpg');
imagevector=Function(I406);
x406=imagevector

I407 = imread('./FaceAging/60-Female/blanco61.jpg');
imagevector=Function(I407);
x407=imagevector

I408 = imread('./FaceAging/60-Female/bolarin63.jpg');
imagevector=Function(I408);
x408=imagevector

I409 = imread('./FaceAging/60-Female/carcedo60.jpg');
imagevector=Function(I409);
x409=imagevector

I410 = imread('./FaceAging/60-Female/celinda67.jpg');
imagevector=Function(I410);
x410=imagevector

I411 = imread('./FaceAging/60-Female/chamosa60.jpg');
imagevector=Function(I411);
x411=imagevector

I412 = imread('./FaceAging/60-Female/Chaplin_69.jpg');
imagevector=Function(I412);
x412=imagevector

I413 = imread('./FaceAging/60-Female/cortines74.jpg');
imagevector=Function(I413);
x413=imagevector

I414 = imread('./FaceAging/60-Female/costa68.jpg');
```

```
imagevector=Function(I414);
x414=imagevector

I415 = imread('./FaceAging/60-Female/cullere66.jpg');
imagevector=Function(I415);
x415=imagevector

I416 = imread('./FaceAging/60-Female/cunillera62.jpg');
imagevector=Function(I416);
x416=imagevector

I417 = imread('./FaceAging/60-Female/cutchet66.jpg');
imagevector=Function(I417);
x417=imagevector

I418 = imread('./FaceAging/60-Female/delcastillo61.jpg');
imagevector=Function(I418);
x418=imagevector

I419 = imread('./FaceAging/60-Female/Dench_79.jpg');
imagevector=Function(I419);
x419=imagevector

I420 = imread('./FaceAging/60-Female/diez61.jpg');
imagevector=Function(I420);
x420=imagevector

I421 = imread('./FaceAging/60-Female/escrita62.jpg');
imagevector=Function(I421);
x421=imagevector

I422 = imread('./FaceAging/60-Female/esteve62.jpg');
imagevector=Function(I422);
x422=imagevector

I423 = imread('./FaceAging/60-Female/flores70.jpg');
imagevector=Function(I423);
x423=imagevector

I424 = imread('./FaceAging/60-Female/fraga65.jpg');
imagevector=Function(I424);
x424=imagevector

I425 = imread('./FaceAging/60-Female/garcia67.jpg');
imagevector=Function(I425);
x425=imagevector

I426 = imread('./FaceAging/60-Female/gispert64.jpg');
imagevector=Function(I426);
x426=imagevector

I427 = imread('./FaceAging/60-Female/gonzalez60.jpg');
imagevector=Function(I427);
x427=imagevector

I428 = imread('./FaceAging/60-Female/hillary_65.jpg');
```

```
imagevector=Function(I428);
x428=imagevector

I429 = imread('./FaceAging/60-Female/irigoyen61.jpg');
imagevector=Function(I429);
x429=imagevector

I430 = imread('./FaceAging/60-Female/isabel_86.jpg');
imagevector=Function(I430);
x430=imagevector

I431 = imread('./FaceAging/60-Female/karmele_67.jpg');
imagevector=Function(I431);
x431=imagevector

I432 = imread('./FaceAging/60-Female/lara69.jpg');
imagevector=Function(I432);
x432=imagevector

I433 = imread('./FaceAging/60-Female/lope61.jpg');
imagevector=Function(I433);
x433=imagevector

I434 = imread('./FaceAging/60-Female/Maggie_79.jpg');
imagevector=Function(I434);
x434=imagevector

I435 = imread('./FaceAging/60-Female/margarita_73.jpg');
imagevector=Function(I435);
x435=imagevector

I436 = imread('./FaceAging/60-Female/maria_71.jpg');
imagevector=Function(I436);
x436=imagevector

I437 = imread('./FaceAging/60-Female/marietta62.jpg');
imagevector=Function(I437);
x437=imagevector

I438 = imread('./FaceAging/60-Female/martinez65.jpg');
imagevector=Function(I438);
x438=imagevector

I439 = imread('./FaceAging/60-Female/pepa_70.jpg');
imagevector=Function(I439);
x439=imagevector

I440 = imread('./FaceAging/60-Female/pozuelo61.jpg');
imagevector=Function(I440);
x440=imagevector

I441 = imread('./FaceAging/60-Female/riera63.jpg');
imagevector=Function(I441);
x441=imagevector

I442 = imread('./FaceAging/60-Female/romero67.jpg');
```

```
imagevector=Function(I442);
x442=imagevector

I443= imread('./FaceAging/60-Female/salgado64.jpg');
imagevector=Function(I443);
x443=imagevector

I444 = imread('./FaceAging/60-Female/sofia_74.jpg');
imagevector=Function(I444);
x444=imagevector

I445 = imread('./FaceAging/60-Female/sonia_74.jpg');
imagevector=Function(I445);
x445=imagevector

I446 = imread('./FaceAging/60-Female/suarez68.jpg');
imagevector=Function(I446);
x446=imagevector

I447 = imread('./FaceAging/60-Female/susan_66.jpg');
imagevector=Function(I447);
x447=imagevector

I448 = imread('./FaceAging/60-Female/tarruella64.jpg');
imagevector=Function(I448);
x448=imagevector

I449 = imread('./FaceAging/60-Female/tina_72.jpg');
imagevector=Function(I449);
x449=imagevector

I450 = imread('./FaceAging/60-Female/villalobos64.jpg');
imagevector=Function(I450);
x450=imagevector

I451 = imread('./FaceAging/60-Male/aito67.jpg');
imagevector=Function(I451);
x451=imagevector

I452 = imread('./FaceAging/60-Male/albendea76.jpg');
imagevector=Function(I452);
x452=imagevector

I453 = imread('./FaceAging/60-Male/alonso62.jpg');
imagevector=Function(I453);
x453=imagevector

I454 = imread('./FaceAging/60-Male/alvarez68.jpg');
imagevector=Function(I454);
x454=imagevector

I455 = imread('./FaceAging/60-Male/antonio69.jpg');
imagevector=Function(I455);
x455=imagevector

I456 = imread('./FaceAging/60-Male/arias63.jpg');
```

```
imagevector=Function(I456);
x456=imagevector

I457 = imread('./FaceAging/60-Male/aurelio66.jpg');
imagevector=Function(I457);
x457=imagevector

I458 = imread('./FaceAging/60-Male/banegas65.jpg');
imagevector=Function(I458);
x458=imagevector

I459 = imread('./FaceAging/60-Male/barreda60.jpg');
imagevector=Function(I459);
x459=imagevector

I460 = imread('./FaceAging/60-Male/barrero64.jpg');
imagevector=Function(I460);
x460=imagevector

I461 = imread('./FaceAging/60-Male/bush_66.jpg');
imagevector=Function(I461);
x461=imagevector

I462 = imread('./FaceAging/60-Male/cain_80.jpg');
imagevector=Function(I462);
x462=imagevector

I463 = imread('./FaceAging/60-Male/cayo61.jpg');
imagevector=Function(I463);
x463=imagevector

I464 = imread('./FaceAging/60-Male/chaves68.jpg');
imagevector=Function(I464);
x464=imagevector

I465 = imread('./FaceAging/60-Male/cisar67.jpg');
imagevector=Function(I465);
x465=imagevector

I466 = imread('./FaceAging/60-Male/cortizo_62.jpg');
imagevector=Function(I466);
x466=imagevector

I467 = imread('./FaceAging/60-Male/diaz63.jpg');
imagevector=Function(I467);
x467=imagevector

I468 = imread('./FaceAging/60-Male/duran61.jpg');
imagevector=Function(I468);
x468=imagevector

I469 = imread('./FaceAging/60-Male/duvall_82.jpg');
imagevector=Function(I469);
x469=imagevector

I470 = imread('./FaceAging/60-Male/erias61.jpg');
```

```
imagevector=Function(I470);
x470=imagevector

I471 = imread('./FaceAging/60-Male/fabio_66.jpg');
imagevector=Function(I471);
x471=imagevector

I472 = imread('./FaceAging/60-Male/fidel_78.jpg');
imagevector=Function(I472);
x472=imagevector

I473 = imread('./FaceAging/60-Male/gabino64.jpg');
imagevector=Function(I473);
x473=imagevector

I474 = imread('./FaceAging/60-Male/gasulla66.jpg');
imagevector=Function(I474);
x474=imagevector

I475 = imread('./FaceAging/60-Male/hiddink_66.jpg');
imagevector=Function(I475);
x475=imagevector

I476 = imread('./FaceAging/60-Male/isi60.jpg');
imagevector=Function(I476);
x476=imagevector

I477 = imread('./FaceAging/60-Male/jauregui65.jpg');
imagevector=Function(I477);
x477=imagevector

I478 = imread('./FaceAging/60-Male/Jeremy65.jpg');
imagevector=Function(I478);
x478=imagevector

I479 = imread('./FaceAging/60-Male/John60.jpg');
imagevector=Function(I479);
x479=imagevector

I480 = imread('./FaceAging/60-Male/lanzuela65.jpg');
imagevector=Function(I480);
x480=imagevector

I481 = imread('./FaceAging/60-Male/Lee_90.jpg');
imagevector=Function(I481);
x481=imagevector

I482 = imread('./FaceAging/60-Male/llamas60.jpg');
imagevector=Function(I482);
x482=imagevector

I483 = imread('./FaceAging/60-Male/llibre64.jpg');
imagevector=Function(I483);
x483=imagevector

I484 = imread('./FaceAging/60-Male/llorens70.jpg');
```

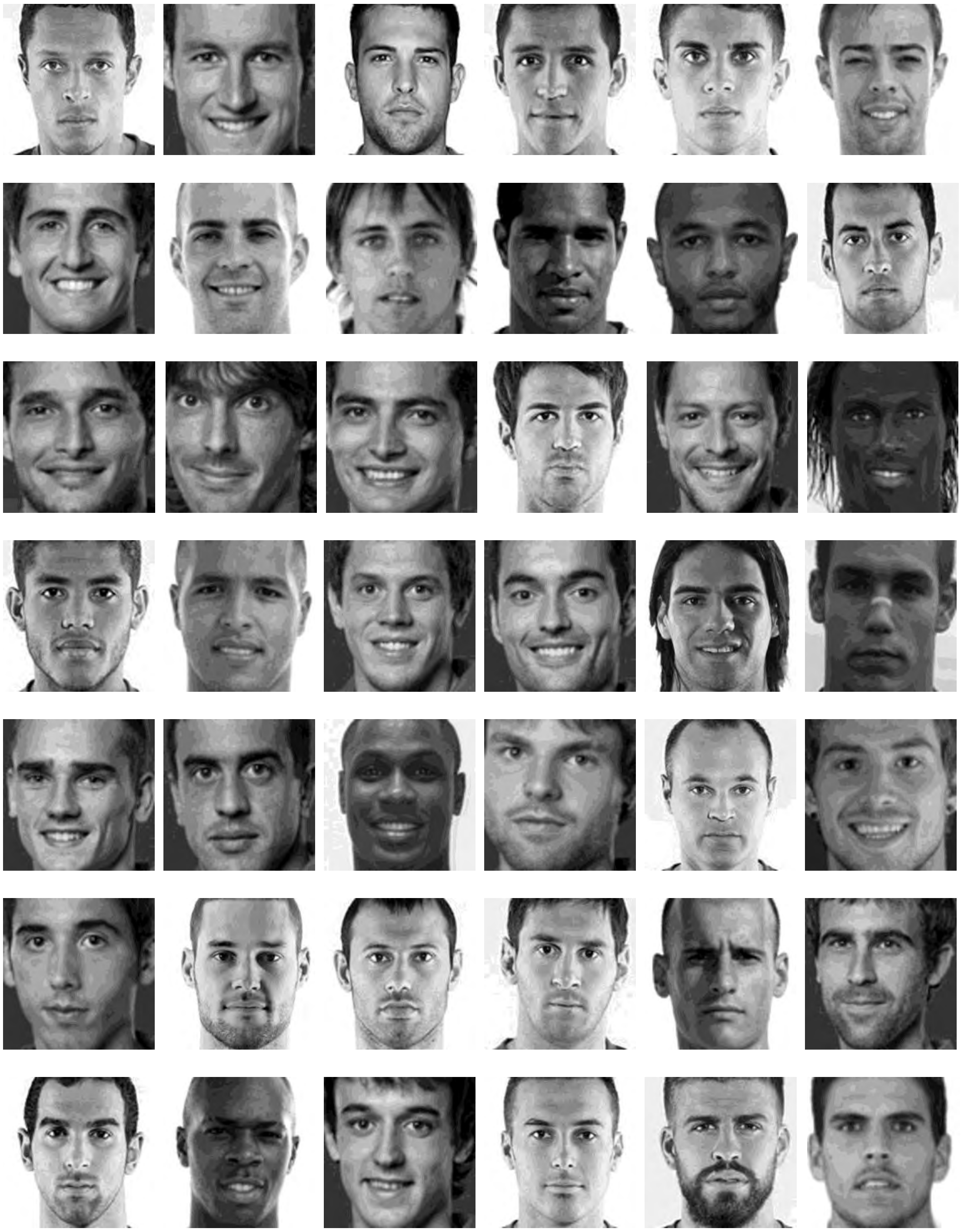
```
imagevector=Function(I484);
x484=imagevector

I485 = imread('./FaceAging/60-Male/lopez66.jpg');
imagevector=Function(I485);
x485=imagevector

I486 = imread('./FaceAging/60-Male/McKellen_74.jpg');
imagevector=Function(I486);
x486=imagevector

I487 = imread('./FaceAging/60-Male/migo66.jpg');
imagevector=Function(I487);
x487=imagevector

I488 = imread('./FaceAging/60-Male/molinero60.jpg');
imagevector=Function(I488);
x488=imagevector

I489 = imread('./FaceAging/60-Male/montoro63.jpg');
imagevector=Function(I489);
x489=imagevector

I490 = imread('./FaceAging/60-Male/morlan66.jpg');
imagevector=Function(I490);
x490=imagevector

I491 = imread('./FaceAging/60-Male/nasarre67.jpg');
imagevector=Function(I491);
x491=imagevector

I492 = imread('./FaceAging/60-Male/ovidio61.jpg');
imagevector=Function(I492);
x492=imagevector

I493 = imread('./FaceAging/60-Male/pacheco62.jpg');
imagevector=Function(I493);
x493=imagevector

I494 = imread('./FaceAging/60-Male/paramo64.jpg');
imagevector=Function(I494);
x494=imagevector

I495 = imread('./FaceAging/60-Male/pellegriniface_60.jpg');
imagevector=Function(I495);
x495=imagevector

I496 = imread('./FaceAging/60-Male/perez63.jpg');
imagevector=Function(I496);
x496=imagevector

I497 = imread('./FaceAging/60-Male/perez65.jpg');
imagevector=Function(I497);
x497=imagevector

I498 = imread('./FaceAging/60-Male/pesic64.jpg');
```

```
imagevector=Function(I498);
x498=imagevector

I499 = imread('./FaceAging/60-Male/pezzi66.jpg');
imagevector=Function(I499);
x499=imagevector

I500 = imread('./FaceAging/60-Male/rangel63.jpg');
imagevector=Function(I500);
x500=imagevector

for i=401:500
    str_to_save=sprintf('save x%d.txt -ASCII -DOUBLE x%d;',i,i);
    eval(str_to_save);
end
```

Annex 3

Big Database

FIGURE 1.- *Big Database: women between 20-30 years old*



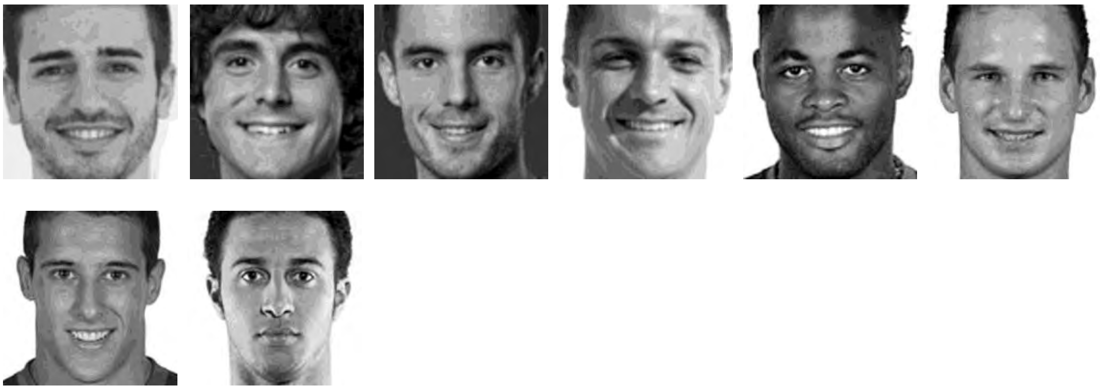


FIGURE 2.- *Big Database: men between 20-30 years old*

FIGURE 3.- *Big Database: women between 30-40 years old*

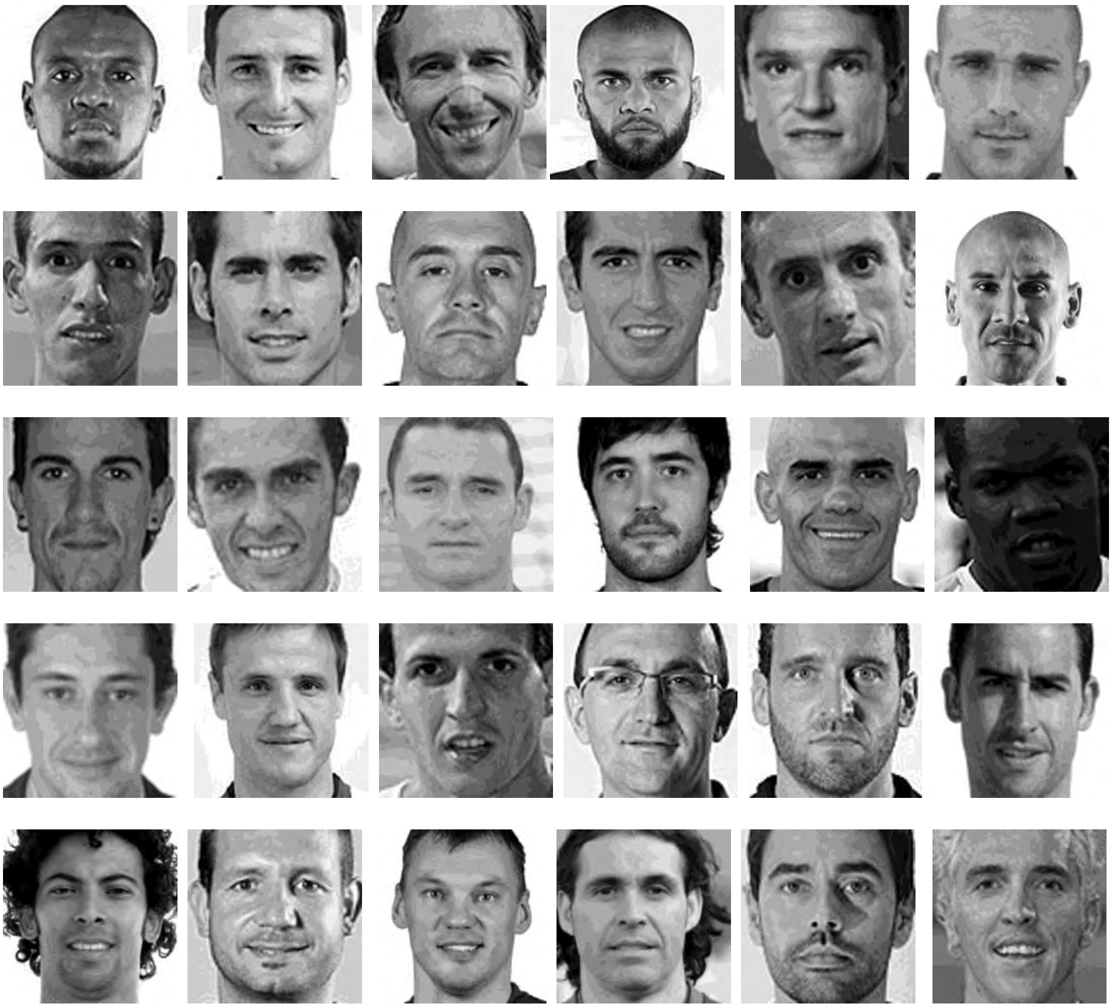


FIGURE 4.- *Big Database: men between 30-40 years old*

FIGURE 5.- *Big Database: women between 40-50 years old*

FIGURE 6.- *Big Database: men between 40-50 years old*

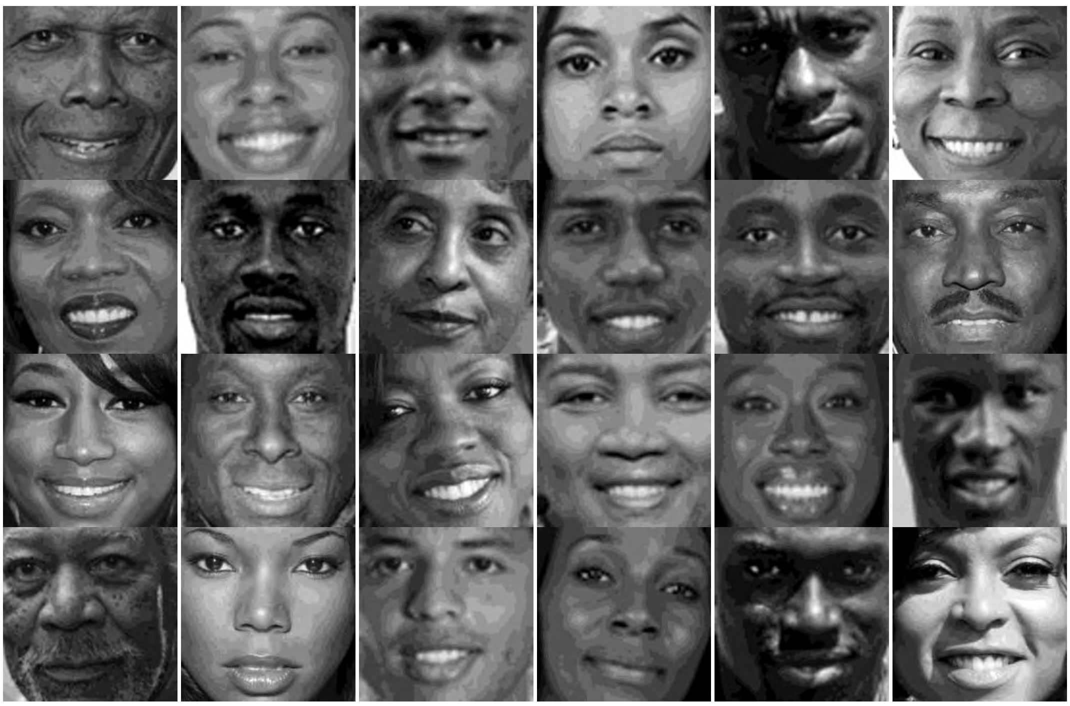
FIGURE 7.- *Big Database: women between 50-60 years old*

FIGURE 8.- *Big Database: men between 50-60 years old*

FIGURE 9.- *Big Database: more than 60 years old women*

FIGURE 10.- *Big Database: more than 60 years old men*

Black database



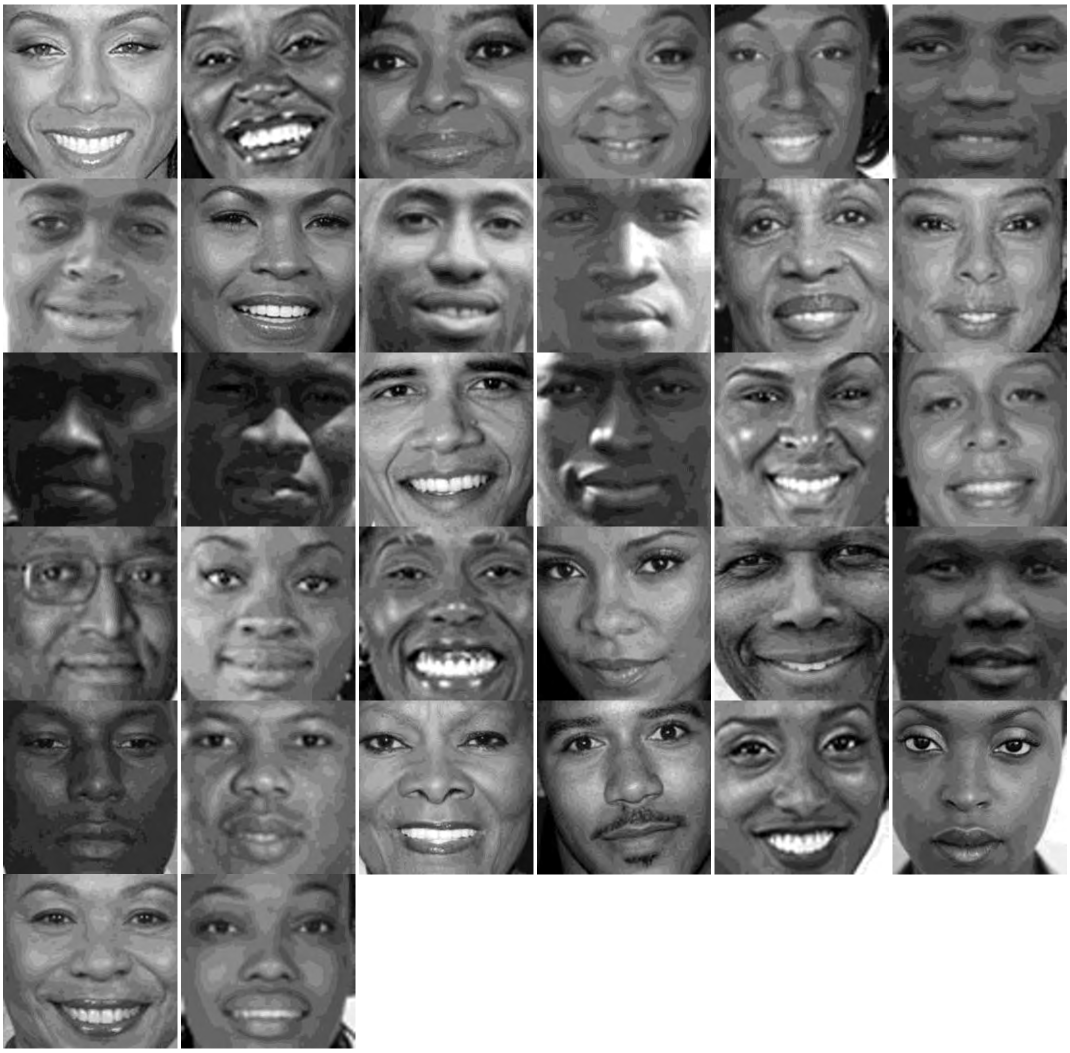
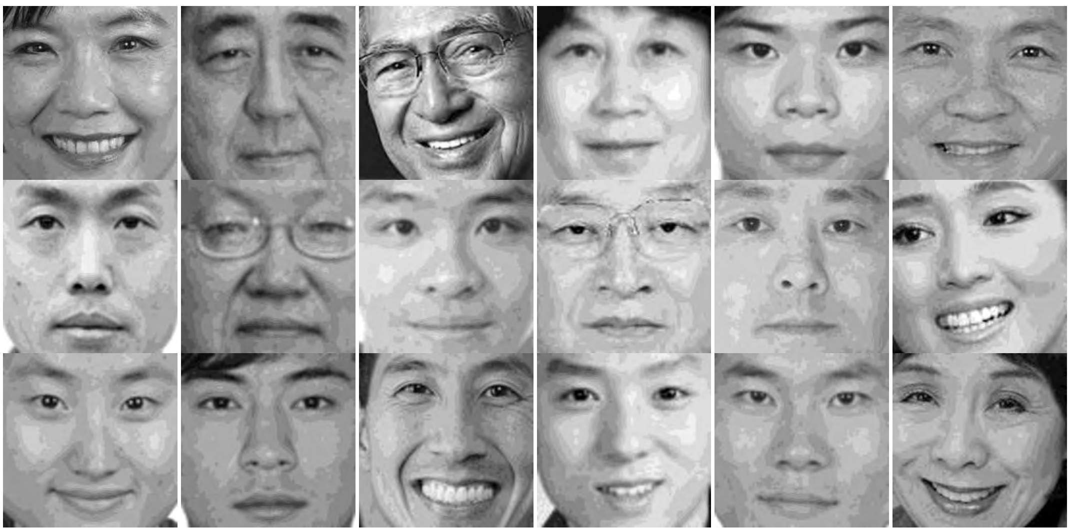


FIGURE 11.- *Black database*

White database

***FIGURE 12.-** White database*

Asian database



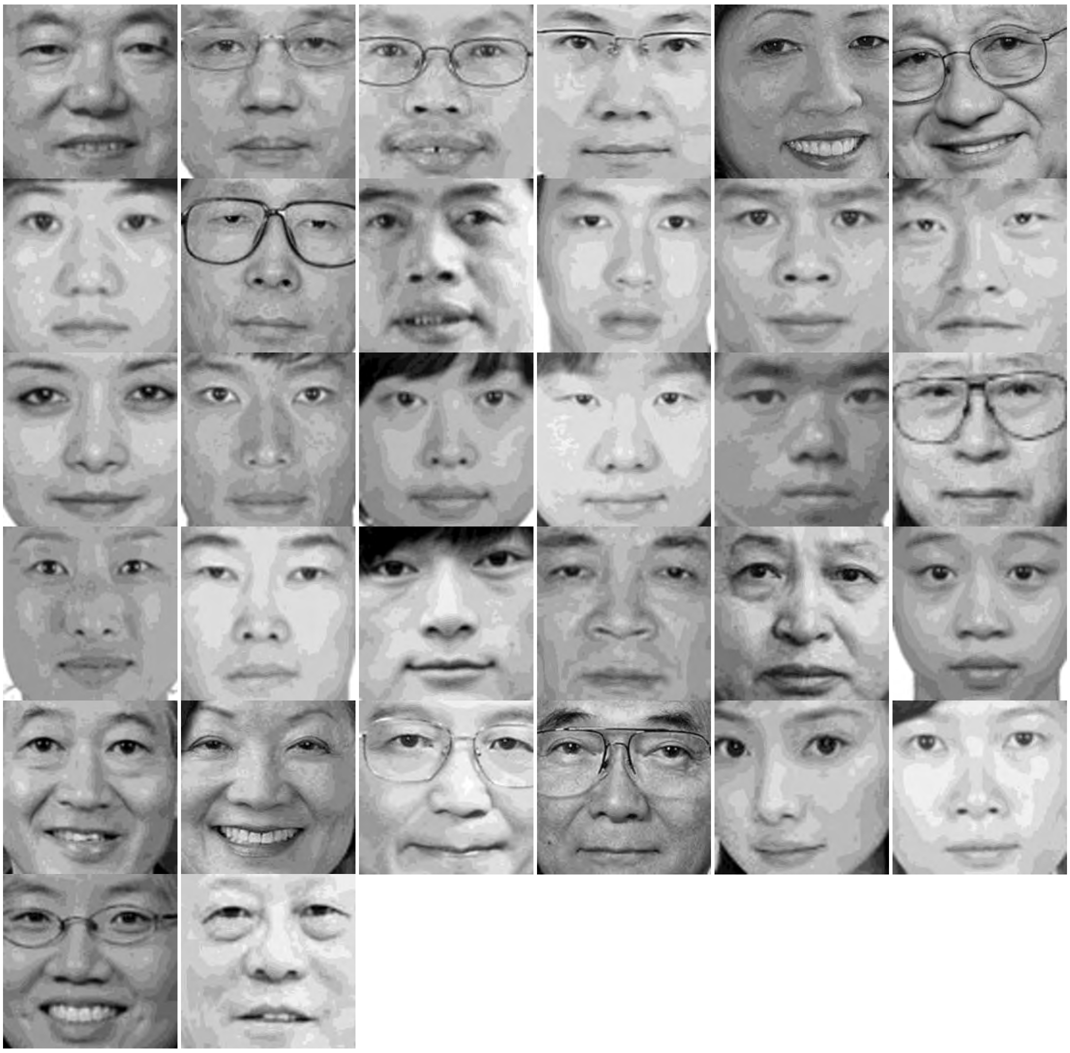


FIGURE 13.- *Asian database*

Annex 4

Black and White classification

After observed that the programs which classify in two groups (man or woman, more or less 30, more or less 40 and some more) offer a suitable results, a study of the human race has been done, hoping satisfactory results, because both groups have a quite differentiated characteristics.

FIGURE 14.- *Black and White men comparison*

To classify the images depending on their race, the used program will be the 256 features with cropped images. This choice is because this program is the best classifying between men or women and it is the more similar classification to a race classification.

Races database

To the study of classifying people according to their race, a new database is done. This contains a 50 white persons (everyone belonging to the big database) and 50 black people (few images belonging to the big database). Then another test database is created with 25 images for each group, with the aim to test the programs and analyze the obtained results.

Results

	Right	Wrong	Success rate (%)
256 crop 5 features	39	11	78,0
256 crop 10features	40	10	80,0
256 crop 20features	**44**	**6**	**88,0**

TABLE 94.- *Accuracy of Black and White program*

The obtained results for the same program change depending on the number of used features. With more features used, better results are obtained. The best success ratio is achieved using 20 features and it has an accuracy of 88%.

Chi square analyze

Races	
chi index	chi result
22	1,6000
21	2,2600
11	2,6000
20	2,7200
10	3,0600
12	3,0600
23	3,0600
13	4,1600
24	4,8200
14	4,8800
9	5,3000
6	6,4000
4	7,4000
5	7,4000
19	7,5400
117	8,0000
177	8,1000
25	8,1800
169	8,2000
8	8,3200

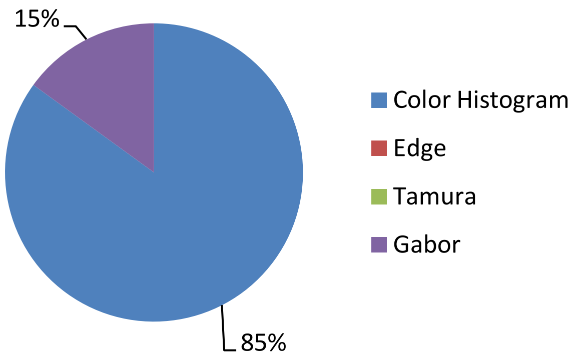


TABLE 95.- *a) Chi Square analysis Black and White program b) Graphic of Used Features*

The 22 index feature is which offers the best result. In this, the chi square value is the lowest, just 1,6, and it is the best result achieved for all the programs. The explanation of this fact is because classify between black and white people is simple and the program can have a high trustworthiness. Also, it is logical that for the 20 best indexes, 17 belong to the colour histogram, because the simplest way to classify these two groups is focusing in the image colour.

From all the 20 first features, 17 belong (85%) to the colour histogram and the 3 remaining, belong to the gabor filter. The edge and the tamura are not used in this program.

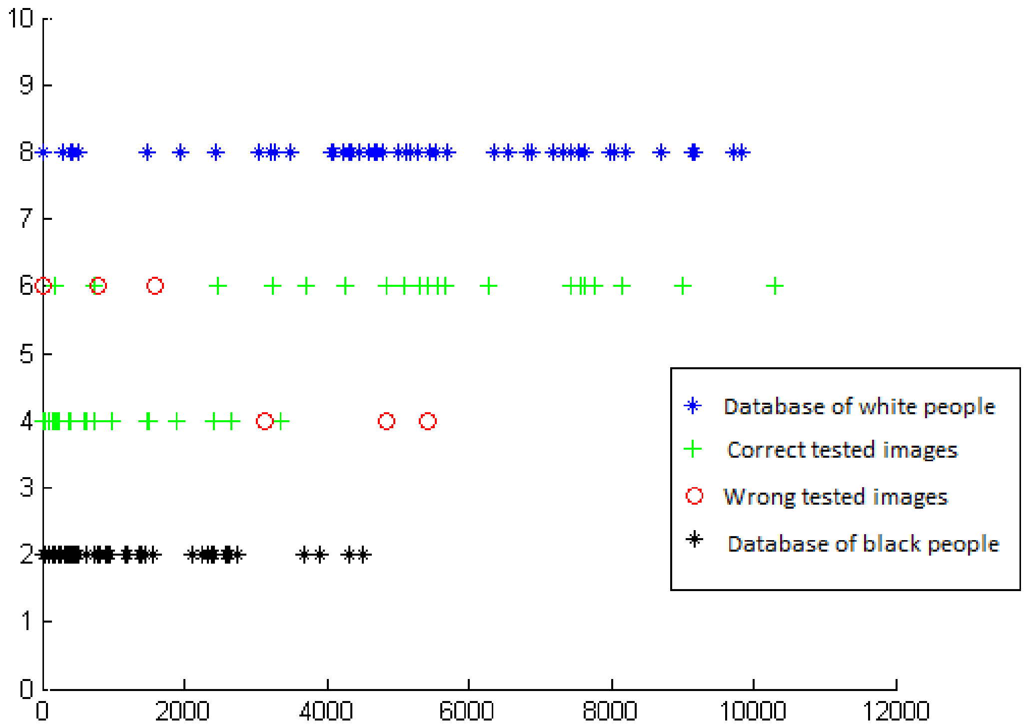


***FIGURE 15.-** Best Feature Black and White program*

In the figure above, are represented the values (feature 22) of the two groups of the database, black people (in y=2) and white people, located in y=8 (the values of y are not important they are just to achieve a better representation). It is possible to observe that this feature is useful to classify images because the values for the group of black people are concentrated near 0, on the other hand, the white people group, it has values between 4000 and 9000, so the difference between these two groups is enough to achieve a high success ratio for the classification.

In y=4, it is represented the values for the feature 22 of the black people tested images. The green cross represents the correct tested images and the red circles are the wrong classified tested images. The same happens in y=6, but for the tested images of white people.

The wrong classified images are located in a logical wrong area, for instance, the incorrect classified images for the black people are located far of 0, on the other hand, the wrong classified images for the white people are near 0, where dominate the black people features.

Other experiments

After the conclusions of the Black and White people tests, to complete the project, other classification is done. It is tried to classify into these groups: Black people, White people and Asian people.

To do this, it is necessary to construct a database of 50 Asian people and a test database of 25 Asian people (different of the other 50). The Black and the White databases and test databases was constructed in the previous experiments. When it is done, it is only necessary to adapt the Black and White program to three groups and compile it.

The results are the following:

	Black Right answers	White Right answers	Asian Right answers
256 crop 5f	20	9	20
256 crop 10f	**20**	**9**	**21**
256 crop 20f	21	8	20

	Black Accuracy	White Accuracy	Asian Accuracy
256 crop 5f	80	36	80
256 crop 10f	**80**	**36**	**84**
256 crop 20f	84	32	80

	Program Accuracy
256 crop 5f	65,3
256 crop 10f	**66,7**
256 crop 20f	65,3

TABLE 96.- *Asian, Black and White program results*

The program with best results is the 256 features program with images without background and 10 features used. It obtains a 66,7% of accuracy.

These tables permit to observe that the Black and the Asian classification are well, because they obtained an 80% of accuracy. However, the white classification is not correct, because it only obtains the 36%. This is more than randomly, but it is not enough to work with it.

The insufficient results in the White people classification are probably because the differences between “White and Black” and “White and Asian” are less than the difference between “Asian and Black”. This happens in some images i.e.,

FIGURE 16.- *White, Black and Asian comparison*

In this image it is easy to classify the White man as Black.

FIGURE 17.- *White, Black and Asian comparison*

In this image it is easy to classify the White man as Asian.

It is for this, that the White classification is more difficult than the Asian and Black classifications.

In these experiments, Blakc and White classification and Black, White and Asian classification, probably the result would be better if there was an increase of images in the databases. These databases only have 50 images and probably with 500 images the results would improve.