ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
*(An ISO 3297: 2007 Certified Organization)*
**Vol. 5, Issue 4, *April* 2017**

# Calculating Student Performance of Jagannath University Using Artificial Neural Network

*Md. Tanjil Sarker[1], Md. Al Mamun Sarker[2], Dr. Uzzal Kumar Acharjee[3]

[1]Department of Computer Science and Engineering, Jagannath University, Bangladesh
[2]Department of CSE, Daffodil International University, Bangladesh
[3]Chairman & Associate Professor, Dept. of CSE, Jagannath University

**ABSTRACT:** In this paper an Artificial Neural Network (ANN) display, for estimating the execution of a sophomore understudy selected in designing majors in the Faculty of Science in Jagannath University of Bangladesh was created and tried. Various variables that may conceivably impact the execution of an understudy were illustrated. Such elements as higher secondary school score, score of subject, for example, Math I, Math II, Electrical Circuit I, and Electronics I taken amid the understudy first year, number of credits passed, understudy aggregate review point normal of first year, sorts of secondary school went to and gender orientation, among others, were then utilized as information factors for the ANN demonstrate. A model in light of the Multilayer Perceptron Topology was created and prepared utilizing information spreading over five eras of alumni from the Computer Science and Engineering Department of the Jagannath University, Dhaka Bangladesh. Test information assessment demonstrates that the ANN model can effectively foresee the execution of over 80% of forthcoming understudies.

**KEYWORDS**: Jagannath University, Artificial Neural Networks, Student performance, ANN, Education, Predictive Model.

## I. INTRODUCTION

The principle target of the understudy execution forecast framework is to decide understudies who might be normal do well in the Faculty of Science in Jagannath University. The nature of understudies selected into any university impacts the exploration and preparing level inside the university, and besides, overall affects the advances of the nation itself, as these understudies may turn into key players in the issues of the nation in a wide range of the economy. In Jagannath University, understudies get admitted to the Department of Computer Science and engineering in the Faculty of Science after they effectively passed the logical branch of the higher secondary school with no less than 70%, understudies are required to concentrate their first year without getting a noteworthy in engineering yet. Once the understudy completed the first year, he or she can major in either Computer and Communication Engineering or ICT. An understudy can major in one of the Engineering major in the event that he/she fulfil particular prerequisites, for example, Higher secondary school score, number of credits completed, pass a few subjects in the first year, for example, Math, Electrical Circuits, and Electronics. It ought to be noticed that this module of anticipating understudy execution will help in distinguishing which understudy perhaps will prevail with regards to examining Engineering programs. Henceforth this review adopts an Engineering strategy to make the procedure an understudy choosing Engineering real more powerful and effective. Particularly the review looks to investigate the likelihood of utilizing an Artificial Neural Network model to foresee the execution of an understudy before he/she begins his/her sophomore year in building considers. Actually one expects the execution of an understudy to be some sort of capacity with various variables (contentions) including his experience and knowledge. It is then again obvious that it will be quite troublesome finding a scientific model that may enough models this execution/elements relationship. Be that as it may one practical approach for foreseeing the execution of an understudy may be by concentrate his authentic information of past understudies experience and their related exhibitions. A practical approach to this type of problem is to apply common regression analysis in which historical data are best fitted to some function. The result is an equation in which

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
(An ISO 3297: 2007 Certified Organization)
Vol. 5, Issue 4, April 2017

each of the inputs xj is multiplied by a weight wj; the sum of all such products and a constant θ, then gives an estimate of the output $y = \Sigma\, wjxj + \theta$ , where j=0..n.

The issue here is the multifaceted nature of choosing an appropriate capacity equipped of catching all types of information relationship and in addition consequently conforms yield if there should be an occurrence of additional data, on the grounds that the execution of a competitor is controlled by various variables, and this control/affiliation is not going to be any clear understood relapse demonstrate. An artificial neural network, which imitates the human brain in taking care of an issue, is a more typical approach that can handle this sort of issue. In this manner, the endeavor to set up a versatile framework, for example, Artificial Neural Network to anticipate the execution of an understudy in light of the result of these variables.

The aims of this study are:

- To recognize some reasonable elements that influences an understudy execution,
- To change over these components into structures suitable for a versatile framework coding.
- To demonstrate an Artificial Neural Network that can be utilized to anticipate an understudy execution in view of some foreordained information for a given understudy.

## II. LITERATURE REVIEW

Kanakana and Olanrewaju [11] utilized Artificial Neural Network and straight relapse models to anticipate understudy execution after access to advanced education. Information got from the Tshwane University of Technology was used for the review. The aggregate Average Point Scores (APS) understudies got in review 12 was utilized as info variable. The outcomes demonstrated a superior understanding between ANN show expectation and watched values contrasted with those in the straight relapse. Kyndt et al. in their review anticipated general scholastic execution in the main lone ranger year instructive sciences, in view of understudies' inspiration, ways to deal with learning, working memory limit and consideration utilizing a neural system examination. Members in this review were 128 college understudies. Comes about demonstrated that working memory limit and consideration are both great indicators of scholarly execution, particularly generally advantageous and weakest entertainers of the gathering. Understudies' inspiration and ways to deal with learning were great indicators for the gathering of understudies whose execution was in the center 60% [12]. Mukta and Usha completed an examination to foresee the scholastic execution of business college graduates utilizing neural systems and conventional factual methods and the outcomes were contrasted with assess the execution of these procedures. The fundamental builds in conventional business college educational programs were likewise distinguished and its importance with the different components of confirmation process was exhibited [13]. Stamos and Andreas displayed a model utilizing a counterfeit neural for anticipating understudy graduation results. The system was produced as a three-layered perceptron and was prepared utilizing the back engendering standards. For preparing and testing different examinations were executed. In these investigations, a specimen of 1,407 profiles of understudies was utilized. The example spoke to understudies at Waubonsee College and it was isolated into two sets. The main arrangement of 1,100 profiles was utilized for preparing and the staying 307 profiles were utilized for testing. The normal consistency rate for the preparation and test sets were 77% and 68%, individually [14].

In [6] Authors had modified the route table of AODV adding power factor field. Only active nodes can take part in rout selection and remaining nodes can be idle. The lifetime of a node is calculated and transmitted along with Hello packets. In [7] authors considered the individual battery power of the node and number of hops, as the large number of hops will help in reducing the range of the transmission power. Route discovery has been done in the same way as being done in on-demand routing algorithms. After packet has been reached to the destination, destination will wait for time δt and collects all the packets. After time δt it calls the optimization function to select the path and send RREP. Optimization function uses the individual node's battery energy; if node is having low energy level then optimization function will not use that node.

## III.THE ARTIFICIAL NEURAL NETWORKS

The structure of artificial neural networks depended on the present comprehension of organic neural frameworks. The calculation is accomplished by thick interconnection of basic preparing units. To depict the traits of registering, the manufactured neural systems pass by many names, for example, connectionist models, parallel circulated processors, or self-sorting out framework. With such elements, a counterfeit neural framework has incredible potential in performing applications, for example, discourse and picture acknowledgment where extreme calculation should be possible in parallel and the computational components are associated by weighted connections. The simulated neuron, the most

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
(An ISO 3297: 2007 Certified Organization)
Vol. 5, Issue 4, April 2017

crucial computational unit, is displayed in light of the fundamental property of an organic neuron. This sort of preparing unit performs in two phases: weighted summation and some kind of nonlinear capacity. It acknowledges an arrangement of contributions to produce the weighted total, and then passes the outcome to the nonlinear capacity to make a yield. Dissimilar to artificial neural networks, which have settled guidelines to perform particular calculations, the manufactured neural system should be educated and prepared to work effectively. The favourable position is that the neural network can learn new information yield designs and alter the network parameters. Such learning can dispose of determining guidelines to be executed for calculations. Rather, clients essentially supply proper example input-yield examples to the system.

An Artificial Neural Network (ANN) is an arithmetical model that is inspired by the association and additionally utilitarian element of natural neural systems. A neural system contains an interrelated arrangement of counterfeit neurons, and it forms data utilizing a connectionist shape to calculation. When in doubt an ANN is a versatile framework that alters its structure in view of outer or inward data that goes through the system amid the learning procedure. Late neural systems are non-straight numerical information demonstrating instruments. They are generally used to display multifaceted connections among information sources and yields or to reveal designs in information. ANN has been connected in various applications with significant achievement [7-8]. For instance, ANN have been successfully connected in the zone of expectation, written by hand character acknowledgment, assessing costs of cabin [9-10]. Neurons are frequently assembled into layers. Layers are gatherings of neurons that perform comparative capacities. There are three sorts of layers. The information layer is the layer of neurons that get contribution from the client program. The layer of neurons that send information to the client program is the output layer. Between the input layer and output layer are hidden layers. Shrouded layer neurons are just associated just too different neurons and never specifically communicate with the client program. The info and output layers are not only there as interface focuses. Each neuron in a neural system has the chance to influence preparing. Handling can happen at any layer in the neural system. Not each neural system has this many layers. The hidden layer is discretionary. The input and output layers are required, yet it is conceivable to have on layer go about as both an input and output layer [10] ANN learning can be either supervised or unsupervised. Supervised training is accomplished by giving the neural network a set of sample data along with the anticipated outputs from each of these samples. Supervised training is the most common form of neural network training. As supervised training proceeds the neural network is taken through several iterations, or epochs, until the actual output of the neural network matches the anticipated output, with a reasonably small error. Each epoch is one pass through the training samples. Unsupervised training is similar to supervised training except that no anticipated outputs are provided. Unsupervised training usually occurs when the neural network is to classify the inputs into several groups. The training progresses through many epochs, just as in supervised training. As training progresses the classification groups are “discovered” by the neural network [9] Training is the process by which these connection weights are assigned. Most training algorithms begin by assigning random numbers to the weight matrix. Then the validity of the neural network is examined. Next the weights are adjusted based on how valid the neural network performed. This process is repeated until the validation error is within an acceptable limit [8]. Validation of the system is done once a neural network has been trained and it must be evaluated to see if it is ready for actual use. This final step is important so that it can be determined if additional training is required. To correctly validate a neural network validation data must be set aside that is completely separate from the training data [10]. About 60% of the total sample data was used for network training in this paper. About 30% of the total sample data served as test and the remaining 10% used for validation of the system.

## IV.METHODOLOGY

By looking profoundly through the writing and requesting the experience of human specialist’s on understudy execution, various elements that are considered to affect the execution of a sophomore understudy were sketched out. These components were carefully examined and synchronized into an advantageous number proper for Computer coding inside nature of the ANN demonstrating. These elements were named input factors. The output factors encapsulate some conceivable levels of execution of an understudy as far as Jagannath University review in framework.

### 4.1 The input variables

The input variables identified are those which can simply be obtained from student file and registrar system. The input variables are:

1. Higher Secondary School score,
2. Result in Math I in the understudy first year,

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
(An ISO 3297: 2007 Certified Organization)
Vol. 5, Issue 4, April 2017

3. Result in Math II in the understudy first year,
4. Result in Electrical Circuits in the understudy first year,
5. Result in Electronics I in the understudy first year,
6. Number of credits goes in the understudy first year,
7. CGPA of the first year,
8. Sort of Higher secondary whether it is private or open,
9. Area of higher secondary School, regardless of whether it is in Bangladesh or outside, and
10. Student's Gender

| S/N | Input variable | | Domain | S/N | Input variable | | Domain |
|---|---|---|---|---|---|---|---|
| 1 | Higher secondary School score | Above 80%<br>75-79<br>70-74 | 1<br>2<br>3 | 6 | Number of credits passed | 32 hours<br>26-31<br>24-25 | 1<br>2<br>3 |
| 2 | Math I | Above 85%<br>75-84<br>60-74 | 1<br>2<br>3 | 7 | CGPA of freshman Year | Above 90%<br>80-89<br>70-79<br>65-69 | 1<br>2<br>3 |
| 3 | Math II | Above 85%<br>75-84<br>60-74 | 1<br>2<br>3 | 8 | Zone of High school attended | Palestine Outside of Palestine | 4<br>1<br>2 |
| 4 | Electrical Circuit I | Above 85%<br>75-84<br>60-74 | 1<br>2<br>3 | 9 | Type of High School | Private<br>Public | 1<br>2 |
| 5 | Electronics I | Above 85%<br>75-84<br>60-74 | 1<br>2<br>3 | 10 | Gender | Male<br>Female | 1<br>2 |

**Table1:** Input Data Transformation.

These factors were converted into a format suitable for neural network analysis as shown in Table1.

**4.2 The output variable**

The output variable represents the performance of a student on graduation. The output variable is based on the current grading system used in Jagannath University. However, for the scope of this paper, the domain of the output variables represents some range of Cumulative Grade Point Averages (CGPA).

| S/N | Output Variable | CGPA |
|---|---|---|
| 1 | Excellent | 90% and above |
| 2 | Very Good | 80% and less than 90% |
| 3 | Good | 70% and less than 80% |
| 4 | Poor | 65% and less than 70% |

**Table 2:** Output Data Transformation.

Table 2 shows the classification of the output variable chosen which are in compliant with the grading system in Jagannath University in Bangladesh.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
(An ISO 3297: 2007 Certified Organization)
Vol. 5, Issue 4, April 2017

## V. DESIGN OF THE NEURAL NETWORKS

### 5.1 Network Architecture

The network is a multilayer perceptron neural network using the linear sigmoid activation function as seen in Figure 1.

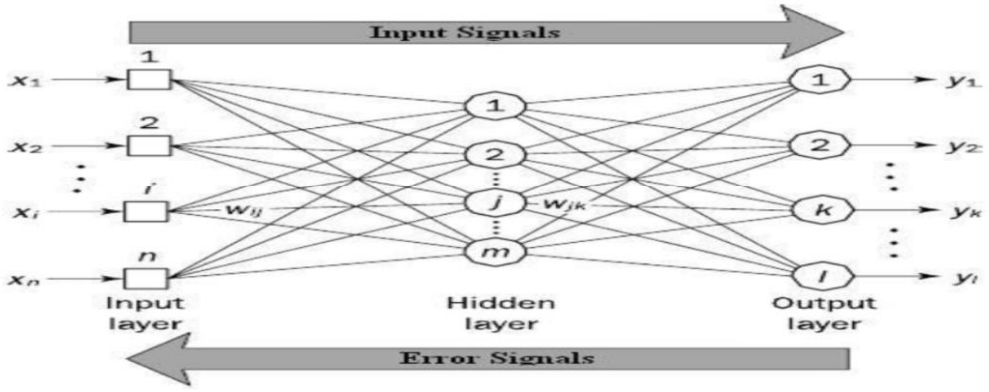


**Figure 1:** Artificial Neural System Architecture.

### 5.2 The Back-propagation Training Algorithm

- Initialize each $w_i$ to some small random value
- Until the termination condition is met, Do
- For each training example <(x1,…xn),t> Do
- Input the instance (x1,…,xn) to the network and compute the network outputs ok
- For each output unit k: δk=ok(1-ok)(tk-ok)
- For each hidden unit h: δh=oh(1-oh) ∑k wh,k δk
- For each network weight wj Do
- wi,j=wi,j+ Δwi,j, where Δwi,j =η δj xi,j xi,j and η is the learning rate.

## VI. EVALUATION OF NEURAL NETWORK

As expressed before, the motivation behind this investigation was to foresee the sophomore understudy execution in the Faculty of Science. We utilized bolster forward Back spread, which gives the office to execute and test the neural network and its learning calculation. Our neural network is an encourage forward system, with Single information layer (10 inputs), a shrouded layer (6 inputs) and a solitary Output layer (4 yields).

An aggregate of 150 sophomore understudies records were utilized as a part of the examination. Around 60% of the aggregate information (i.e. 90 understudies) was utilized as the preparation set, 30% (i.e. 45 understudies) as the testing set, and 10% (i.e. 15 understudies) utilized for cross approval. After the preparation and cross approval, the system was tried with the test informational index and the accompanying outcomes were acquired. This includes given the information variable information to the system without the yield variable outcomes. The yield from the system is then contrasted and the real factor information.

The neural system could foresee precisely 11 out of 13 for the astounding information (which speaks to understudies CGPA in scope of 90% to 100%), 10 out of 12 of the great information (which speaks to understudies with CGPA in scope of 80% to under 90%) and 9 out of 11 of the great information (which speaks to understudies with CGPA in scope of 70% to under 80%), and 8 out of 9 of the poor information (which speaks to understudies with CGPA in range 65% and under 70%) used to test the Network's topology. This gives an exactness of 85% for Excellent, 83% for Very Good, 82% for Good, and 88% for the Poor characterization. This shows a general precision of 84.6% for the Artificial Neural system's which a decent execution (See Figure 2).

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
*(An ISO 3297: 2007 Certified Organization)*
**Vol. 5, Issue 4, *April* 2017**

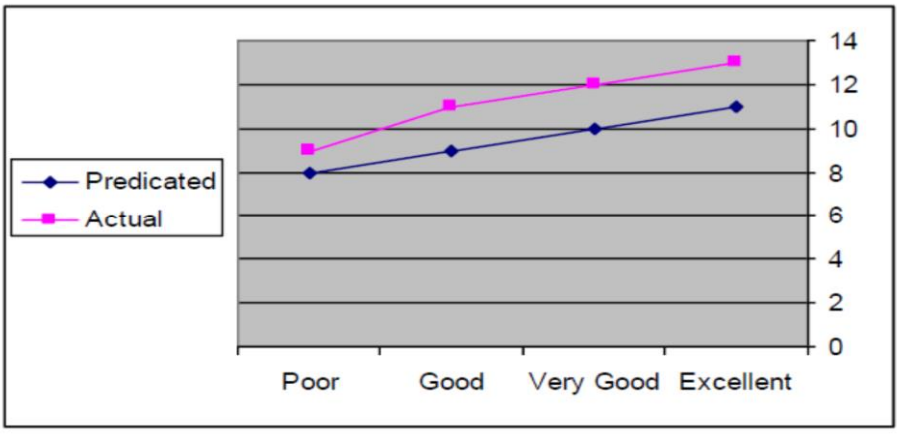


**Figure 2:** Performance of the Neural Network Model.

## VII. ACKNOWLEDGEMENT

We are extremely grateful to Allah for urging the authors to finish the research effectively. Here, we wish to express our true reverence to our supervisor for moving us to execute this examination superbly. The authors likewise might want to recognize to commitment for made by the Jagannath University (JnU) and Daffodil International University (DIU) expert who give us a situation where we work additional time specifically, we might want to be thankful all staffs and Liberian for their coordinated effort, auxiliary or straight support to finish the whole research.

## VIII. CONCLUSION

An artificial Neural Network model for predicating student performance in the Department of Computer Science and Engineering was presented. The model used feed forward back propagation algorithm for training. The factors for the model were obtained from student registration records. The model was tested and the overall result was 84.6%. This study showed the potential of the artificial neural network for predicating student performance.

## XI. REFERENCES

[1] NA Samy, Predicting Learners Performance Using Artificial Neural Networks In Linear Programming Intelligent Tutoring Systems. IJAIA 2012; 3:65-73.
[2] NA Samy, OAZ Abu, An Expert System For Diagnosing Eye Diseases Using Clips. Journal of Theoretical and Applied Information Technology 2008; 5:923-930.
[3] NA Samy, AN Alaa, A proposed Expert System for Skin Diseases Diagnosis. Journal of Applied Sciences Research 2008; 4:1682-1693.
[4] NA Samy, BH Mohammed, et al. A Proposed Expert System for Guiding Freshman Students in Selecting A Major In Al-Azhar University. Gaza, Journal of Theoretical and Applied Information Technology, 2008; 4:889-893.
[5] NA Samy, KA Kashkash, et al. Developing an Expert System for Plant Disease Diagnosis. Journal of Theoretical and Applied Information Technology 2008; 1:78-85.
[6] NA Samy, AA Masri, etal. A Prototype Decision Support System for Optimizing the Effectiveness of E-learning in Educational Institutions. International Journal of Data Mining & Knowledge Management Process (IJDKP) 2011; 1:1-13.
[7] L Abdelhadi , B Abdelkader, Using Probabilistic Neural Networks for Handwritten Digit Recognition. Journal of Artificial Intelligence 2011; 4:288-294.
[8] PB Khanale , SD Chitnis, Handwritten Devanagari Character Recognition using Artificial Neural Network. Journal of Artificial Intelligence 2011; 4:55-62.
[9] EO Peter, UI Ralph, Application of neural network in evaluating prices of housing units in Nigeria: A preliminary investigation. Journal of Artificial Intelligence 2010;1: 21-27.
[10] HT Martin, DB Howard, Neural Network Design. 2014.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering
*(An ISO 3297: 2007 Certified Organization)*
**Vol. 5, Issue 4, *April* 2017**

[11] G Kanakana1, A Olanrewaju, Predicting student performance in Engineering Education using an artificial neural network at Tshwane university of technology ISEM Proceedings September 21-23, Stellenbosch, South Africa 2011.
[12] E Kyndt, M Musso, et al. E. Predicting academic performance in higher education: Role of cognitive, learning and motivation. Earli Conference 2011, 14th edition, Exeter, UK 2011.
[13] M Paliwal, KA Usha, A study of academic performance of business school graduates using neural network and statistical techniques. Expert Systems with Applications, Elsevier Ltd 2009; 36: 7865-7872.
[14] KT Stamos, V Andreas, An Artificial Neural Network for Predicting Student Graduation Outcomes. Proceedings of the World Congress on Engineering and Computer Science WCECS 2008, October 22 - 24, 2008, San Francisco, USA