



**Adaptive Neuro-Fuzzy (ANFIS) Approach for Effective Selection of
Job Applicants at Certain Offered Post**

A Dissertation Proposal

Submitted

By

RAJNI VERMA

(41200284)

To

Department of Computer Science & Engineering

In partial fulfillment of the Requirement for the

Award of the Degree of

Master of Technology in Computer Science

Under the Guidance of

Mr. Sanjay Kumar Singh

(Asst. Professor, LPU)

June, 2015

PAC APPROVAL FORM



School of: Computer Science and Engineering

DISSERTATION TOPIC APPROVAL PERFORMANCE

Name of the Student: Rajni Verma	Registration No:41200284
Batch: 2012-2015	Roll No. RK2213A12
Session: 2014-2015	Parent Section:RK2213
Details of Supervisor:	Designation: A. P.
Name: Sanjay Kumar Singh	Qualification: M. Tech
U.ID: 15745	Research Experience: 3 years

SPECIALIZATION AREA: Intelligent System (pick from list of provided specialization areas by DAA)

PROPOSED TOPICS

- Adaptive Neuro-fuzzy approach for effective selection of job applicant at certain post.
- Adaptive Neuro-fuzzy approach for elective selection.
- Adaptive Neuro-fuzzy approach for NLP.

Signature of Supervisor

PAC Remarks:

Topic 1 may be Answare

APPROVAL OF PAC CHAIRPERSON:

Signature:

Date:

*Supervisor should finally encircle one topic out of three proposed topics and put up for approval before Project Approval Committee (PAC)

*Original copy of this format after PAC approval will be retained by the student and must be attached in the Project/Dissertation final report.

*One copy to be submitted to Supervisor.

ANSTRACT

In this work, the ANFIS (Adaptive Neuro-Fuzzy Inference System) is used to the generated Expert system to find job matching for unemployed and also to give the effective selection of job. The dataset which is used to feed into the ANFIS is the data contain the different sets of mix design of different jobs finding. Using ANFIS the error generated by proposed approach is less as compared to FIS.

AKNOWLEDGEMENT

I would like to present my deepest gratitude to **Mr. Sanjay Kumar Singh** for his guidance, advice, understanding and supervision throughout the development of this dissertation study. I would like to thank the **Project Approval Committee** members for their valuable comments and discussions. I would also like to thank **Lovely Professional University** for the support on academic studies and letting me involve in this study.

RAJNI VERMA
Reg. No.: 41200284

DECLARATION

I hereby declare that the dissertation proposal entitled, Adaptive Neuro-Fuzzy (ANFIS) Approach for Effective Selection of Job Applicants at Certain Offered Post submitted for the M. Tech Degree is entirely my original work and all ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

Date:

Rajni Verma

Reg. No: 41200284

CERTIFICATE

This is to certify that **Rajni Verma** has completed M.Tech dissertation proposal titled **“Adaptive Neuro-Fuzzy (ANFIS) Approach for Effective Selection of Job Applicants at Certain Offered Post”** under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of the dissertation proposal has ever been submitted for any other degree or diploma.

The dissertation proposal is fit for the submission and the partial fulfillment of the conditions for the award of M.Tech Computer Science & Engg.

Date:

Signature of Advisor

Mr. Sanjay Kumar Singh

(15745)

TABLE OF CONTENTS

CHAPTER	PAGE NO.
CHAPTER -1: INTRODUCTION	1
1.1 Adaptive Neuro –fuzzy logic.....	1
1.2 ANFIS Architecture	1
1.3 Working of ANFIS	4
1.4 ANFIS Editor	6
CHAPTER – 2: LITERATURE REVIEW.....	8
CHAPTER – 3: PRESENT WORK.....	15
3.1 Problem Definition	15
3.2 Objective	15
3.3 Methodology	16
3.4 Experiment No. 1 (FIS)	18
3.4.1 Design of Fuzzy Expert System.....	18
3.5 Experiment 2 (ANFIS).....	27
CHAPTER - 4: RESULTS AND DISCUSSION.....	33
4.1 Results of Experiment 1 (FIS)	33
4.2 Results of experiment 2 (ANFIS)	34
Chapter - 5: CONCLUSION AND FUTURE WORK	35
REFERENCES.....	36

LIST OF FIGURES

Figure No.	DESCRIPTION	PAGE NO
Figure 1.1:	Fuzzy Interface System	2
Figure 1.2:	Architecture of ANFIS	4
Figure 1.3:	ANFIS Working of layer	5
Figure 1.4	ANFIS Editor.....	6
Figure 3.1:	Data Flow Diagram	17
Figure 3.2:	Flow Diagram of Job matching System	18
Figure 3.3:	FIS Input variable Qualification MFs	19
Figure3.4:	FIS Input variable Additional Qualification MFs	20
Figure 3.5	FIS Input variable Age MFs	21
Figure 3.6:	FIS Input variable category MFs.....	22
Figure.3.7:	FIS Input variable Experience MFs.....	23
Figure 3.8 :	FIS Input variable Output (job) MFs.....	24
Figure 3.9:	FIS Surface viewer of inputs	25
Figure3.10	Rule viewer of FIS model testing.....	26
Figure 3.11:	loaded data into ANFIS.....	28
Figure 3.12:	Tuned MFs of Input 1 in ANFIS	29
Figure3.13	Tuned MFs of Input 2 in ANFIS	29
Figure 3.14	Structure of ANFIS.....	30
Figure 3.15:	testing of ANFIS	31
Figure3.16	Training ANFIS.....	31
Figure 4.1:	Results of ANFIS	34

LIST OF TABLES

Table 4.1:Results of FIS testing.....	33
---------------------------------------	----

CHAPTER -1

INTRODUCTION

1.1 Adaptive Neuro –fuzzy logic

ANFIS is the combination of fuzzy interface system and neural network, it has ability to create the fuzzy logic and rule based system and has the NN viability and features. This has the features of both FIS and NN which make it more effective. The results came with this way are more accurate. It can be use in much type of the automatic system and AI. The AI is used in the many fields for decision making process like diagnostics, design and repair.

ANFIS was adopted by different researcher in their work, for mathematical representation of the data, as it have high degree of potential for calculating the hard and nonlinear problems occur in different field like in marketing, manufacturing industries, civil engineering etc. applied ANFIS to solve the forecast problem of many different effect by adopting parameters and its values entries as variable. Then they develop an ANFIS model to study its forecasting ability. After getting the output and calculate the conclude the output of ANFIS with training and testing data, they get result with good ability to predict the result, detection of minimum amount of error and low data requirement are found with ANFIS.it is concluded that the ability of ANFIS is very good as this method gives a good idea to work for mixture of NN and fuzzy logic

This work on simple basis first take input type and mentioned all its membership function after that rules are made and according to rule get the output of the output membership functions and gets final results.

1.2 ANFIS Architecture

Adaptive neuro-fuzzy inference system is first used and introduced by Roger Jang. It is a feed next layer adaptive neural network which implies a FIS and by its architecture and neurons. He examined and gives the results that the ANFIS can be used to model nonlinear functions. It is a hybrid neuro-fuzzy technique that brings learning ability of neural networks to fuzzy inference systems. The FIS is a mostly used in calculating

work based upon the concepts of fuzzy system and its set theory, fuzzy rules, and reasoning of fuzzy functions.

It has given in the previous researches that the application gives best results in a different types of fields, such as automobile, data clustering and classification, decision making, expert system, prediction, AI, and pattern recognition.

The basic structure of a FIS consists of three main components:

A rule base- Which contains a collection of fuzzy rules.

A database- Which define the membership function used in fuzzy rules.

A reasoning mechanism- Which execute the inference procedure on the selected rules are given by the facts of a desired combination of rules and gets output.

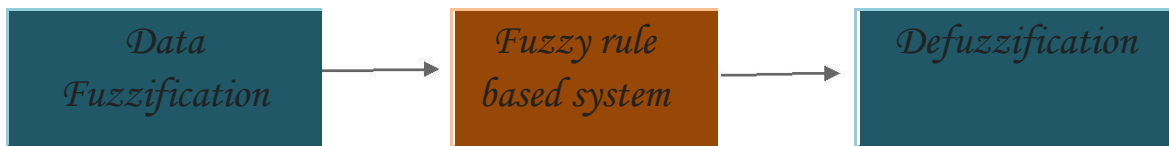


Figure 1.1: Fuzzy Interface System

The basic FIS can take either fuzzy input that can be in the form of crisp values, but outputs it produces are almost gets the fuzzy sets. Therefore, such kind of system is used which gives the results in the human understandable way so the defuzzification is needed to get extract crisp value that best gets the a fuzzy set.

Expert System are designed in such a way that it is understandable by the system i.e Computer System but also human can get knowledge from it. Expert System is knowledgeable and if we compare it with the human being then it is cheaper, faster and more reliable. As we know that if go out to take the advise of an expert about certain type of topic first there should be free time for the expertise to answer the question and even there can be many persons who are not in the range i.e far away from the expert wants that result or knowledge the it is not easy to answer all the queries. Hence ES can be available at different places at same time and cheaper and convenient.

Once the Expert System is generated on the basis of knowledge get from the expertise, then these systems are also likely to carry out special tasks . With ES results and relationship with the customer increases which is a main motive of business. ES agents teach the student in same way as a teacher teaches to them. FIS is the method, to gets the fuzzy interface model,. The Sugeno FIS was proposed by Takagi, Sugeno, and Kang in an effort to develop a systematic approach to generate fuzzy rules from a given input and output data set.

The Grid partitioning method is almost selected in designing a fuzzy system, which gets input of many different types of variables as input to the system. This methods needs only a small number of membership functions for each input. However, it occurred problems when a there is need of huge amount of number of the inputs variables are taken into the system . The system identification includes the following steps.

- There is to Specified and parameter of a class of along with the math model represent the system to be identified.
- Parameter used for identification of the performance to choose the parameters that gives best results that will fits to the set of data for training.
- Validation of tests are conducted to see if the model are identify then results will correctly to data set which is unseen.
- Once there is end or the termination of the function then results of the test which is validated will be satisfactory.

Although there is , another class of model is used then steps from 2 to 4 are again repeated.

From the above discussions, it is concluded that ANFIS is a fuzzy rule-based model using neural network like structure (i.e. involving nodes and links). It consists of five layers implementing fuzzy inference systems as schematically shown in Figure 1.1. The square nodes are adaptive nodes and the circle nodes are fixed ones.

1.3 Working of ANFIS

The ANFIS works in the layers and each layer gives an output which is input for the next layers. When there is a forward pass, the parameters are then automatically adjusted such a way that the antecedent parameters will always remain fixed.

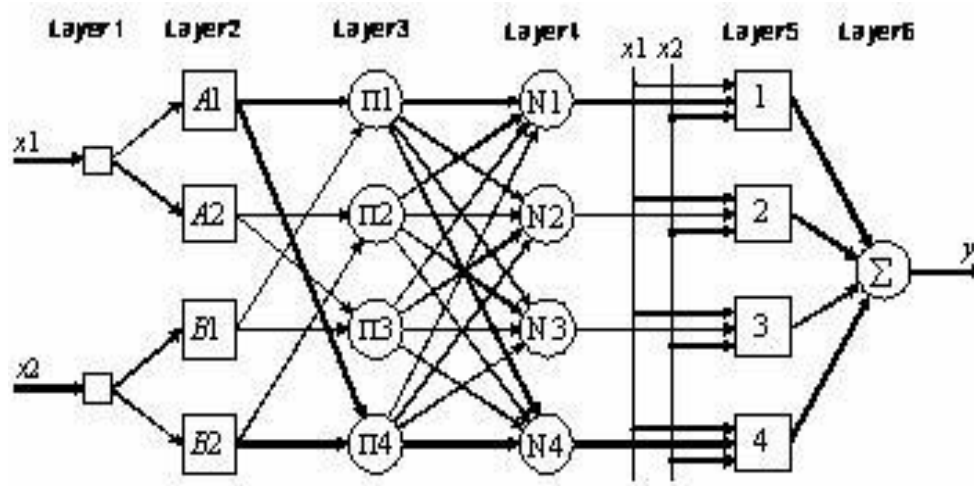


Figure 1.0.2: Architecture of ANFIS

1.3.1 Layer 1

The first layer is the input layer. The layer 1 is used to simply the given crisp inputs to next layer 2. The layer 1 of ANFIS calculates the values according to the a fuzzy condition connecting the given input by using desired membership functions .

1.3.2 Layer 2

The second layer is fuzzification layer. The layer 2 is used Neurons to calculate fuzzification . The second layer evaluates the truth value of the variables of each rule in the rule base.

1.3.3 Layer 3

The third layer is the rule layer. In layer 3 the neuron gets only a one Sugeno-type fuzzy rule. A rule neuron gets inputs from the fuzzification of neurons which suits and matches and results the target power of the rule. In an ANFIS, the combination of the rule is calculated by the operation of the product. So, the third layer normalizes these truth values.

1.3.4 Layer 4

The fourth layer is the normalisation layer. In layer 4 neurons in gets inputs from all others neurons in the previous layer, and calculates the normalised results and target power of the given rule. The fourth layer calaculates the resultant of each rule. Hence, the output of neuron is calculates in fourth layer.

1.3.5 Layer 5

The layer fifth is the defuzzification layer. In the layer 5 neurons are gathers to the corresponding normalised neuron, and also gets initial inputs, like x_1 and x_2 . A defuzzification neuron answers the weighing the value of a given rule. Finally, the fifth layer is used to calculates the output that aggregate all rules.

1.3.6 Layer 6

The last alyer is, sixth layer is summation layer and gives the single output . This layer calculates the outputs that is sum of all the defuzzification neurons and results the final ANFIS output.

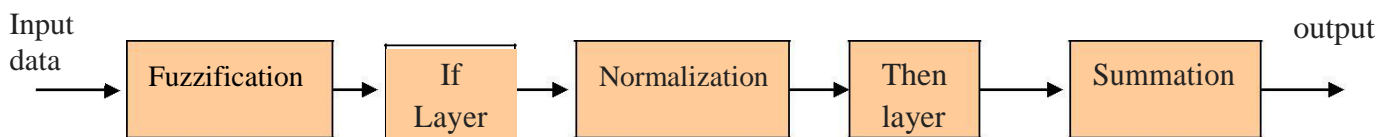


Figure 1.0.3: ANFIS Working of layer

1.4 ANFIS Editor

ANFIS editor is the tool which gets the data and the generate the FIS . On the basis of rules and the data which has been input by the user it generated the required results and also test the system and also mentioned the error generated while operating the system.

The working of the ANFIS is as follow:-

Create the database and the load that database from the file or another source and set the type of it like training, testing, checking and demo.

Training data is the data which will have the all the mix designs which will help the system to get the knowledge that's why the system called knowledge based system. Testing and checking data helps to generate the find out the percentage of error and test and check the system.

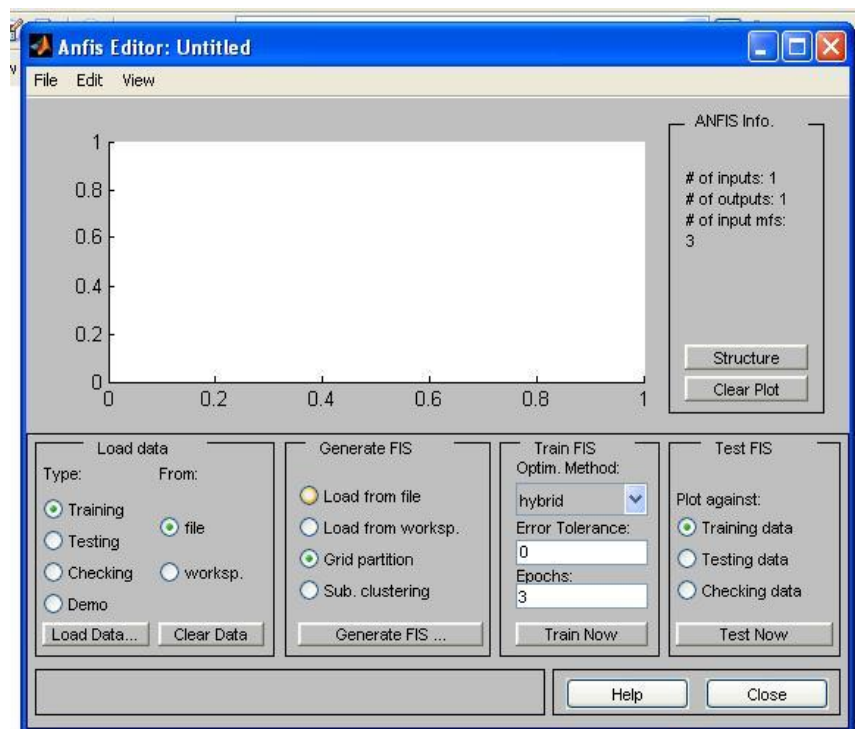


Figure 1.0.4ANFIS Editor

Then generate of the FIS which means to rules formations used with the grid portioning which is used if there is small number of input variable that is less than 6.

The train the FIS with the hybrid method.

After that testing of the FIS of particular type either training, testing or checking data and gets the final output.

CHAPTER – 2

LITERATURE REVIEW

Swartout, W., Paris, C., and Moore, J. (1991) give knowledge about design and the working of the expert system. The paper is about that how the rules are generated based on expert knowledge and information and their experience and the results is out is very much close to the expertise answer. Expert System is very useful as it can be used at different place at same time and gives the results very fast and frequently. It is cheaper and convenient.

Jhy-Shing Roger Jang, (1993) shows that how the ANFIS is used for the modeling and best outfit results on Network This paper works on identify the nonlinear components on the network and working for detect the error and generate the result effectently on the use of the FIS system and the also asked that ANFIS approach can used to get better results.

Mendel J.M (1995) aware about the detailed analysis of the variation of the joint angle with the arm angle parameter is considered, which is then utilizes for redundancy resolution. However link offset were not considered in his work. Some authors also applied ANN, due to its adapting and learning nature. Although ANN are very efficient in adopting and learning but they have the negative attribute of 'black box'. To overcome this drawback, various author adopted neuro fuzzy method like ANFIS (Adaptive Neuro-fuzzy Inference system). This can be justify as ANFIS combines the advantage of ANN and fuzzy logic technique without having any of their disadvantage. The neuro fuzzy system are must widely studied hybrid system now a days, as due to the advantages of two very important modeling technique i.e. NN and Fuzzy logic

Drigas A, Kouremenos O S, Vretris S, Vrettaros J, Kouremenos, (2004), works on the job search for the jobs list and the unemployed persons list of same social group were considered. Using Neuro-fuzzy system and different parameters are used like. Apply rules on them and find out the job suits to particular group. This system is created for job matching is developing on NFIS system only for the uses of organization or employer side. The system

works first take input employees and unemployed list then rules based upon the parameters like Age, Education, Experience, Additional Education, Language preference, Basic Knowledge of internet and computer each one given some weightage and applying formula on each to get the result to make it user friendly VB is used as front end .

Mateou N H, Andeou A S Zomnabakis G A (2004) have described about the fuzzification and defuzzification terms and methods how this can be do this give us good knowledge of these terms in simple language. The researcher uses the cognitive maps to explain it. He explain that fuzzification makes a trapezoidal membership function with ma, min lower core and upper core values and the variables values lies between mostly -1 to +1. Duffification is used to get the correct result to convert fuzzy variables into realistic result and values.

Necaattin Barisic, Ergun Topal, Firat Hardalac, Inan Guler, (2005) have examined Doppler blood flow in human by diagnosis. The classical method used was not up to the mark. But this technology is based upon neuro fuzzy system and give the 96.67% accurate FFT analysis (Fast Fourier Transform is a way to find out the factorial of the values). The researcher diagnosis the 60 patients. The previous way to detect the Doppler signal was FFT which was not up to mark. The neuro –fuzzy gives the suitable arrangement of the spectrum.

Song-Sen Yang and Jing Xu and Guang-Zhu yao (2005) calculates concrete mix results and uses the fuzzy neural network to gives the result. The results are better than the previous results but is gives the error of 1.11% but this error was expected by the engineers because that was much lea than the last research and is less as compare to the results given by the experts.

M.C nataraja, M,A Jayaram, C.N. Ravikumar (2006) have established concrete Mix deign need very much knowledge and the experience to get the perfect result and best output. Hence need the expert knowledge. This is not based upon the mathematically formula but because of the different places have different types of geographical structure and strengths hence result is in approximation in the laboratory experiments. The researcher said that the area is more scientific and natural hence need of expert system is here.

Busso Carlos, Lee Sungbok , (2007) shows that how neural model can be used in different application like in this research this model is used to detect the word/ speech is emotional or not. This system works on two steps. First step there is comparison between input and refer words and secondly detect the words are normal or emotional. The result is given in the form of graphs. The researchers distinguish between emotional words and non-emotional words. This system has accuracy of 78%. This is the helpful for all kind of further researches.

Minghe Wei, Baojun Bai, Andrew H. Sung, Qingzhong Liu, Jiachun Wang(2007)

Works on different types of the working profiles of the ANFIS there are two ways to generate rules in ANFIS these are grid partition or clustering they both are combined the data and based upon the data gives the results but the reaserch studied that that the grid partition is used where there is the input variable less that 6 and the clustering is used where there is large number of input.

Ke L., Hong-ge M. and Hai-jing Z(2009) emphasized on the applied ANFIS to measure the forecast the problems of microwave and its effects by getting and adaptive microwave parameters and its end values as variable. Then they develop an ANFIS model to study its forecasting ability. By conclude the output of ANFIS with training and testing data, they gets results that the system is with good forecasting ability, very less error and data requirement are with ANFIS.

Armano, Marchesi, & Murru, (2009) gets the system which helps in the optimised intelligent systems such as NN and, FIS and algorithms for the purpose of forecast in the field of economical and banking sector for financial benefits has extensive applications. After that the system based upon artificial networks (ANNs) and gets input from the vector machines (SVMs) has been good results and applied to solve the problems of predicting financial series, including stock market forecasting

Mahmut bilgehan (2010) compare of the results in the neural network and the neuron fuzzy system and shows that the both have the importance in the different fields but the system which is based upon the neuron fuzzy gives the better results as compare to the previos study.

Melek Acar Boyacioglu,, Derya Avciba Selcuk (2010) emphasized on the stock market, today most of the people invest their money in the stock market and the stock market tends are very important to make the benefits. The economical growth of the country take place because of trade and decision to buy and sell of the objects. It is very difficult to make decision . Hence there is a need of a expert advise. Hence The ANFIS is used to get the best knowledge with less computing error and this system which is generated by the reaserach is really very helpful , cheaper and effective.

Abe Kazemzadeh, (2010) has developed translator only fixed amount of Spanish Words into English Language. The system uses fuzzy logic. For this researcher do the English Language survey and Spanish language Survey create some rules and match the each Spanish word with English to get the result by giving three types of the results.

Ramkumar R, Dr. Tamilarasi A, Dr. Devi T,(2011), have try to provide the fully GUI which works on fuzzy rule to developed an A I System which shows the job scheduling to optimize the resources. This gives advice to the shopkeeper and retailer that how can they schedule the jobs and minimize the loss and can get effective results and benefits. The researcher explains that how the resources can be utilize by scheduling the tasks under the different situations. This paper gives idea about effective shopping method by scheduling the working of machines and works according the three parameters that are responsible for scheduling these are date, customer preference and process time.

Guo Ping, Tanskanen m A, Wang Jing, Gao XZ,(2012), have differentiate the different signals of EEG (EEG is the signals in the brain which is responsible for the activities of human body) The multivalve square root is used to find out the values, FIS system with neuro fuzzy is used which give the effective diagnosis of the brain signal which is helpful in make type of mental disabilities and its success rate is more than traditional method.

Yogesh Kumar, Yogyata Jain(2012) gives us the knowledge about the Expert system . An expert system is the computer program that simulates the judgment and behavior of a person or and institution or working place that has expert knowledge and experience in a particular field. It is a system that shows the conversation a end user along with a expert system to solve a particular type problem. But Expert system is the system which uses the expertise knowledge and based upon the different rules gives the expert knowelge. The end user provides input by selecting one or more answers from a list or by entering data. An Expert System soles the problem and gives the answers based upon the knowledge of the work and logical rules or functions for getting knowledge. Both the information and the rules are obtained from the experience of a specialist in the area. This paper also tells us about the different uses application and importance of the Expert System.

R. Sivakumar, C. Sahana, P. A. Savitha (2012), about the performance of the control methods is based on the control of distillation of the problem of column. The results are confirmed that manage the improvement of quality with MPC and multi-loop PID controller. Thus the results that optimized the output is always obtained and the performance methods are we tally with the ISE and IAE values.

Juan Pablo Nieto González,(2012) measure and check the influence of current. The current flows through any circuit of cables can be AC and DC i.e. there is fluctuation in the current. The researcher here wants to check the fault in the circuit. He first gets the gets the data in the voltage in normal and extreme condition and deeply studies its parameters for cause disturbance in the circuit and gets the result on the next step he uses ANFIS to gets the final result.

Gambler Nidhi , Aggarwal Prateek , Singh Sanjay Kumar, Jain Leena (2013), uses the UGC guideline to evaluate teacher's performance to give the rewards or wages to the faculty according to that. By using this system there can be impartial and fair result will be come and each one will get the reward and incentives etc according to their work they did in the university and organization. According to this paper

there are lots of factors that are responsible for judge the working of an employee. They use FIS .This system gives the scores of each employee based upon their working in different fields. This system can be used for judge both present and past performance.

Anuradha T. Agrawal , Pankaj S. Ashtankar (2013),have given the idea for start the attempts for online find out the health problems in the patients using Adaptive Neuro-FIS and the adpated nature of fis in ANFIS is used in the research. The performance of ANFIS is very good in determine and diagnosing a large number of patients under the managing of a medical problem in a private and government hospitals and health center. After concluding the results obtained from the designed system and the list of patients and check the output after insert into the system that ANFIS approved to be acceptable and suitable with the least training error of 0.1557 1. The ANFIS come near has effectively solved the problem of the FIS system generated by the human expert. Hence,the system can be used successfully for health centers for monitoring the system..

Singh Sanjay Kumar, Aggrawal Parteek, Jain Leena, Vishu, (2013), calculates automatically the present year grading of a student using his/her previous year result, compare the paper level, course level and section level of both years. The result is 100% accurate in all cases. This system works on different mathematical formulas for each level and gives accurate result.

K Rajeswari, V Vaithyanathan and Deepa Abin.(2014),” Ischemic Heart Disease (IHD is such kind of disease which cannot be diagnosis easily because its symptoms are same to many other diseases. It is very dangerous disease because of late detection of this disease causes death.. The objective is to build a clinical decision support system, which will diagnose the presence. A retrospective data set that included 800 clinical cases was taken for the work. A total of 88 sets were discarded during pre-processing. Tests were run on 712 cases using the Weka classifiers available in Weka 3. 7. 0. Out of 113 classifiers, 16 were identified to be the best based on the following parameters: sensitivity, specificity, accuracy, F-measure, kappa statistic, correctly classified cases, time taken to run the model, and the

Receiver Operating Characteristic (ROC) curve. The diagnoses made by the Clinical Decision Support System (CDSS) were compared with those made by physicians during patient consultations.

Sodiya A.S, Ojesanmi O.A, Akinola A and Aborisade O, (2014), measures that how the interruption can be detect in the system with high speed and accuracy. This procedure works on two levels first which take input samples and categorizes them. According to their weightage and rules apply on them then output is the intrusion detection. This system gives more accurate result than previous system.

Behzad Nikham, Kourosah Sahriar and Eng. Madani Hassan ,(2014), calculates that how to use of neural network and artificial intelligence for calculate the fire flame length under tunnel. In this paper new technique is used which is more effective than the previous uses alternate techniques. The accuracy of this system if 99.86 %.

Aggarwal Prateek,Singh Sanjay Kumar, Kaur Parwinder, Jain Leena,(2014), gives the knowledge about the factors which effect the students' study how the students' study and results in the examination can be observed. For examine the factors they did research in the Lovely Professional University by discuss the issue with higher authority , faculty , and students and come to the come that factors are which effect the students performance are family issues, university environment, university system, teaching method and some of their personal factors. The result made by the system is up to mark.

3.1 Problem Definition

Selection of different jobs based on different sets of rules and reducing the testing and training error using ANFIS.

3.2 Objective

The main Objective is to create such kind of Expert system using Fuzzy Logic which can help to an unemployed to find out the suitable job. I found out that in many places and post such kind of person is appointed who can deserved much better job that which he /she is already doing with better allowance or salary. But just because of that not aware about the suitable job they are doing such kind of job.

There are some such places where the under qualified employees are working. Hence to solve such kind of mismatch between post and employee, the idea is to developed suck kind of system which will beneficial for both employee and employer to check the suitable job.

The system can be used for both unemployed and organization to know the best suited job and candidates respectively. The organizations can find the best suited candidates for certain job based upon the criteria set by them.

3.3 Methodology

The methodology will be used to fulfill my project will be the Fuzzy toolkit with Neuro Fuzzy Logic using MATLAB. Model Learning and Inference through ANFIS. The main idea that neuro-adaptive learning techniques is very easy. These methods gets for the fuzzy generating and design functions to learn and gets idea about a data set, in order to calculate the membership function parameter that will be the suits and allow the related fuzzy inference system to tells the path for the given input/output data.

The above said method of learning works same as that of the system of neural networks. The function used in the Fuzzy Logic Toolbox that accomplishes the membership function variables modified is called anfis. The anfis variables procedures are accessed either from the command line, or through the ANFIS Editor GUI. Since the working of the command line of anfis and that of ANFIS Editor GUI is same, they are used according to the need of the user. Until. I uses the ANFIS Editor GUI for the system working for both FIS and ANFIS.

1. To collect the data of unemployed of different social groups
2. Collect the job list with eligibility criteria.
3. Generate the dataset
4. Connect the dataset Train the dataset to anfis
5. Result of the testing data and reduce the error which suited to that unemployed person.

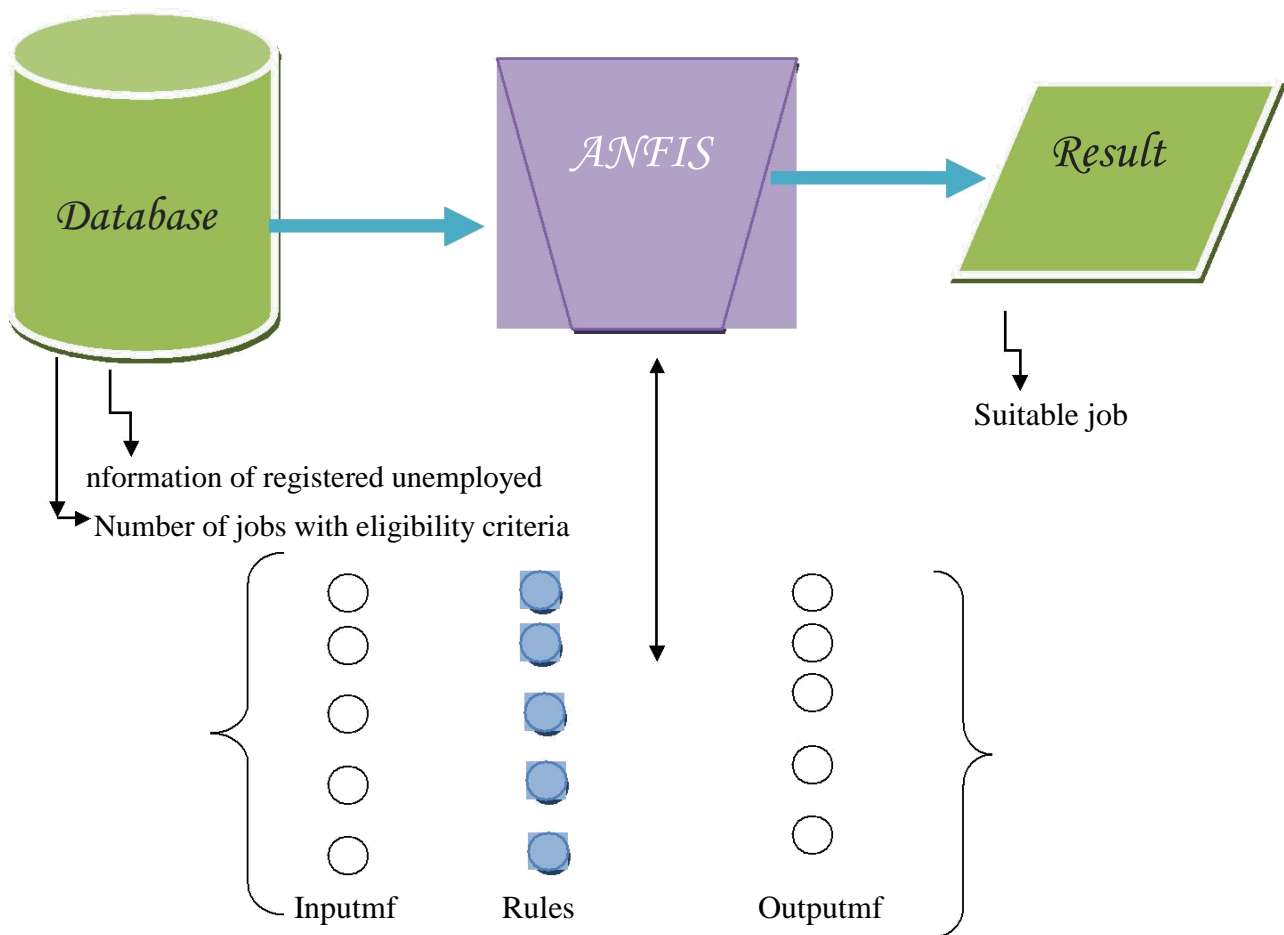


Figure 3.0.1:Data Flow Diagram

Database: Database is the collection of data .The database will contain the information regarding registered unemployed and the eligibility criteria for different types of post.

ANFIS: It is the system helps to train , test the data files based upon the FIS

Result: The result is the final outcome of any input .It will be the required output of the input using rules.

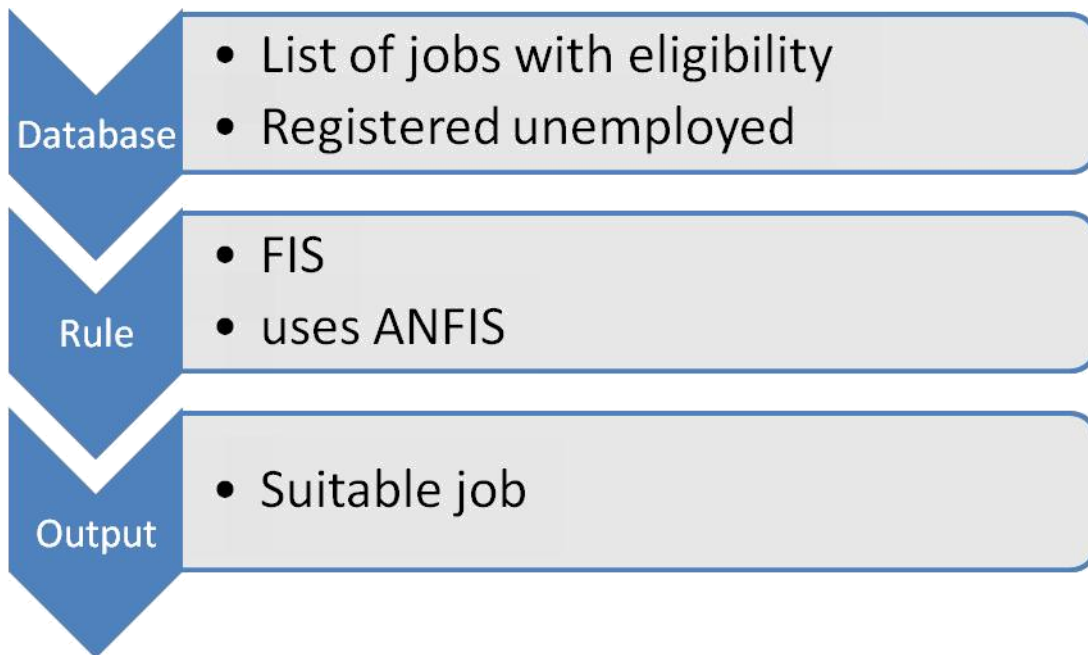


Figure 3.0.2: Flow Diagram of Job matching System

3.4 Experiment No. 1 (FIS)

The FIS (Fuzzy Interface System) is used to generate the expert system based upon sets of the criteria for the job. The previous research for the jobs list and the unemployed persons list of same social group were considered. Using fuzzy system and different parameters are used like. Apply rules on them and find out the job suits to particular group. This system is created for job matching is developing on sugeon system only for the uses of organization or employer side. The system works first take input employees and unemployed list then rules based upon the parameters

3.4.1 Design of Fuzzy Expert System

First Determine the input and the output of the FIS system and then find out the ranges of the all the input and output membership functions. There are five input variables and only one output variable.

Here the Five input variables

- (i) Qualification
- (ii) Additional Qualification
- (iii) Age
- (iv) category
- (v) Experience

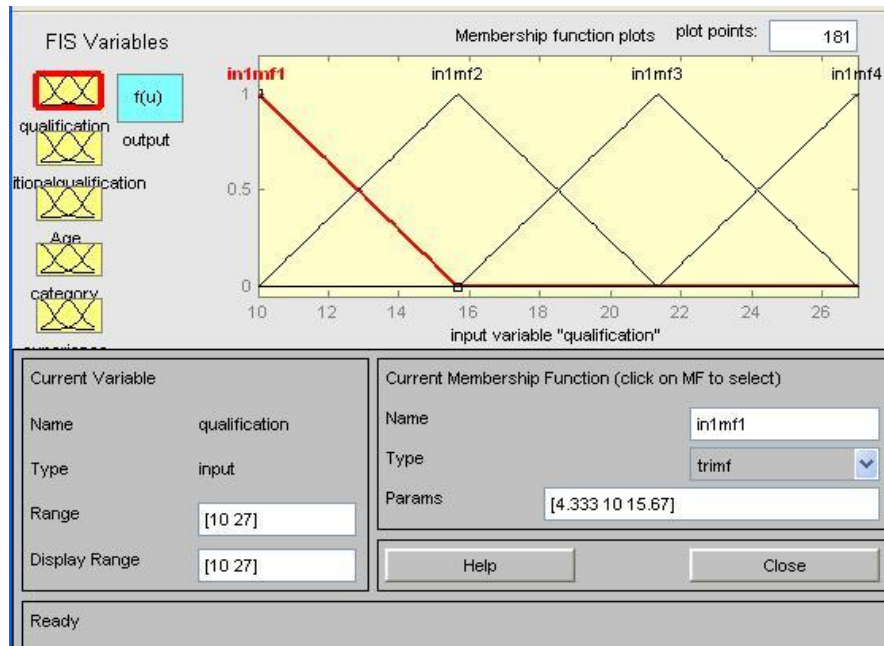


Figure 3.0.3:FIS Input variable Qualification MFs

The figure 3.3 shows the membership function of the variable first Qualification , It is the trimp i.e triangular type of the membership functions and the range if 10 to 28

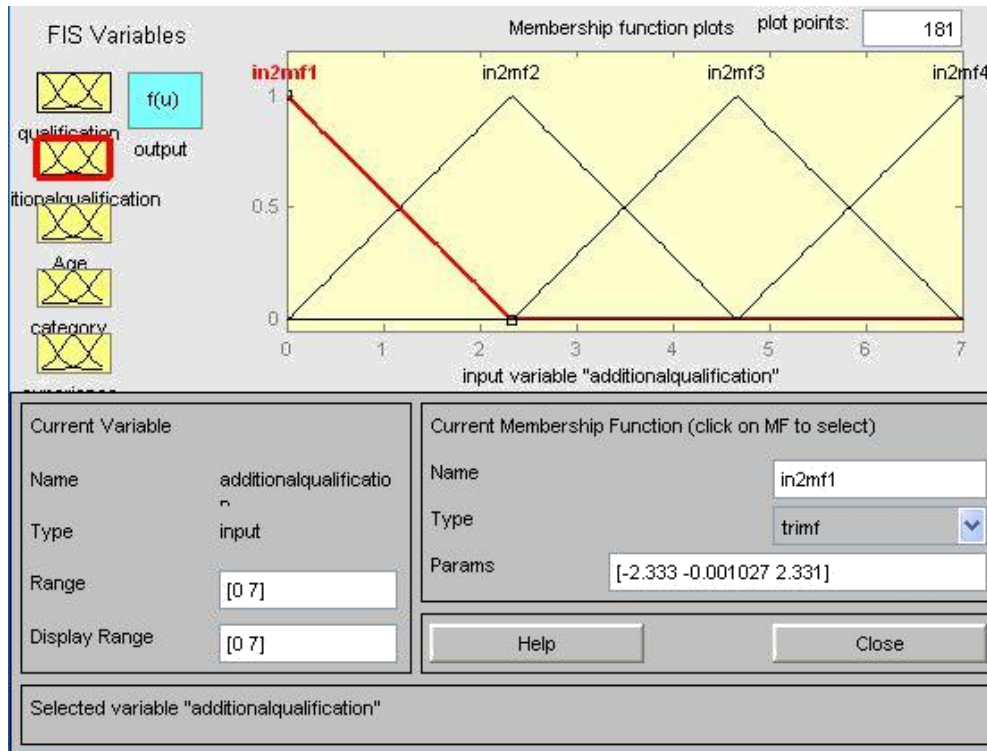


Figure3. 4: FIS Input variable Additional Qualification MFs

The figure 3.4 shows the membership function of the variable second Additional Qualification , It is the trimp i.e triangular type of the membership functions and the range if 10 to 28

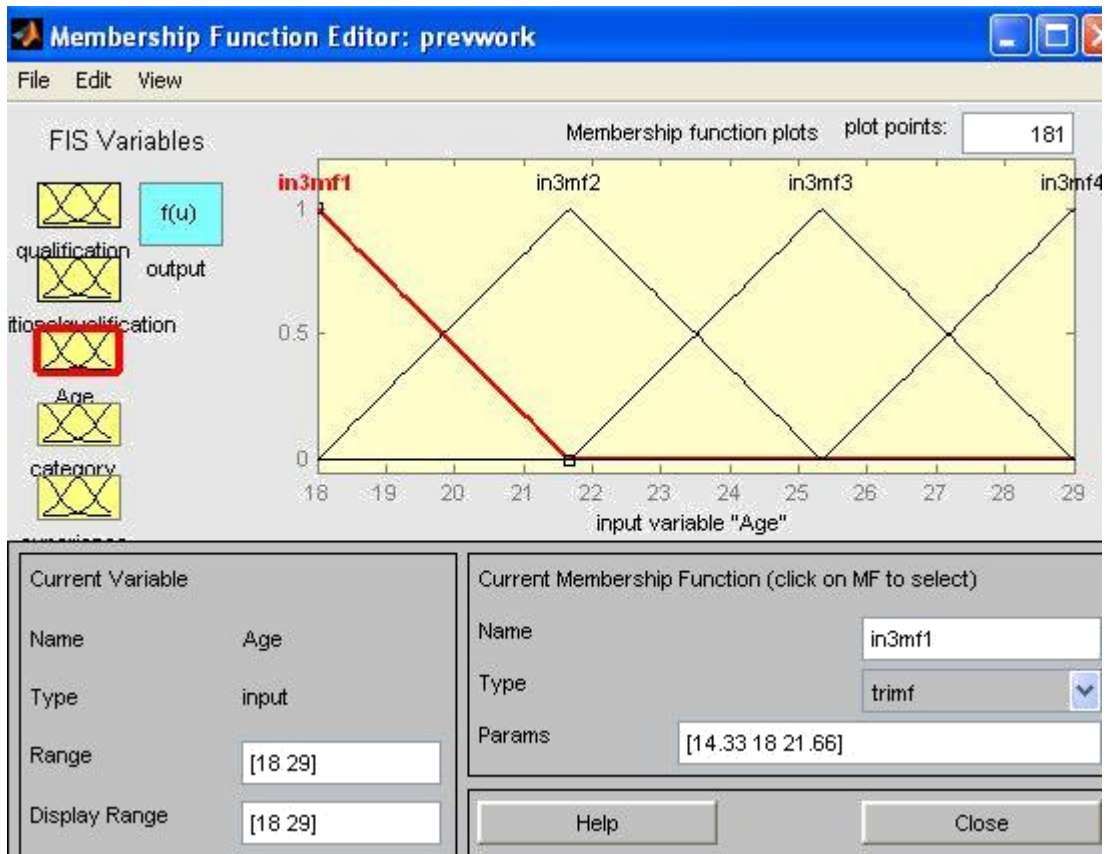


Figure 3. 5 FIS Input variable Age MFs

The figure 3.5 shows the membership function of the variable third Age , It is the trimf i.e triangular type of the membership functions and the range is 18 to 29

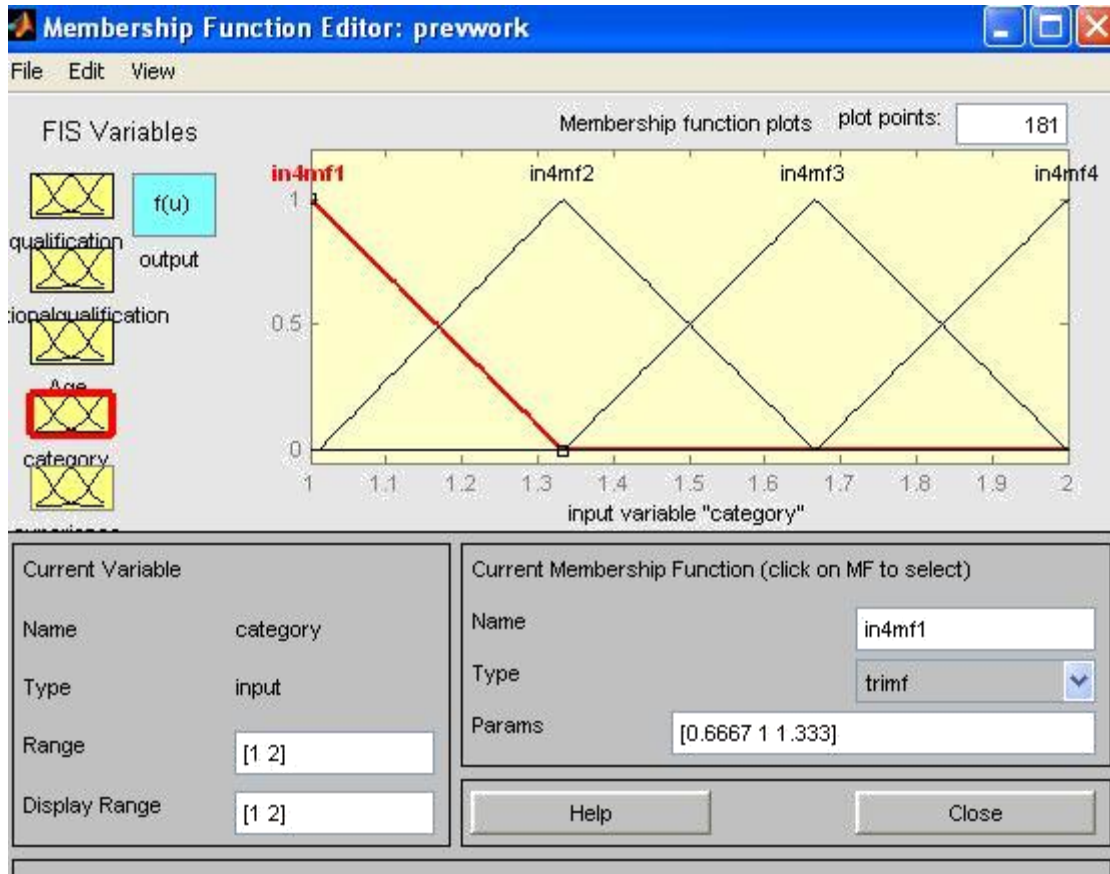


Figure 3.6: FIS Input variable category MFs

The figure 3.6 shows the membership function of the variable fourth category , It is the trimp i.e triangular type of the membership functions and the range is 1 tp 2

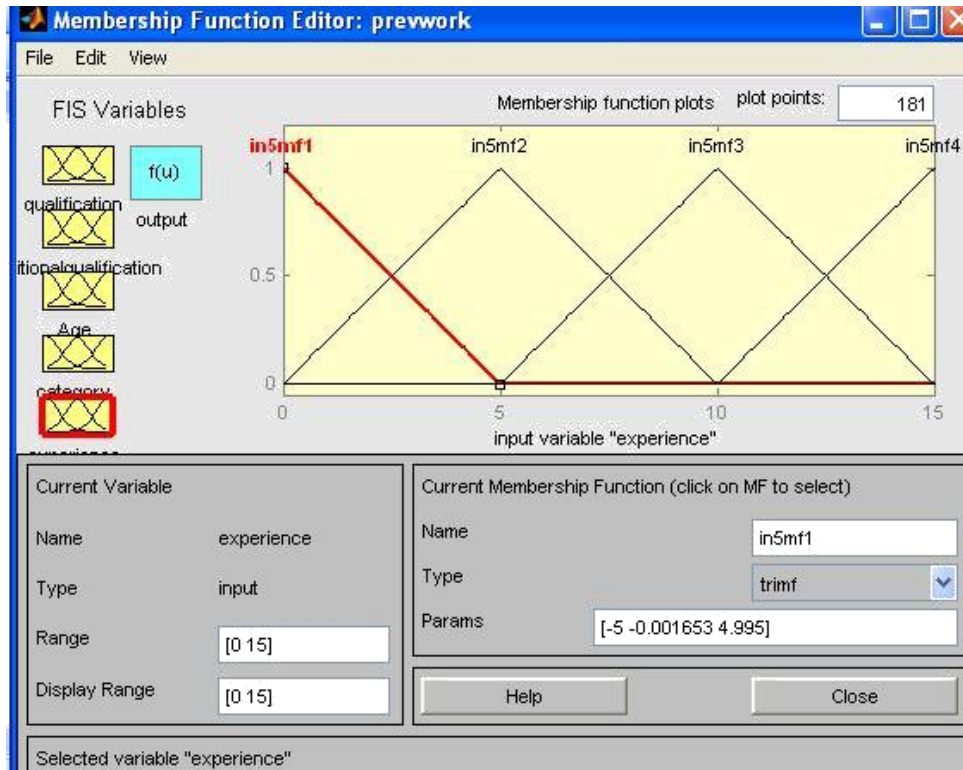


Figure.3.7: FIS Input variable Experience MFs

The figure 3.7 shows the membership function of the variable fifth category , It is the trimp i.e triangular type of the membership functions and the range is 0 to 15

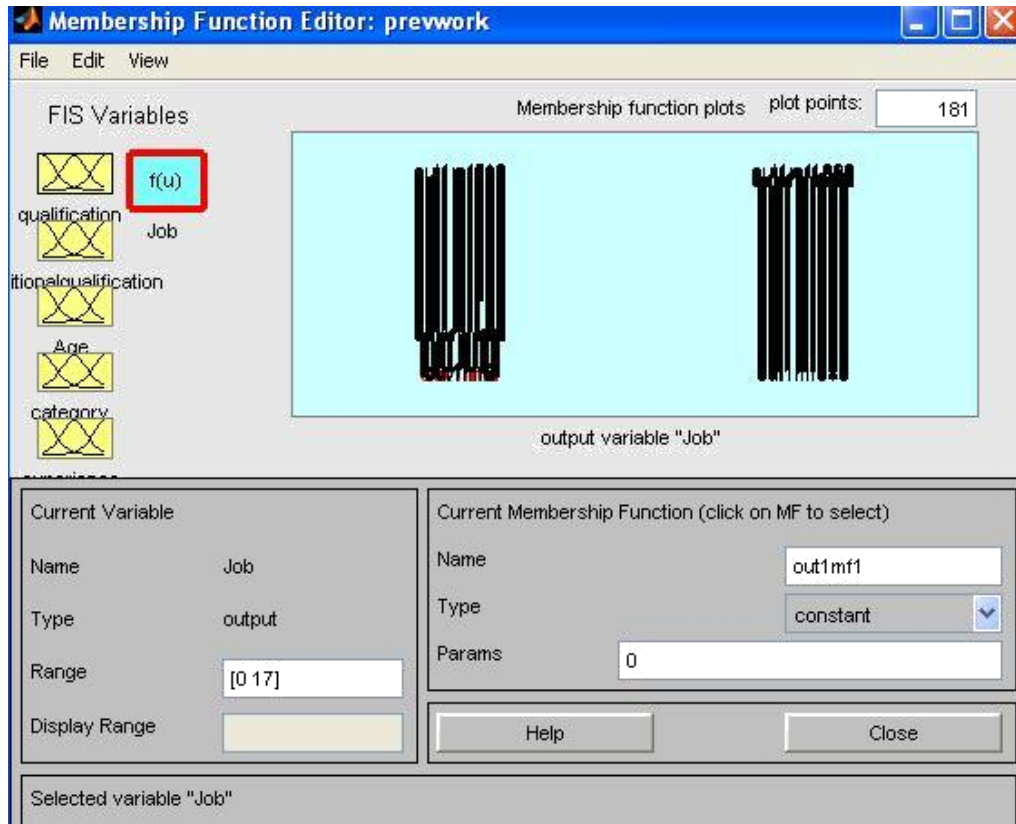


Figure 3. 8 :FIS Input variable Output (job) MFs

The figure 3.8 shows the membership function of the variable output (job) , It is the linear types of the membership functions and the range is 0 to 17.

3.4.2 Fuzzy Rule base

Rules are the base part of the FIS and quality of results in fuzzy system depends on the fuzzy rules. It is the structure to form the statement which give the result after the concept is true or not.

Syntax: - If <condition > then <result>

Like if you are intelligent and got good marks then you can got scholarship

3.3.3 Fuzzification and defuzzification

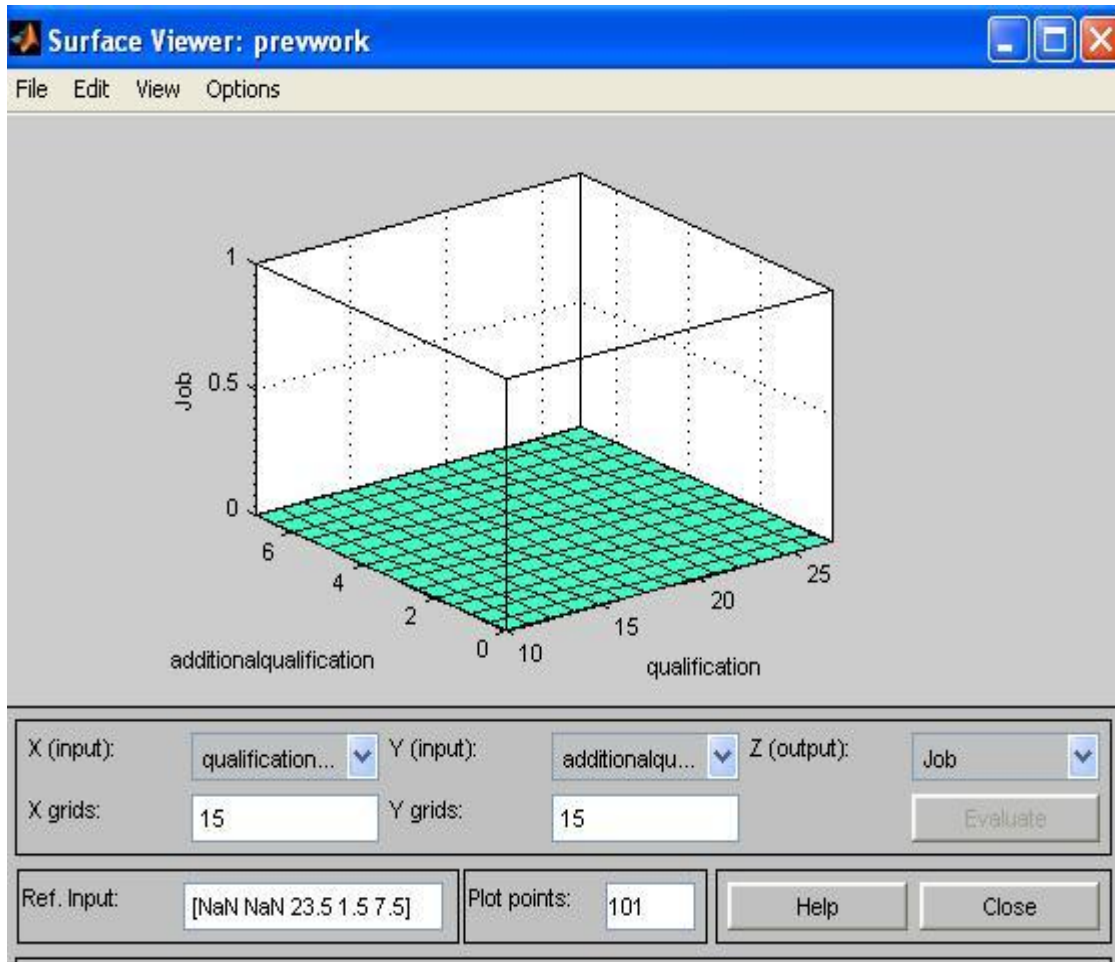


Figure 3.9: FIS Surface viewer of inputs

3.4.3 System Testing

The design system testing is shown in the figure 3.9. The result obtained has been compared with the results of the job matching profile and found that there is 50% average error.

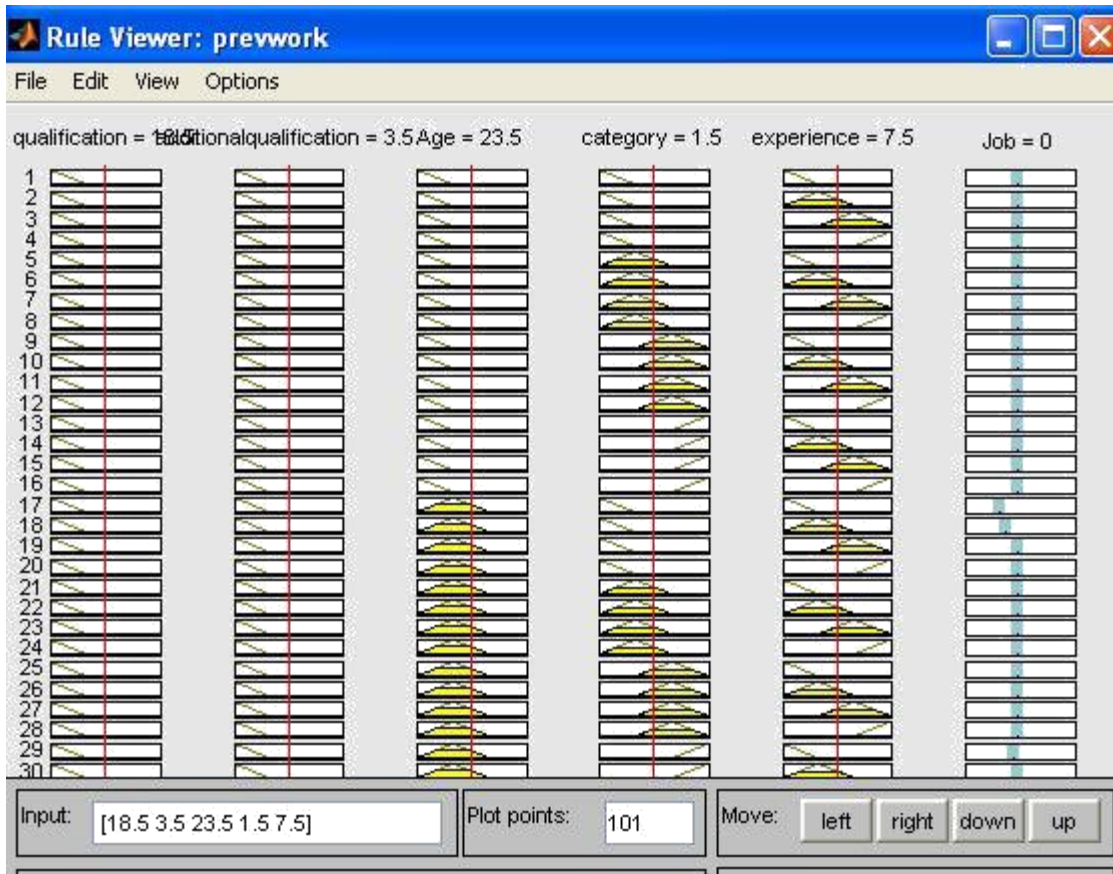


Figure 3.0.10 Rule viewer of FIS model testing

```
fismat=readfis('prevwork.fis')
```

```
fismat =
```

```
    name: 'prevwork'
```

```
    type: 'sugeno'
```

```
    andMethod: 'prod'
```

```
    orMethod: 'probor'
```

```
    defuzzMethod: 'wtaver'
```

```
    impMethod: 'prod'
```

```
    aggMethod: 'sum'
```

```
    input: [1x5 struct]
```

```
output: [1x1 struct]
rule: [1x1024 struct]

>>out=evalfis([13 6 25 1 4],fismat)
out = 9.4620

>> out=evalfis([13 6 24 1 5],fismat)
out = 9.9999

>> out=evalfis([13 6 24 2 0],fismat)
out = 10.9999

>> out=evalfis([13 6 24 1 0],fismat)
out = -4.5294e-007

>> out=evalfis([12 3 24 1 4],fismat)
out = 2.0001

>> out=evalfis([12 0 25 2 0],fismat)
out = 11.6541

>> out=evalfis([12 3 25 1 4],fismat)
out = 4.4887
```

3.5 Experiment 2 (ANFIS)

ANFIS is the multilayered system having different nodes and functions to tune parameters of the rules using a hybrid learning mode. An adaptive network is a multi-layer feed forward system in which each layer performs a particular function on the coming output of previous layer. No weights are associated with layer of output and the layers just indicate the flow

3.5.1 Input Data

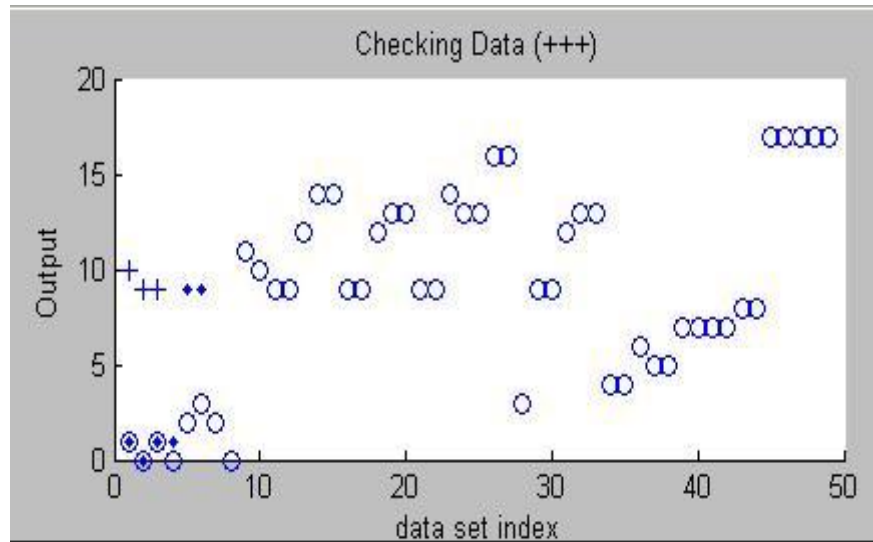


Figure 3.11: loaded data into ANFIS

Circles are represented training data

Dots are represented checking data

Plus sign are represented testing data

3.5.2 Generate FIS

For the FIS generation there are the three ways but I selected the grid partitioning because this is best suited to reduce the error and it is very best for the inputs which I used in this study.

The grid partitioning is the way in which the number of rules increase with increase in the MFs.

There is the wider range of the uses of the grid partitioning.

Figures 3.11 and figure 3.12 uses to show the MFS of the ANFIS

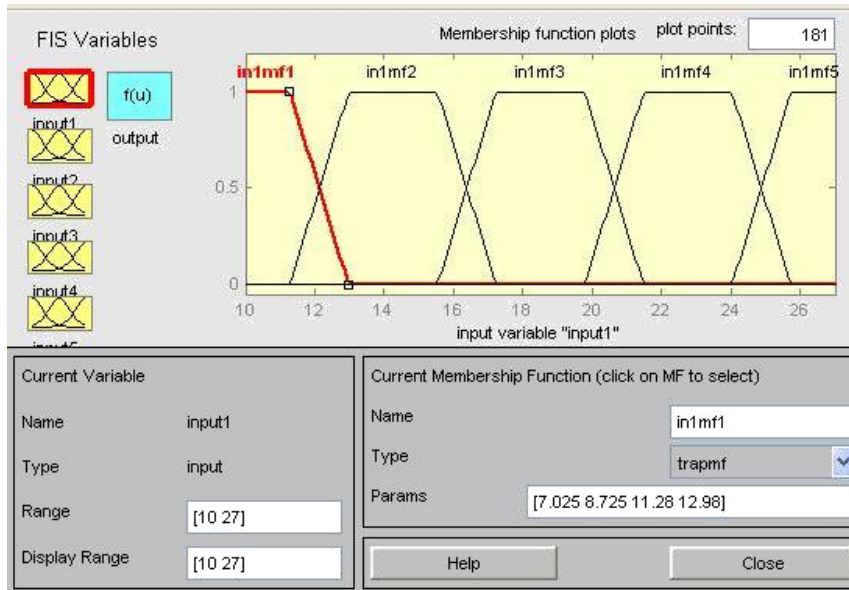


Figure 3.12: Tuned MFs of Input 1 in ANFIS

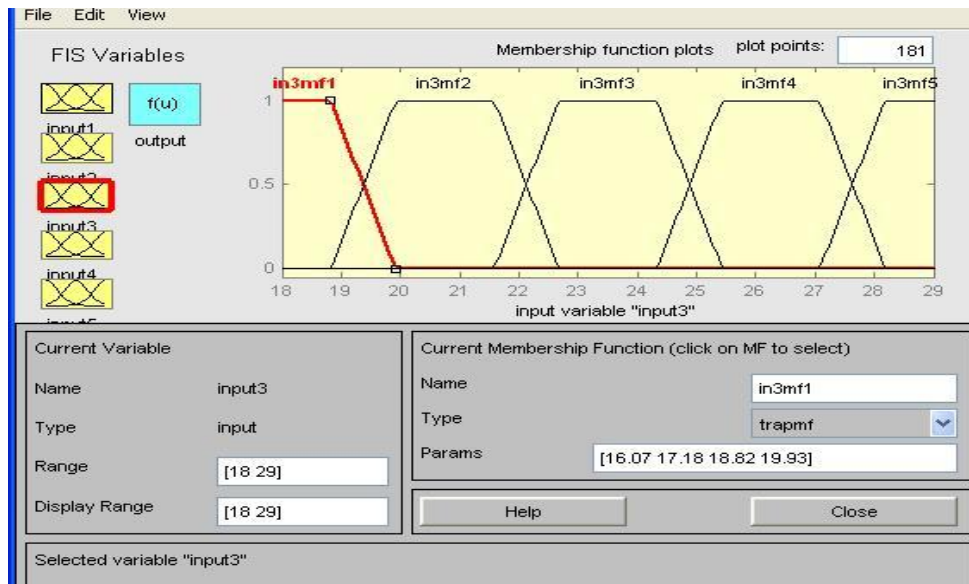


Figure 3.13: Tuned MFs of Input 2 in ANFIS

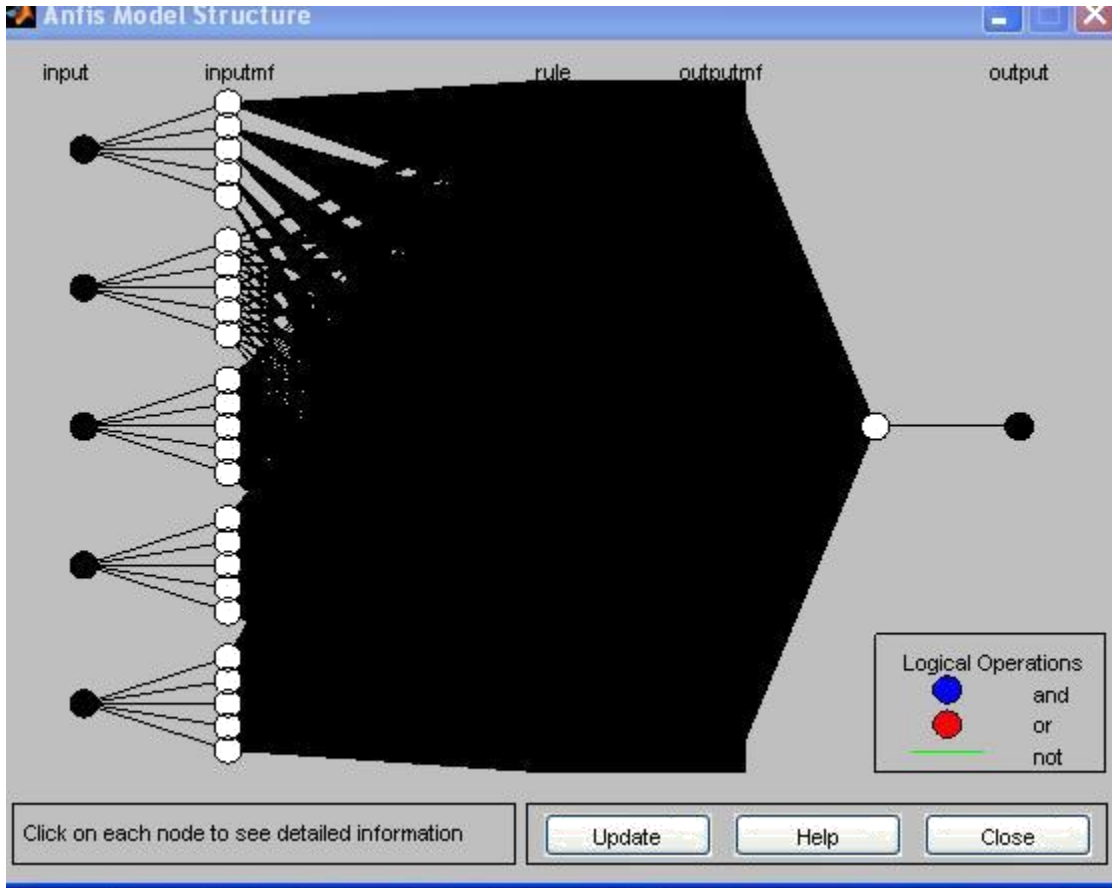


Figure 3.13: Structure of ANFIS

The figure 3.13 is the model structure of the ANFIS shows that there are five input variable in the first layer and the results are forwarded and the membership functions are checked and after passing through the layer 3 and 4 . the fifth layer is the defuzzification layer and gives the output at the last layer.

3.5.3 Train and test ANFIS

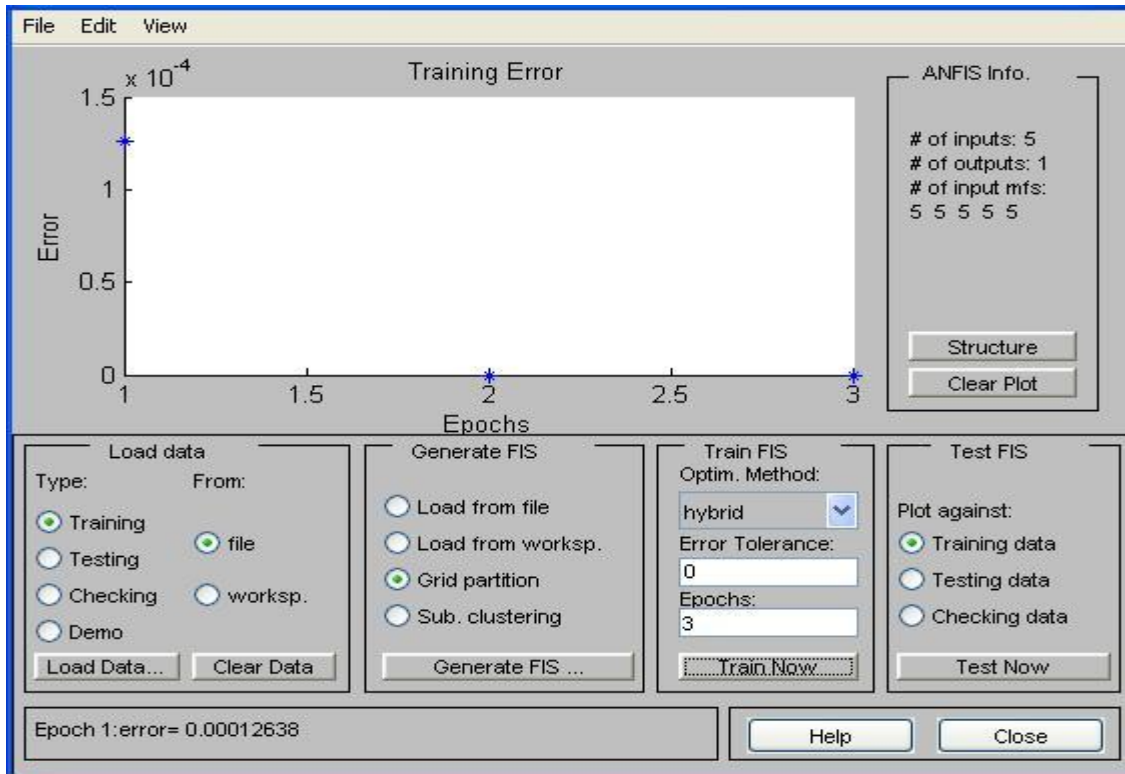


Figure 3.14: testing of ANFIS

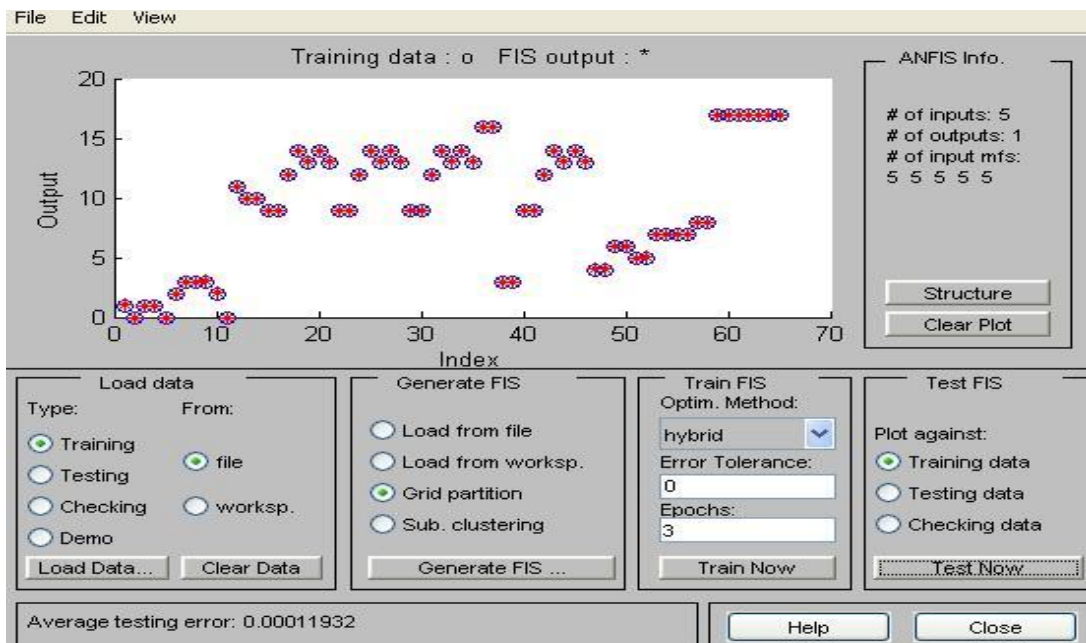


Figure3. 15Training ANFIS

Start training ANFIS ...

1 0.000126379

2 0.000119321

Designated epoch number reached --> ANFIS training completed at epoch 2.

```
>> fismat=readfis('mywork.fis')
```

```
>> out=evalfis([13 6 25 1 4],fismat)
```

```
out = 10.0000
```

```
>> out=evalfis([13 6 24 1 5],fismat)
```

```
out = 10.0000
```

```
>> out=evalfis([13 6 24 2 0],fismat)
```

```
out = 11.0000
```

```
>> out=evalfis([13 6 24 1 0],fismat)
```

```
out = 0
```

```
>> out=evalfis([12 3 24 1 4],fismat)
```

```
out = 2.0000
```

```
>> out=evalfis([12 0 25 2 0],fismat)
```

```
out = 3.0000
```

RESULTS AND DISCUSSION

4.1 Results of Experiment 1 (FIS)

The table 4.1 shows the output of suitable job based upon the given input and the FIS output is the result given by the FIS system. There are some of the wrong results generated by the system.

Table 4.1:Results of FIS testing

1	A	B	C	D	E	F	G	H	I
	Input					Output		FIS Output	Result
2	Qualification	Additional Qualification	Age	Category	Experience	Job		Job	
3	10	0	23	1	2	1		0.9998	Yes
4	10	5	18	1	2	0		8.22E-11	No
5	10	0	23	2	0	1		1	yes
6	10	5	23	2	0	1		6.4722	No
7	10	1	18	1	5	0		-7.42E-08	No
8	12	0	23	1	2	2		2.003	Yes
9	12	0	23	2	3	3		3	Yes
10	12	3	25	1	4	3		4.4887	No
11	12	0	25	2	0	3		11.654	No
12	12	3	24	1	4	2		2.0001	Yes
13	13	6	24	1	0	0		-4.53E-03	No
14	13	6	24	2	0	11		9.1187	No
15	13	6	24	1	5	10		9.9999	Yes
16	13	6	25	1	4	10		9.462	No
17	14	7	27	1	4	9		8.999	Yes
18	14	7	27	2	2	9		8.999	Yes
19	14	1	26	1	2	12		11.9996	Yes
20	14	1	26	1	5	14		14	Yes
21	14	2	26	1	3	13		11.5021	No
22	14	1	25	2	0	14		13.9999	Yes
23	14	2	25	2	0	13		11.3063	No

The table 4.1 shows that there is only 11 output of FIS is corrected out of 22.

Input/Output data = 22 candidates

Correct answer = 11 times

Average testing = $(22 / 11) * 100 = 50 \%$

4.2 Results of experiment 2 (ANFIS)

The ANFIS has the adaptive nature and neuron works in the system which helps to give the results always rights with very negligible error . As the figure 4.1 shows that the average testing error of ANFIS is very less.

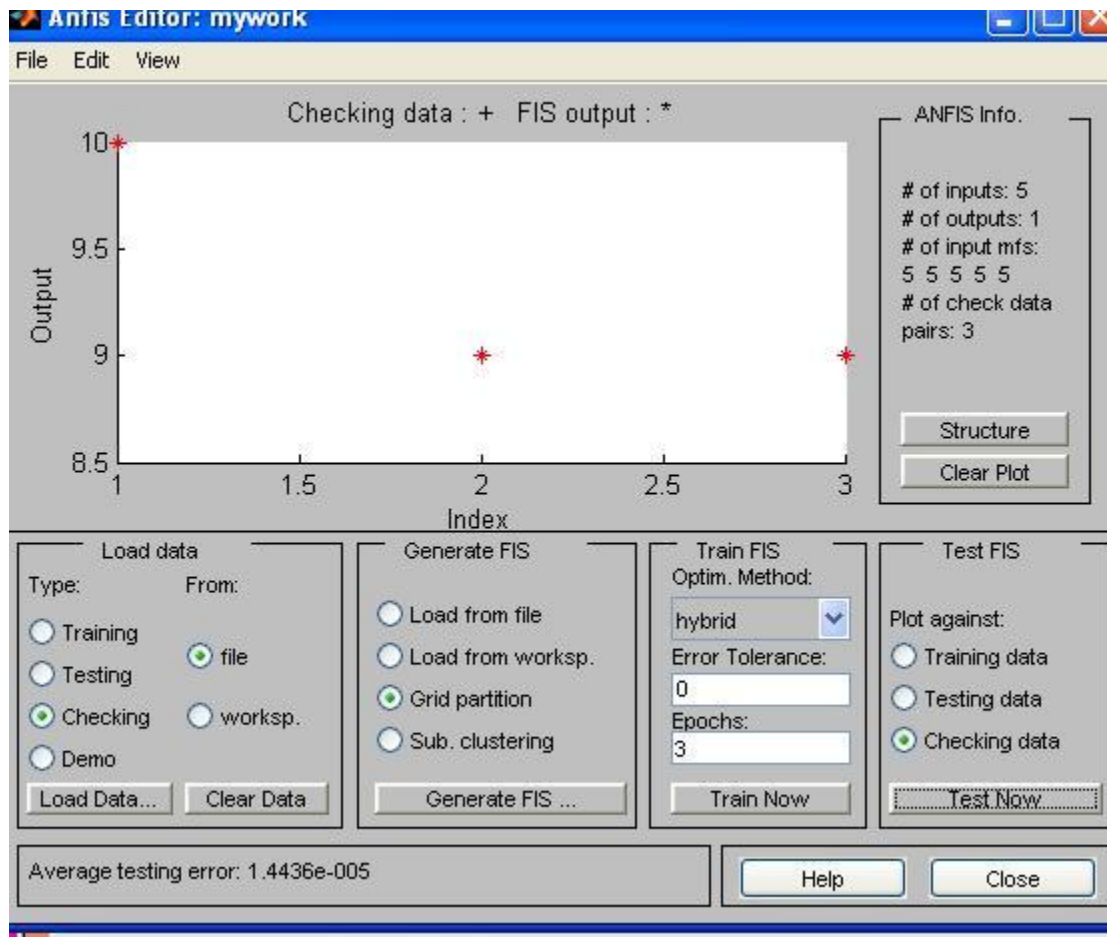


Figure 4.1: Results of ANFIS

The results of both the system after testing shows that the average testing of the fuzzy system is about 50% and the ANFIS reduced the error and the average testing error of the system is about 0.00011 only.

CONCLUSION AND FUTURE WORK

This system helps in finding the job matches to an unemployed person based upon certain criteria. The job detected corresponding to each attribute feature and also with combination of all the attribute features form the given data. With combination of attributes, the rules results and performances of ANFIS is better than FIS.

The future work of this work is that when can add the more parameters and can gets the results.

REFERENCES

- Abe Kazemzadeh. (2010). "Using Interval Type -2 Fuzzy logic to Translate Emotion words from Spanish to English"., *IEEE, ISSN :1098-7584*.
- Aggarwal Prateek, S. S. (2014). ,"Fuzzy rule based Student's Performance analysis system", . *IEEE, 978-1-4799-2900-3-9* , Pg. 103-109.
- Behzad Nikham, K. S. (2014). "An intelligent approach to predict Fire flame length under Tunnel ceiling". *IJSER* , 106 (18):Pg. No.39-43.
- bilgehan, M. (2010). " A comparative study for the concrete compressive strength estimation using neural network and neuron-fuzzy modeling approaches", *Nondestructive Testing and Evaluation,. Internal Journal of Computer Science* .
- Busso Carlos, L. S. (2007). Neural Speech model for emotional speech analysis ". *SAIL* , Pg. No. 34-49.
- Drigas A, K. O. (2014). "An expert system for job matching of the unemployed". " *International Conference on Computer Science , Elsevier* , Pg. No. 217-224.
- Gamber Nidhi, A. P. (2013). "Fuzzy rule based Expert System for employee appraisal based on UGC guideline, 2013.". *Internal Conference of Computer Science, ELSEVIR ISBN : 978-93-5107-172-3* , Pg. No. 80-87.
- González, J. P. (n.d.). "Multiple fault diagnosis in electrical power systems with dynamic load changes using soft computing",.
- Guo Ping, T. m. (2012). "Epileptic EEG Signal Classification with ANFIS based on Harmony Search Method" . *IEEE SBN: 978-0-7695-4896-8* , Pages 690-694 .
- J.M., M. (1995). Fuzzy logic system for engineering:. *IEEE. 83(3)* , pp. 345-377.
- Jhy-Shing Roger Jang. (, 3 may/June 1993). " Adaptive network Based Interface System",. *IEEE Transactions on Systems, Man and Cybernetics Vol 23 No.*
- K Rajeswari, V. V. (2014). " Artificial Intelligence (AI) Techniques Applied for the Development of a Clinical Decision Support System (CDSS) for Diagnosing Ischemic Heart Disease (IHD)." . *International Journal of Computer Application* .

- Ke L., H.-g. M.-j. (2009). Application of Adaptive Neuro-Fuzzy Inference System to Forecast of Microwave Effect, . *IEEE Conference Publications* , pp. 1 –3.
- M.C nataraja, M. J. (2006). ” *A Fuzzy Neuro Model for Normal Concerete Mix Design*”.
- Mateou N H, A. A. (2004). ” Fuzzification and defuzzifictaion process in Genetically evolved Fuzzy Cognitive Maps (GEFCMs)” ,. *The 8th WSEAS International Conference on Circuits, Systems, Communications and Computers (CSCC)*.
- Melek Acar Boyacioglua, , D. (2010). “An Adaptive Network-Based Fuzzy Inference System (ANFIS) for the prediction of stock market return: The case of the Istanbul Stock Exchange”. *Elsevier, Expert Systems with Applications* .
- Minghen Wei, B. B. (2007.). “ Predicting injection profiles using ANFIS“ , . *Elsevier , Information Science Journal* , .
- Necaattin Barisic, E. T. (2005). ”Classification of Aorta Insufficiency and Stenosis Using N euro-Fuzzy System”. *Journal of Medical Systems* , Vol. 29, No. 2 ,Pg.No.155-164.
- P.Anuradha T. Agrawal, P. S. (7, July 2013,). ” An Expert System for Home Health Monitoring: The ANFIS Approach" . ,*International Journal of Scientific and Research Publications, Volume 3, Issue ISSN 2250-3153* .
- Ramkumar R, D. T. (2011). ” Multi Criteria Job Shop Schedule Using Fuzzy Logic Control for Multiple Machines Multiple Jobs ". *International Journal of Computer Theory and Engineering* , , Vol. 3, No. 2,ISSN: 1793-8201.
- Regina Barzilay, D. M. (2013). “A NEW APPROACH TO EXPERT SYSTEM EXPLANATIONS. *IJCS* .
- Singh Sanjay Kumar, A. P. (2013). “Fuzzy Rule based Expert system to automate university examination grading . “*International Conference on Computer Science ,Elsevier* ” , ISBN: 978-93-5107-172-3,Pg. No. 612-62.
- Sodiya A.S, O. O. (2014). ” Neural Network based Intrusion Detection Systems” . *International Journal of Computer Application* , 106 (18): 19-24.
- Song-Sen Yang and Jing Xu and Guang-Zhu yao. (2005). ” Concrete strength evaluation based on fuzzy neural networkd,” . *IEEE* , pages” 3344-3347.
- Swartout, W. (1991). ” Designfor explainable exp ert systems” . . *IEEE Expert*,6(3):59{64} .
- Tuntas, R. (2014). ” The modelling and analysis of nonlinear systems using a new expert system approach ,. *Iranian Journal of Science & Technology* ,” .

Yogesh Kumar, Y. J. (2015). "Research Aspects of Expert System" . *International Journal of Computing & Business Research ISSN (Online): 2229-6166* .