



A Study on "Role of Artificial Neural Network in Predicting the Student'S Course Selection and Their Academic Performances in Higher Education"

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A study on “Role of Artificial Neural Network in predicting the student’s course selection and their academic performances in higher education”

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Abstract

Artificial intelligence has enabled the development of more sophisticated and more efficient student models which represent and detect a broader range of student behavior than was previously possible. In this work, we describe the implementation of a user-friendly software tool for predicting the students' performance in the course of “Mathematics” which is based on a neural network classifier. This tool has a simple interface and can be used by an educator for classifying students and distinguishing students with low achievements or weak students who are likely to have low achievements.

Keywords: Artificial Neural Network, Decision Support System, Student academic performance.

I. INTRODUCTION

The application of artificial intelligence in education has grown exponentially, spurred by the fact that it allows us to discover new, interesting and useful knowledge about students. Educational data mining (EDM) is an emerging discipline, concerned with developing methods for exploring the unique types of data that come from educational context. One of the key areas of the application of EDM is the development of student models that would predict student characteristics or performances in their educational institutions. Hence, researchers have begun to investigate various data mining methods to help educators to evaluate and improve the structure of their course context (see Romero & Ventura 2007; Romero et al. 2008 and the references therein). Limiting the students that fail in the final examinations is considered essential and therefore the ability to predict weak students could be useful in a great number of different ways. More specifically, the ability of predicting the students' performance with high accuracy in the middle of the academic period is very significant for an educator for identifying slow learners and distinguishing students with low achievements or weak students who are likely to have low achievements. By recognizing the students' weaknesses the educators are able to inform the students during their study and offer them additional support such as additional learning activities, resources and learning

tasks and therefore increase the quality of education received by their students.

Thus, a tool which could automatically recognize in time students' performance and especially students with learning problems is really important for educators. However, the idea of developing an accurate prediction model based on a classifier for automatically identifying weak students is a very attractive and challenging task. Generally, datasets from this domain skewed class distribution in which most cases are usually located to the one class. Hence, a classifier induced from an imbalanced dataset has typically a low error rate at the majority class and an unacceptable error rate for the minority classes.

The application of an artificial neural network for predicting student's performance at the final examinations in the course of “Mathematics”. Our aim is to identify the best training algorithm for constructing an accurate prediction model. We have also evaluated the classification accuracy of our neural network approach by comparing it with other well-known classifiers such as decision trees, Bayesian networks, classification rules and support vector machines. Moreover, we have incorporated our neural network classifier in a user-friendly software tool for the prediction of student's performance in order to making this task easier for educators to identify weak students with learning problems in time.

II. PURPOSE OF STUDY

The software tool for predicting the student's performance at the final examinations which has a simple user-friendly interface. The main features of our software tool are:

- Neural network: This module is dedicated for importing the dataset in a specific format (txt). Once the dataset is loaded the user can ask the tool to construct the neural network classifier
- Neural network parameters: This module is used for selecting the neural network training algorithm and the classification level using the corresponding pop-up menus

- Student's grades: This module allows the user to insert the grades of a new student for predicting its performance. Prediction of student's performance at the final examinations: This module displays the prediction of the classifier for the new student.

Subsequently, the case study to illustrate the functionality of our tool and the experiment set up process. Firstly, by clicking on the button "Load Data" the user can load his data collected from his own course .the user can select the training algorithm and the classification level using the corresponding pop-up menus from the "Neural network parameters" module. Our tool always recommends one algorithm and a classification level by default in order to facilitate its usage/execution for beginners. In our example, we have chosen the MSP as training algorithm and the 3-level classification.

III. METHODOLOGY

The main emphasizes will be on classification of the existing literature, is to differentiate between approaches, each approaches are presented using same template and same type of tables (for easier understanding) by developing a perspective on the area, and evaluating trends.

IV. CLASSIFICATION

The main research themes, trends, challenges/issues, and results of that field are classified in the tables:

- Table 1: Summary of work done in successive years
- Table 2: Students Course Selection

The tabulated information were explained in detail using seven Ws (Who, What, When, Where, Why, for Whom, hoW).

TABLE 1: SUMMARY OF WORK DONE IN SUCCESSIVE YEARS

2002	In this year author shown the potential of the artificial neural network for enhancing the effectiveness of a university admission system
2006	Author tries to Understand student enrollment behavior is a central focus of institutional research in higher education. However, in the eyes of an enrollment management professional, the capacity to explain why students drop out, why they transfer out, or why some graduate quickly while others take their time may be less critical than the ability to accurately predict such events
2012	They developed a user-friendly software tool which is based on neural network classifiers for predicting the student's performance in the course of "Mathematics" of the first year of Lyceum. Based on our numerical experiments.
2013	ANNs are a powerful tool to model future academic performance, specifically in academic diagnostic evaluations for placement and early-warning assessments
2014	The analysis revealed that some interesting attributes are observed from backpropagation algorithm on 10 cross fold validation and by applying association rule mining algorithm some dependent attributes like Unit test, Assignment, Attendance and graduation

	percentage are found which will help to predict the student's university performance.
2015	In this year the researchers research An artificial Neural Network model for predicating student performance in the Faculty of Engineering and Information Technology was presented. The model used feed forward backpropagation algorithm for training.
2016	since data are independent of specific university and based on the main candidate's information, they can be generalized to all higher education institutes. Therefore, using the results of the researches can help heads and senior managers of educational planning in educational institutes.
2017	They tries to make a plan to expand our research by increasing the number of students in survey (increasing training examples may increase accuracy rate in ANN) and by deeply analyzing with variety of data mining algorithms
2019	They conclude that Random Forest model should be deployed to provide a predicting system for the student performance. This study also shows that personality of the student as provided by Myers-Briggs type indicator is an influencing factor in determining the performance of the students and thus merits further investigation using larger dataset and features
2020	They Predict the students' performance and outcomes on a weekly basis could help faculty to identify poor-performing students. This can act as an early alert system for faculty to intervene with any problems faced by the students within the module. Students could also self-assess their own performance within the module with the help of a dashboard.

V. RESULTS ANALYSIS

The analysis of results in order to evaluate the classification capability of neural networks using four different training algorithms: BFGS, LM, Rprop and MSP. All networks have received the same sequence of input patterns and for evaluating classification accuracy. The generalization results of each neural network training method, measured by the percentage of testing patterns that were classified correctly in the presented datasets. We point out that the training algorithm MSP is an excellent generalizer since it manages to exhibit the highest generalization performance, followed by the Rprop algorithm. Unfavorably, the neural networks that were trained with the training algorithms BFGS and LM achieved the worst performance relative to all datasets.

VI. SCOPE FOR FURTHER RESEARCH

The future scope is a dashboard with data representations from these virtual learning environments would help in projecting the students' performance and interactions.

Predicting the students' performance and outcomes on a weekly basis could help faculty to identify poor-performing students. This can act as an early alert system for faculty to intervene with any problems faced by the students within the module. Students could also self-assess their own performance within the module with the help of a dashboard.

VII. CONCLUSION

This study was to build a model to predict performance of student at KSITM to help control the ongoing dropout and graduation delay issues. To achieve that, WEKA software tool was used to create a Multilayer Perceptron Neural Network (MLP-NN) model, the model was trained using 70% of the total instances of student dataset of 2018 academic year obtained from the Department of Networking and System Security in KSITM. The model appeared to be promising when tested using the remaining 30% of the dataset. The accuracy of the model was evaluated using some well-known evaluation criteria, it correctly predicts 73.68% of the students' performance and particularly, 66.67% of the poor performing students.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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TABLE 2: STUDENT COURSE SELECTION

Author/year	Methodology	Domain	Research type	Scope for future research
Suchita borkar, k.rajeswari[1](2014)	Data mining , artificial neural network	Student's academic performance	Simulation	It will be include fuzzy logic in categorized values as good, poor for better results.
Loannis livieris, P.E pintelas[2](2012)	Artificial neural network	Predicting student's Performance	Descriptive	To make systematic and extensive evaluation of the tool by teachers.
Samy S.abu-naser , ihab Zaqout , rasha atallah [3](2015)	Artificial neural network	Predicting the student academic performance	Descriptive	How the feed forward and backpropagation model works.
Raza hasan , salman mahmood,kamal uddin sarker[4](2020)	Vedio learning analytics, data mining techniques	Student performance in higher education institution	Theoretical	Predicting the student's performances and outcomes on a weekly basis could help faculty to identify poor performing students.
Serge Herzog[5](2006)	Decision tree, neural network	Estimating student retention and degree-completion	Classification	To come a change in current projections are in part based and how quickly students move from one class standing to another.
Maryam khademi[6](2016)	Neural network, data mining techniques	Predicted increase enrollment in higher education	Diagnosis	How state or non-state universities to design more accurate and proper plans for further

Binh hoang tieu[7](2017)	Artificial neural network	Predicating student's performance based on learning style	Descriptive	By increasing the number of students in survey and by deeply analyzing with variety of data mining algorithm
The author(s)[8](2019)	Artificial neural network	Modeling, prediction and classification of student	Diagnosis	Evaluate and predict the student's CGPA using the data.
Ivana ognjanovic, dragan gasevic[9](2016)	Institutional data	Predict student course selections in higher education	Theoretical	What course a student may select has important quality assurance and economics imperatives.
Victor oladokun[10](2002)	Artificial neural network	Predicting students' academic performance (a case study of engineering course)	Analytical	To improve the standard of candidates being admitted into the institution
Mariel musso,eva kyndt, Eduardo cascallar[11](2013)	Neural network	Predicting general academic performance and identifying the differential contribution of participating variables	Descriptive	The use of ANN together with other methods.
Eyman alyahyan, dilek dustegor[12](2020)	Neural network	Predicting academic success in higher education	Diagnosis	How Student performances prediction can be help universities to provide timely actions.
Lenin thingbaijam[13](2019)	Classification techniques in R	Students performance modeling	Theoretical	What was the performance of students at secondary level of education