

# Faces Recognition Based on Artificial Neural Networks

**Ibrahim Abdulrab Ahmed**

Faculty of Computer Science & Engineering Hodeidah University

**ABSTRACT:** This paper represents an application study for faces recognition using ANN .A backpropagation neural network with three hidden layers was used as a classifier.

## 1.INTRODUCTION

Face recognition may seem an easy task for humans ,but till now computerized face recognition systems in real time can not achieve a completely reliable performance. The difficulties arise due to large variation in facial appearance, head size, orientation and change in environmental conditions. Such difficulties make face recognition one of the fundamental problems in pattern analysis .In recent years ,there has been a growing interest in machine recognition of face [2 ]due to potential systems ,and other applications .A recent survey of the face recognition systems can be found in [3,4] .

The Artificial Neural Network (ANN ) became one of the most commonly used tools in solving many problems in various application domains like classification, approximation, forecasting ,pattern recognition, photo recognition and others.

Using the neural networks to recognize images is consider one of the great interests of the researches nowadays.

Faces recognition is a problem that neural networks may solve it well.

We apply a neural network to recognize a group of faces (44 images represent 12 faces for each of which three to four different images are there).

These samples were taken by a digital camera and saved in computer as files.

And by using some suitable image processing methods we got the files ,

which we used as input to our selected neural network .

## 2. ALGORITHM DESCRIPTION

The Proposed algorithm depends upon the following [4,8,9,10]:

1-Filtering is of great importance as it helps lessening the extra scattered spots and noise found in the image so that it becomes easy for the ANN to recognize the images concerned. It is important to mention here that in case there are extra scattered spots and noise in the image.

2-Image subtraction algorithm is thereby used to determine the differences between the two images i.e. the one referred to here and any other ordinary image. The result is either (zero, negative positive), if the result is zero means that the two images as identical.

3- Image Minimization, one of the ways to minimize the original image, is the average method we locate the pixels of the given image in small squared areas and then we get the average of each square. As a result of this, we get the small pattern needed.

4-Gray Scal is a method to change a coloured image into a grey one in order to reduce the number of colours since the coloured image consists of about 256 colours.

## 3.NEURAL NETWORKS

In this paper , the Artificial Neural Network is used for faces recognition. The designed ANN, has been trained and tested by using Back propagation networks (BPNN).

The network topology is constructed to be feed forward :i.e. loop-free-generally connections are allowed from the input layer to the first hidden layer , from the first hidden layer to the second ,etc and from the last hidden layer to the output layer[5,6].

Each layer consists of a number of neurons which depends on the cases to be solved[7] .The basic BP architecture is shown in figure 2. layers intalled as the following:

- 1-Input layer of 1120 nodes , which represents the number of coordinates of the samples.
- 2- Three hidden layers with 20 nodes in the first hidden layer ,10 nodes in the second hidden layer and 6 nodes in the last one .
- 3-Output layer of 6 nodes .

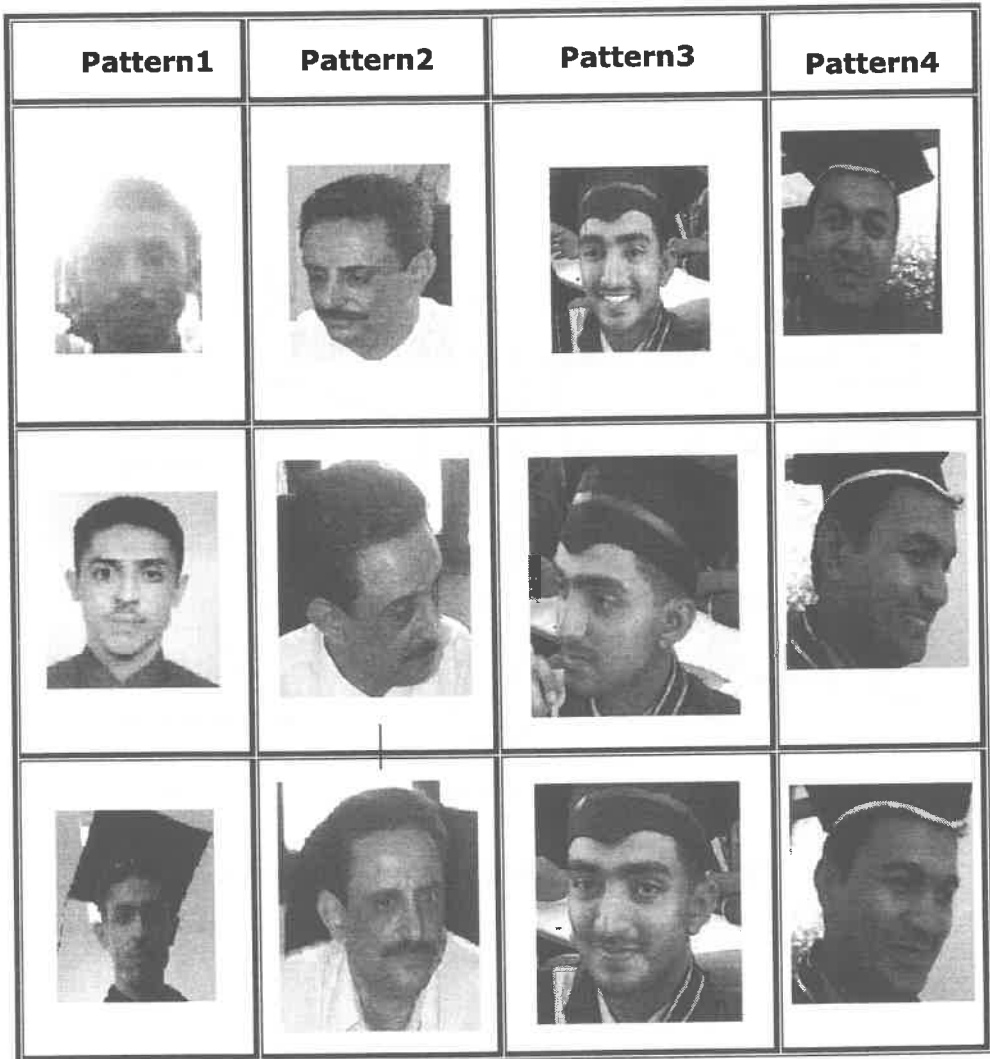


Fig.1 Some samples of inputs faces .

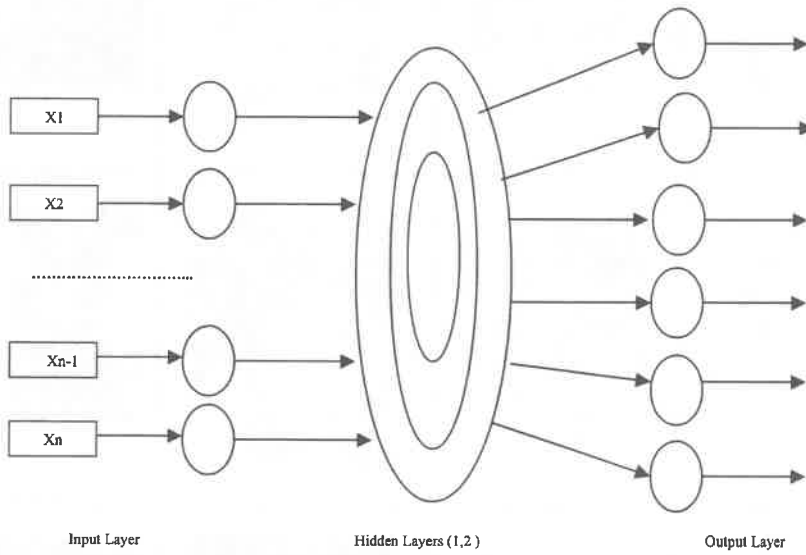


Fig.2 Structure of Back propagation Network





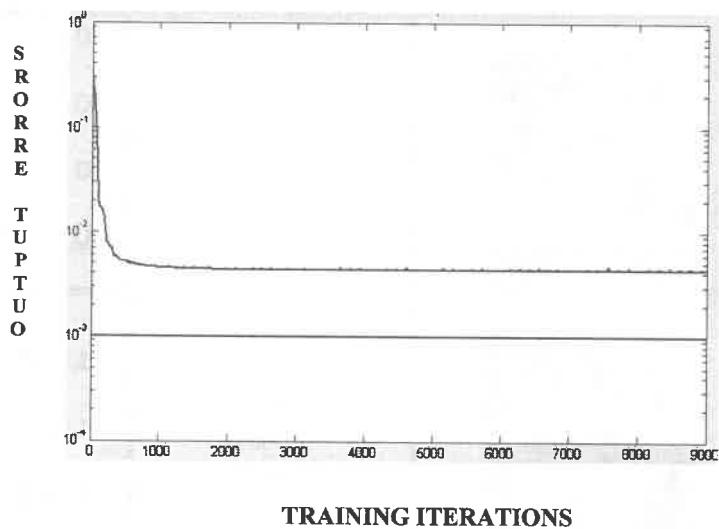
Pattern	Testing result	Required result is one of:
	0.8754 0.1432 -0.3101 0.0516 1.1902 0.9531	1 0 0 0 1 0 <u>1 0 0 0 1 1</u> 1 0 0 1 0 0
	0.0216 0.9170 1.0885 0.1377 0.8916 0.0146	0 1 0 1 1 1 0 1 1 0 0 0 0 1 1 0 0 1 <u>0 1 1 0 1 0</u>
	1.1662 -0.2113 -0.1222 1.4048 0.9132 0.8107	1 0 0 1 0 1 1 0 0 1 1 0 <u>1 0 0 1 1 1</u>
	0.0310 0.8892 1.4651 0.9373 0.8639 0.1484	0 1 1 0 1 1 0 1 1 1 0 0 0 1 1 1 0 1 <u>0 1 1 1 1 0</u>

Fig.3 Some samples of the testing output.



TRAINING ITERATIONS  
Fig.4 Error Variation Against Training Iterations

## 4-RESULTS AND DISCUSSION

Some images processing method however is necessary to confirm the image into binary or dipolar file to be dealing with the ANN.

More than 40 images were used for training (three to four images for the same face), more than 10 images were used for testing.

Training the BPNN with 3 Hidden layers gives a required result; we got on average accuracy about 90% on the testing samples.

The other parameters used with BP network are:

1-Learning rate = 0.05;

2-The maximum number of iterations (epochs) = 9000 , and goal=0.001 .

3-A sigmoid function is used as activation function .

All connection weights and nodes threshold values are randomly initialized.

These values are uniformly distributed between ( 0,1 ).

The training continues until the Root Mean Square or validation error failed to decrease by a certain amount or error over a given period or reached the maximum limit of hidden units.

The neural network works probably and absolutely no errors found in the outputs .

The testing results are shown in figure 3. The result of testing in the second column must to be approximately to one of targets ( the last column of fig.3) so it's clear here that ANN can recognize the given faces for testing.

Figure 4 shows the variation of the outputs error as a function of the number of training iterations .The figure shows also that, the error decrease widely approaching 0.004 in the case of increasing the training iterations to 1200 .

## 5-CONCLUSION

This work presents an attempt to design a face recognition system based on artificial neural networks type BPNN. We apply a BP neural network to recognize a group of faces. Using a neural network as classifier was a successful one. Results of over 90% were achieved in a relatively short amount of time .It has to be mentioned that the used image processing methods in this paper can be applied to any photos recognition (not only faces).

## 6. REFERENCES

- [1] Sherif Kassem Fthy, "An Optimal Architecture of Neural Network for Face Recognition," Egyptian Informatics Journal .Vol.4.No.2,pp.93-101.December 2003.
- [2] Chellappan,R.,Wison,C.and Sirohey,S,,"Humman aand machine recognition of face :A survey"Intenal Representation in face Recognition Systems",Pattern Recognition,Vol.33,No.7.pp1161-1177,2000.
- [3] J.Dauguman,"Facr recognition:A Survay ",computer Vision and Image Understanding, Vol.83,No.3,pp.236-274,Sept.2001.
- [4] معالجة الصور بلغة Visual Basic ،ترجمة د.عزيز اسد و د.على سليمان ،سوريه\_ حلب 1990م.
- [5] R.Schalkoff ,Artificial Neural Networks,McGraw-Hill,1999.
- [6]White .H, Artificial Neural Networks: Approximation and Learning Theory,Blackwell,1992b.
- [7]White H., and Gallant, A.R., "On Learning the Derivatives of an Unknown Mapping with Multilayer 1992.
- [8] Anil K. JAIN , Fundamentals of digital image processing,University of California,Davis,Prentice-Hall International,Inc.,1999.
- [9] Bernd Jahne ,Practical Handbook on Image Processing for Scientific Application , Santa Clara, USA, 1997
- [10] Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing Addison-Wesley Pub Co, 3rd edition,canada, 2002