

AN AUTOMATED IMPLEMENTATION OF INDIAN UNIVERSITY ADMISSION SYSTEM USING ARTIFICIAL NEURAL NETWORKS

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Abstract

Indian University Admission is a complex phenomenon encompassing various factors both tangible and intangible. Apart from Merit - Caste, Community and Religion play a crucial role in getting admission to various courses offered by Universities. The Single Window Admission System followed by almost all Government Universities (for example: Anna University, Chennai) is, so far, the best practice to offer Admission sought by student community. But, still, in Private Universities, the Admission process is done manually since number of students seeking a course is smaller in size. This manual process is fraught with some drawbacks: such as slower in time, cumbersome and costlier, bias by the Admission Officer, manual errors while processing, due to influence exercised by powerful people qualified students not getting their course of choice and unqualified students getting into their course of willingness and etc. This paper addresses these problems via neural network architecture based Admission system which will eliminate all the pitfalls and drawbacks inherent in the current system and offers a smooth, clearer, easier and cost effective way of student admission system implementation in Indian Universities.

Keywords:

Artificial Neural Network, Back Propagation Neural Network, Indian University Admission System, Automated Admission Process, Basic Artificial Neuron

1. INTRODUCTION

Indian Education system starts from the Vedic age where Gurukul style of system was followed. In that the students (Shishyas) would go to teacher's (Guru) home and stay for a particular period of time and have their tutelage. They would be taught on both secular and spiritual matters. In turn the students would perform all house-hold activities as a service to the Guru. Gurukuls followed [6] exercises that includes Pranayam, Yogasan and Meditation. These coupled with activities to promote team spirit and self reliance made sure that students become an asset for the country. A child can become what he wants and his becoming is shaped by the environment he lives in. This was wont till the Mogul Emperors reined the country. But after the establishment of British Colonial regime and with the introduction of McCauley system of Education, a total change-over had occurred. Then the purpose of Education was to produce Clerks to assist the British Administrators helping them

in executing their jobs and hence the English Knowledge became a Must.

After Independence, Jawaharlal Nehru, the first Prime Minister of India wanted to model the India along Western Line of thinking. So he established heavy Industries at large all over the country. Then the need was on the availability of high technocrat people to run the industries which resulted in establishment of higher technical Institutions such as IITs and RECs (now NITs) and other state level Universities for both Engineering and Arts and Science fields. Now India has hundreds of Universities and thousands of Colleges affiliated to them. Apart from these there are no of Polytechnics and ITI (Industrial Training Institutes) spread all over the country.

At present, the Admission into these institutions follows certain reservation policy. Some percentage of seats is reserved based on Caste, Community, Religion, student background area, sports quota and quota for disabled. This work presents neural network based implementation of such admission system in Indian Universities.

The paper is organized as follows. Section 1 gives the Introduction. Section 2 gives the idea behind the neural network concepts. Section 3 gives the related work. Section 4 describes the neural network based admission system architecture. Section 5 explains the performance evaluation and results. Section 6 concludes.

2. NEURAL NETWORK

Artificial neural networks abbreviated as ANN, mimic the biological brain of the human body system. In its functioning, they are modeled after biological brain neuron. As with the neuron, they learn by the training given to it and produce output accordingly. They can extract patterns that are not visible to our naked eyes. The typical neural network [1] is constructed around a set of adaptive elements, linked through a connection matrix. The exact structure of the connection matrix, the value ranges and the interaction between neural elements vary from model to model. These structures built on the basis of adaptive elements are capable of complex learning behavior. This behavior is *self-organizing*—it is not programmed or governed by an internal central processing unit (Kohonen, 1987).

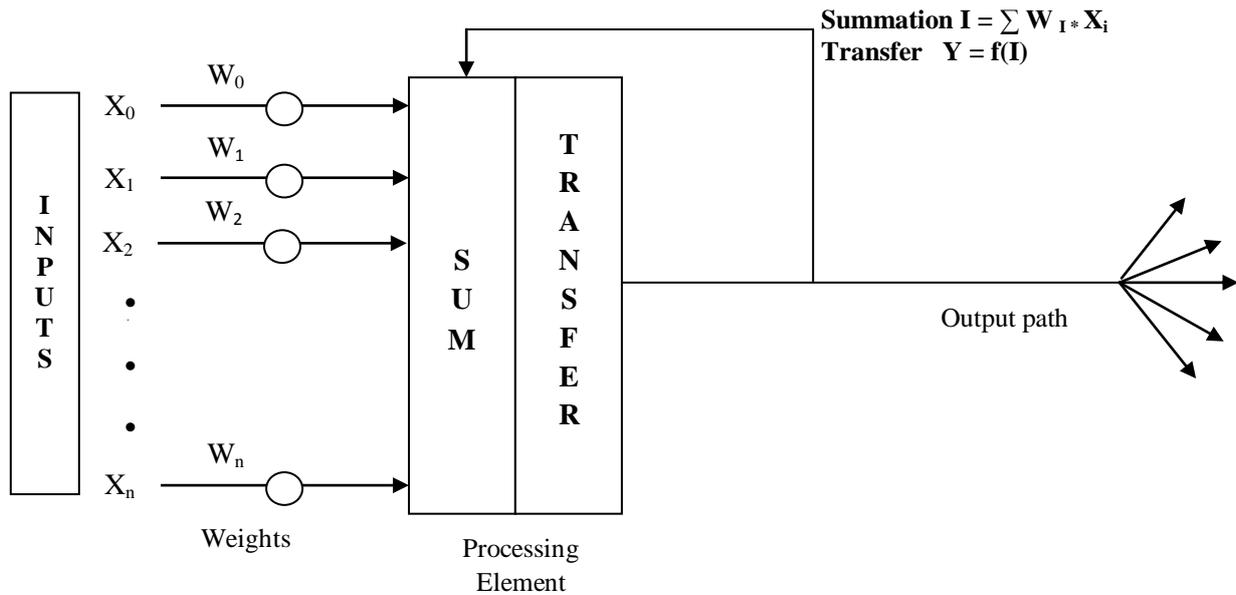


Fig.1. A Basic Artificial Neuron

In Fig.1, inputs to the network are represented by the mathematical symbol, $x(1), x(2), x(3), \dots x(n)$ and each of these inputs are multiplied by a connection weight. These weights are represented by $w(n)$. These products are simply summed, sent through a transfer function to generate a result. A functional model of the biological neuron is based on three basic components of importance. First, the synapses of the neuron are modeled as weights whose value gives the strength of the connection between an input and a neuron. Negative weight values shows inhibitory connections and excitatory connections are given by positive values. The next component, an adder sums up all the inputs modified by their respective weights. This activity is known as linear combination. And an activation function controls the amplitude of the output of the neuron is the last. An acceptable range is usually between 0 and 1, or -1 and 1.

In feed Forward architecture, there are 3 layers, namely, input layer where neuron receives signals from the environment, output layer whose neurons gives the output and a middle layer called hidden layer which process the signal arriving from the input layer and gives its output to the output layer through an activation function.

In back propagation supervised learning neural network architecture, the difference between the desired output and available output in the output layer is fed back into the input layer which modifies the connection weight values to obtain the desired output.

3. THE RELATED WORK

Simon Fong and Robert P. Biuk-Aghai present [2] a hybrid model of neural network and decision tree classifier that serves as the platform for a university admission recommender system. The system was modeled with live data from sources of Macau secondary school students. High prediction accuracy rate and flexibility are the main advantages of it and the system can predict suitable universities that match the students' profiles.

The recommender can be used to making different kinds of predictions based on the students' histories.

Fong S. Yain-Whar Si, Biuk-Aghai R.P (2009). The prediction of university admission [3] is a complex decision making process that is more than merely based on test scores. Students' backgrounds and other factors play a major role in their performance. The work is concerned with a hybrid model of neural network and decision tree classifier that predicts the likelihood of which university a student may enter, based on his academic merits, background and the university admission criteria.

The work by Franklin Wabwoba, Fullgence M. Mwakondo [4] examines the potential use of artificial neural networks at the Joint Admission Board JAB for the processing students' admission in Kenyan Universities. The various metrics coded are used as inputs to the ANNs. The ANN Architecture developed enhances the chances of students being getting into courses they prefer according to the merit. It also results in cost-cutting and takes less time for application processing.

In their model T.O.S. Adewale, A.B. Adebisi and Solanke [5] presents a time-efficient, detailed, and unbiased automated procedure for selecting the most qualified candidates for admission into universities. It is also ensured that candidates who do not qualify to meet the criteria for their chosen course are automatically considered for alternative available courses, provided there are vacant positions, and offers an avenue for a candidate self-screening admission system.

4. INDIAN UNIVERSITY ADMISSION SYSTEM DESIGN

The determining factors for Indian University Admission system are: Stream (i.e.,CBSC, Matriculation, State Board), Community such as OC / BC / MBC / OBC / SC / ST /, Age Limit (between 18 to 20), marks scored in Qualifying Exam (the eligible marks for OC is 50%, BC / OBC / MBC / SC / ST is

40%), marks scored in Entrance Exam (either administered by Government such as AIEEE or conducted by respective universities) and background Place, for example in our SCSVMV university the order of preference given as per hailing place is: 1. Local, 2. Chennai, 3. Tamil Nadu, 4. (Kerala / Karnataka / Maharashtra / Delhi), 5. North Indian Block (Jharkhand / West Bengal / Bihar / Madhya Pradesh / Uttar Pradesh, 6. Andhra Pradesh.

The Applications are received in the month of May/June every year and put to scrutinizing. If they are eligible then they are accepted otherwise rejected. As per the demand of the branches offered, the order of preference of a branch is also fixed. Then the students are called for interview on a allotted

date and branch of their choice is given to them, if eligible and available, otherwise they can go for alternative branch.

The Neural Network based Admission system architecture is given below.

It has 6 input layers, 2 hidden layers and 1 output layer. It has got the following categorical input data: Stream, Community, Age, Qualifying exam marks, Entrance Exam marks and background place. These set of input pattern is processed by neural network and if eligible, the branch required by the candidate is given, otherwise, the order of branches available is displayed from which he / she can choose the alternative branch.

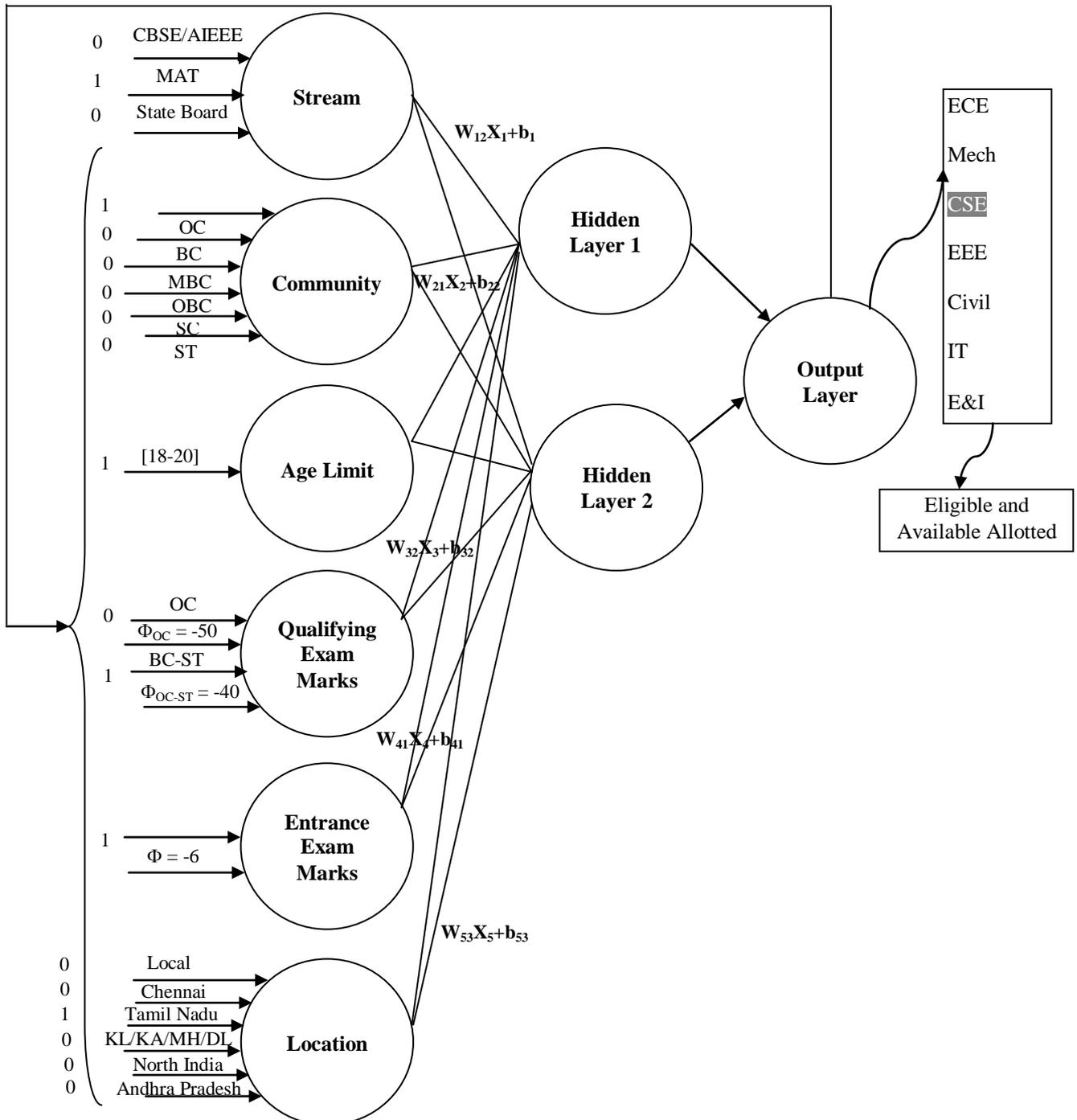


Fig.2. Artificial Neural Network based Indian university Admission System Architecture

For example

If Inputs are:

- ((0,0,1), (0,1,0,0,0,0), (1), (1), (1), (1,0,0,0,0,0)) → Branch CSE
- ((0,0,1), (0,0,0,0,0,1), (1), (1), (1), (0,0,1,0,0,0)) → Branch IT
- ((0,1,0), (1,0,0,0,0,0), (1), (1), (1), (0,1,0,0,0,0)) → Branch E&I
- ((0,0,1), (0,0,0,1,0,0), (1), (1), (1), (0,0,0,0,0,1)) → Branch CSE
- ((1,0,0), (0,0,0,0,0,1), (1), (1), (1), (0,1,0,0,0,0)) → Branch MECH
- ((0,1,0), (0,0,1,0,0,0), (1), (1), (1), (0,1,0,0,0,0)) → Branch ECE
- ((0,1,0), (0,0,1,0,0,0), (0), (1), (1), (0,1,0,0,0,0)) → Age Limit Violation
- ((0,1,0), (1,0,0,0,0,0), (1), (0), (1), (0,1,0,0,0,0)) → Qualifying marks violation
- ((0,1,0), (1,0,0,0,0,0), (1), (1), (0), (0,1,0,0,0,0)) → Entrance Exam marks Violation

The total number of seats allotted for a particular branch is fixed and also percentage of seats within it for particular quota. Hence a counter is fixed and it monitors the number of current available seats. If the seats are exhausted then counter displays the message “seats for a particular branch and particular quota are over”.

5. PERFORMANCE EVALUATION AND RESULT

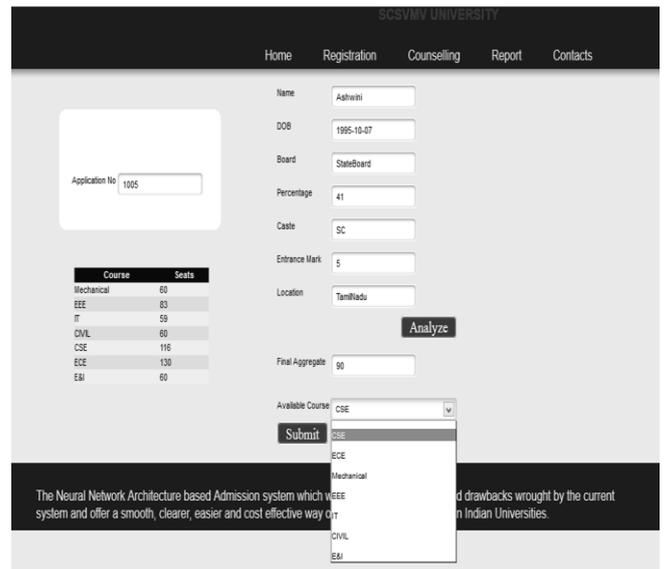
The system is implemented in a simulated software environment called UASS (University Admission System Software) in our SCSVMV (Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya) University Kanchipuram, Tamil Nadu, India for the Academic year 2014-2015 for engineering courses. The same set of Input parameters as shown in Fig.2 is considered. The order of preference of branches by the students is: ECE, MECH, CSE, EEE, CIVIL, IT and E&I. Totally we considered and tested applications from various parts of the country. The result shows that back propagation network works better and overcomes all the drawbacks of the manual operation. A comparison between manual and back propagation neural network is shown in Table.1.

Table.1. Performance Evaluation of University Admission System Architecture

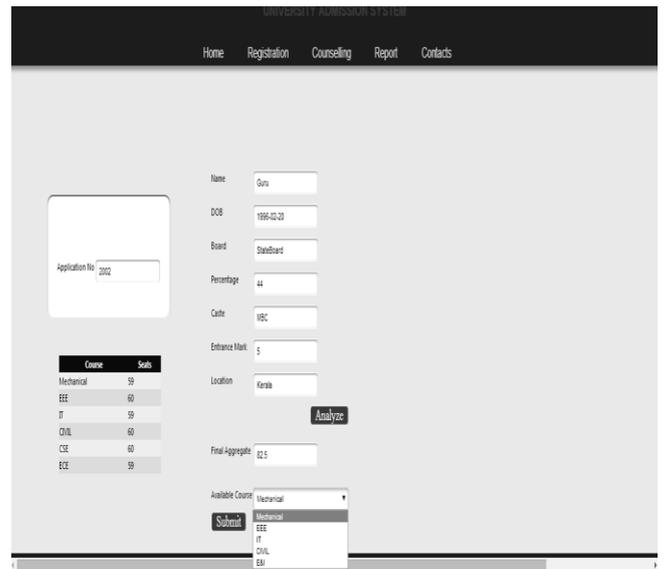
| Parameters | Network tested manually | Network tested without Back-Propagation | Network tested with Back-Propagation |
|-----------------------|-------------------------|---|--------------------------------------|
| Accuracy of Selection | 90.00% | 95.00% | 99.00% |

6. SCREEN SHOTS

a) Course Admission for Final aggregate > 85



b) Course Admission for 70 < Final aggregate < 85



c) Course Admission for Final aggregate < 70

UNIVERSITY ADMISSION SYSTEM

Home Registration Counselling Report Contacts

Name: shresh

DOB: 1999-03-20

Board: Stateboard

Percentage: 54

Caste: OC

Entrance Mark: 5

Location: Andhra

Final Aggregate: 69

Available Course: IT

Submit

| Course | Seats |
|------------|-------|
| Mechanical | 50 |
| ECE | 60 |
| IT | 50 |
| CIVIL | 60 |
| CSE | 60 |
| ECE | 50 |

7. CONCLUSION

This work presents the automated neural network based implementation of offering admission into various courses in Indian Universities. The back propagation neural network performance is better compared to the manual execution of the system. It is best suited, more accurate, less costly and has high processing speed.

ACKNOWLEDGEMENT

I sincerely thank our SCSVMV University management for its constant support and Mr. L. Ganesh, Lab Instructor, Department of Computer Science and Engineering for his valuable help in producing this manuscript. I also thank my

students Mr. B. Balakrishnan and Mr. R.N. Bharathwajan for developing the UASS.

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