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I declare, I confirm, I certify and I sign that I received substantial, important, line by line peer review with several and substantial comments, important remarks and hints from, at least, 3 Reviewers and the Assistant Editor for my paper: The Comparison of Forward and Backward Neural Network Model – A Study on the Prediction of Student Grade

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with Authors: : Saikat Gochhait1, Yagyanath Rimal2, Sakuntala Pageni3.....
I would like to thank all the reviewers for their thoughtful comments and efforts towards improving our manuscript. We revised the manuscript with special attention to the comments that we received from .....Three (3)..... (<-write the correct number) reviewers that were experts, specialists in the area of my paper. I declare, confirm, certify and sign that WSEAS has checked my paper for possible plagiarism by Turnitin and my paper was found without plagiarism or self-plagiarism by Turnitin. I also declare, confirm, certify and sign that also that no Associate-Editor, no Editor-in-Chief, no member of the WSEAS Secretariat forced me in this Journal to add references (citations) to any previous publications of the journal.

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Please, write additional comments below (take ideas from: http://wseas.org/main/author-testimonials.html)
Editor and Reviewer comments:

Reviewer 1:
Why is this method better than other similar methods using Neural Networks?
Can this method be combined with Genetic Algorithms? Please, reply
* minimum reply: one paragraph
Can this method be combined with Fuzzy Logic? Please, reply
* minimum reply: one paragraph

Response to Reviewer 1 comments

Can this method be combined with Genetic Algorithms? Please, reply

Neural networks and genetic algorithms are two techniques for optimization and learning, each with its own strengths and weaknesses. The two have generally evolved along seperate paths. However, recently there have been attempts to combine the two technologies. Davis (1988) showed how any neural network can be rewritten as a type of genetic algorithm called a classifier system and vice versa. Whitley (1988) attempted unsuccessfully to train feedforward neural networks using genetic algorithms.

[Davis 19881 L. Davis, "Mapping Classifier Systems into Neural Networks," to appear in Proceedings of the 1988 Conference on Neural Information Processing Systems, Morgan Kaufimann.

[Whitley 1988] D. Whitley, "Applying Genetic Algorithms to Neural Network Problems," International Neural Network Society p. 230 (1988).

Can this method be combined with Fuzzy Logic? Please, reply

However, the selection of high performance membership functions depends on human experience and it assumes huge relevance for the design of fuzzy controllers. The choice of the membership functions requires tedious trial and error processes which do not fast converge to the optimal solution. Genetic Algorithms [8] are of help to solve this problem.

> Chen, X. and Zhang, J. (2013). The three-dimension path planning of uav based on improved artificial potential field in dynamic environment. In Intelligent HumanMachine Systems and Cybernetics (IHMSC), 2013 5th International Conference on, volume 2, pages 144- 147.

Reviewer 2.
Please, extend the paragraph 2 and give clarifications for the figures 2 and 3
Improve your English Language.
Give one more numerical example.

Response to Reviewer 2 comments

The figure 1 depicts the teaching-learning process with combination of various dimensions, th networks to

find predictions whose predicted SGPAs will be checked against the final university grade for m errors of

misclassification.

Figure 2 shows the validation of a data mining classification model considered as the most impor

In data mining process. The process of validation helps in assessing how well the data mining mo

perform against real time data.

Reviewer 3

This paper can be published in the Journal WSEAS Transactions on Systems and Control.

However, there are many problems in English Language and in the Format

The format is not the right WSEAS Format

https://wseas.org/cms.action?id=13360

Give us directions for future research as well

Please, compare the method, with othter recent methods in Bibliography.

Can you combine your method with Artificial Intelligence and Deep learning

Tell us a few things about it

Response to Reviewer 3 comments

In the future reesearch it is very important to indentify which students' characteristics are associated with test results, and which school characteristics are associated with the added value of the school [14]. In this regrad it is useful for researchers to apply machine learning applications to acquire knowledge about students' learning in different subjects, develop optimal warning models, and discover behavioural indicators from learning analytical reports.

[14] Masci, C., Johnes, G., Agasisti, T. (2018) Student and school performance across countries: A machine learning approach. Eur. J. Oper. Res. 269, 1072–1085. [Google Scholar] [CrossRef]

A neural network model can be used effectively in predicting training accuracy using machine learning. Based on the comparison of forward and backward neural networks, coded to communicate their output in the requisite manner using machine language is the basis of the present study. With the help of students' background information, a study was conducted to predict the Grade Point Average (GPA) of 580 engineering students based on various parameters, including mental health. This study is based on the Boruta algorithm and the random forest methods for data preparation in the matrices (12 * 2 = 24) of single-layered, multiple-layers, and forward and reverse algorithms were developed to test prediction and accuracy of the grade point average by analyzing histograms, confusion matrices, and regression analysis. This study suggests that the best model predictions are made from an artificial neuron network that has roughly

half the number of single layers and the best model predictions are obtained from an artificial neuron network with three hidden layers.

The process of learning a concept that is unfamiliar requires an understanding of brain development that is more practical and appropriate, which facilitates learning knowledge, skills, values, beliefs, and habits of human learning. Using multiple instance regression, we solve the problem of qualitatively and quantitatively predicting the flexible length of the major histocompatibility complex of student grades. It is not possible to develop reliable machine learning neural network model prediction tools without high-quality data sets, including student test results, final grades, and their relationship to past performance (Hussain & Abidi, 2018). In contrast, the neural network model for GPA prediction indicates the shortcomings of these commonly used data sets that are often used to evaluate machine learning approaches to GPA prediction (Rimal Y. P., 2021). Lastly, the researcher proposes an enhanced similarity reduction procedure that uses backward and forward neural networks for student grade prediction which is more stringent than the standard methods currently used.

In a similar study conducted by the department of education at the University of Maastricht (David, Rijt, Filip, & Janine, 2008), the researchers concluded that there are no relationships between students' perceptions of assessment and their performance on assessments. Students prefer written assessments, including home exams and essays in which they are allowed to quote sources. Materials such as notes, books, and papers. Computerized tests and portfolios aren't among the students' preferred methods of evaluation. Oral testing isn't among their preferred methods of evaluation either. According to The Islamic University of Bahawalpur's grade prediction research (Muhammad & Aijaz Ahmed, 2007), 16 students scored more than 80 in internal assignments, but failed the final examination. However, this study only looked at master's in education students. Accordingly, the students receiving the highest score of 88.07 in assignments and the lowest score of 49.57 in the final examination stand out.

In a similar way, British Kumar and Spanabha (2011) explored various attributes of success among a sample of 50 students using the ID3 algorithm. The study by Naqui (2006) analyzed 300 students from affiliated colleges of Panjab University using linear regression. In a study conducted at a Nigerian university, John and Manabete (2015) collected data on 1847 students, and they discovered that the instrument's internal consistency reliability was 0.86 when administered in heterogeneous classes at such a university. Based on the data warehouse of student records, the Naive Bayes method was applied to predict student performance. To achieve an accuracy of 86.66%, 175 records were used for

training data and 45 records were used as test data for the study of 220 students. (Patel, 2017) suggests using one algorithm to predict the outcome among a large class set of data, in such a way that it is at the university level requirement to run three tests of any subject. Sorour, Mine, and Hirokawa (2014) claim to have achieved 82 percent accuracy by using an artificial neural network based on J48 and multiple linear regression along with regression analysis of 181 students' marks to predict student performance.

The study by Rasthnasbapathy & Ramaswami (2009) used the Bayesian and CHID algorithms to predict the performance of students in the higher secondary school based on 35 contributing factors. The results were similar to those reported by (Brijesh Kumar & Saurabha, 2011) who classified 300 students using Na*ve Bayesian reasoning.. Panday & Pal (2012) used Bayesian classification to classify 600 students. A similar study to Cohen's (Cohen, 1995) analysis of 778 Portuguese language and mathematics students concluded that tree algorithms were the most effective in distinguishing between students who would pass or fail their courses. An objective of this study, which employed neural networks algorithms, was to forecast student achievement in schools, colleges, and online multiple-choice courses (Junemann, 2007). Using artificial neural networks, researchers estimate future student performance based on using forward and backward neural network models to predict student grades based on students' family, social, health and wealth characteristics.

Grading a student's is a collective effort of the students' previous and ongoing studies during each semester, so it is possible to use a neural network to predict items with high confidence using the input weight of each matrix element of a variable to another complete neuron that's formed using the outputs of previous neurons, weighted with bias terms, pushed for creating signal weights for students at the beginning of every semester by applying that information to 580 undergraduate engineers. To predict the best outcome, both full and half models of the neural network were created based on a variety of parameters. While the full model illustrates 580 student records, the half model includes 290 students whose exam results were valid in fall 2019. Using the 22 input signals as input, the neural network first passes the data over a single hidden layer whose confusion matrix, the output neuron, and the accuracy of both training and testing are calculated. Based on the dependent variables, the neural network output is calculated into the number of subdivision grades. As a result of some unimportant variables with similar patterns of marks to the model, the prediction accuracy using forward and back propagation is summarized in the following table.

A table that explains how best to select a neural network model based on its accuracy in both training and test sets of samples was produced as part of this study. There were 24 different neural network models created.

To predict student grades whose passing results were excellent, 22 variables were analyzed when previous grades of students were combined with historical information. A half model represents 290 students while a full model passes all 580 student information. A single neuron in the hidden layer whose output is 96 and 86 percent accurate for a variable with two states is the university's final result for a variable with only two states. The student who has a GPA of 4.0 is at least 82 percent more accurate than the student who has a GPA of 2.0. In the same way, when grade point average is defined as categorical variables of grades such as A, A-, B+, B... using the same value, the best average precision is 96 percent: 96 percent for both full and half models.

To predict student grades based on only significant variables (previous grades and internal evaluation of ongoing six subjects' grades), the neural model needed to be simplified rather than predictions that were accurate by 96 percent and 83 percent, respectively. Based on five neurons in the hidden layer, this model has an accuracy of 92:89 percent. Using seven hidden layers in both half and full models produces the best accuracy of 77:86 percent, and using seven hidden layers in both half and full models produces the accuracy of 81:90 percent. Three hidden layers were used by the model when it was designed with both accuracy models, the decreasing pattern produces over 80% accuracy.

Similar to an algorithm used to predict student grades by reverse-backward traversing neurons' weights after first passing to them. Model accuracy was 50% when a single hidden layer conversed at 82. In the same way, a five neuron model with 82:70 percent accuracy can be compared favorably with a forward network of the same inputs. As well, the backward traversing model of 76:52 is at least as good as the forwarding model of 77:83 when two hidden layers (7, 3) are placed between independent and dependent variables. The best model, using the same input in a forward neural network, has an accuracy of 77:90 percent with three hidden layers (7,3,2) between 13 inputs to a single variable and a backward model, 83:84 percent. When 73 to 82 percent accuracy is obtained from a backward model with four hidden layers (25,12,7,3) of 13 input signals, then the reversed accurate full model is the best algorithm.

In considering the above line graph, it appears the prediction of GPA when results pass or fail is more robust when independent predicting variables have large numbers as compared to the scores they scored and Grade Point Averages they are awarded.

In predicting variables with the fewest layers, input signals considered as the best model for predicting student grades, whereas the half and full models are considered as more time consuming between input and output.

Accordingly, the GPA grade for the single layer output of either a half or a full model with 13 independent variables will be least accurate compared to two and three hidden layers. It is therefore recommended to use a three-layer neural network whose average output in both full and half is greater than 80 percent as a backward model.

In the direct application of multiple linear feed forward networks of student grade prediction, neural network models are used to solve very large daily life activities. Study is designed to develop a neural network model that can accurately predict student grades based on background information compared to total accuracy under different mental health conditions, internal assessments, and final grades. As a result of Boruta and the random forest model test, 22 input signals are used to convert the neural network model. For forward passes, it is recommended that for large enough predicting variables, a single hidden layer with fewer neurons be used, while for reversed backward passes, three hidden layers with reduced input signals should be used.

The paper has been formated as per the WSEAS Format

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