Study of Artificial Neural Network and Support Vector Machine for Students Performance Prediction

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Abstract:- Prediction is a complex data analytics task which has gained immense popularity due to the huge availability of data. Students performance prediction is the most sought out research in the educational sectors. The main objective of this paper is to survey the literature on students performance prediction and to compare the Neural Network and Support Vector Machine with respect to students performance prediction.

Keywords:- Prediction; Artificial Nueral Network; Support Vector Machine.

I. INTRODUCTION

Gone are the days, where the students wait, until the end of a semester to know their GPA. Today we have prediction models which predict eight-semester grades with one click [1]. In this paper, we survey and compare research works on Artificial Neural Network and Support Vector Machine for predicting academic performance of the students.

A. Artificial Neural Network (ANN)

Neural Networks are computing structures inspired by biological neurons. This technique works by learning from examples and then uses the learned model to perform tasks.

➢ *Strengths*
- Works well for complex problems.
- Are less sensitive to noise.

➢ *Weakness*
- Hardware dependency.
- Requires more amount of data for training.

B. Support Vector Machine (SVM)

Support vector machine works by defining the decision boundaries. It constructs hyper planes and separates classes with different class labels.

➢ *Strengths*
- Works well with unstructured data.
- Provide accurate classifiers.

➢ *Weakness*
- Runs slowly.
- Large datasets require more time for training.

II. LITERATURE REVIEW

C. Prediction using Artificial Neural Network (ANN)

Bendangnuksung and Prabu (2018) use Deep Neural Network to analyze students' performance. The work uses online datasets. Quality of the classifier is measured by Cost Function and Accuracy. Results reveal this model achieves 83.4 % accuracy. [2]

Okubo et.al (2017) implements a Recurrent Neural Network (RNN) to predict the final grades of students. Grades are predicted from log data of a learning support system. Results show that RNN achieves 90% accuracy. [3]

Amirah, Wahidah and Nur'aini (2015) present a review of the literature, to identify the attributes, techniques used in prediction works. Their work reveals, Neural Network has 98% accuracy and Decision Tree has an accuracy of 91%. [4]

Fahim, Jamal and Sajal (2015) develop a prediction model using the Artificial Neural Network. It predicts the CGPA of students. The model works on academic datasets of a Bangladesh university. The predicted grades were compared with original grades. This model achieves the highest accuracy of 99.98% and Root Mean Square Error [RMSE] of the work is 0.1765. [5]
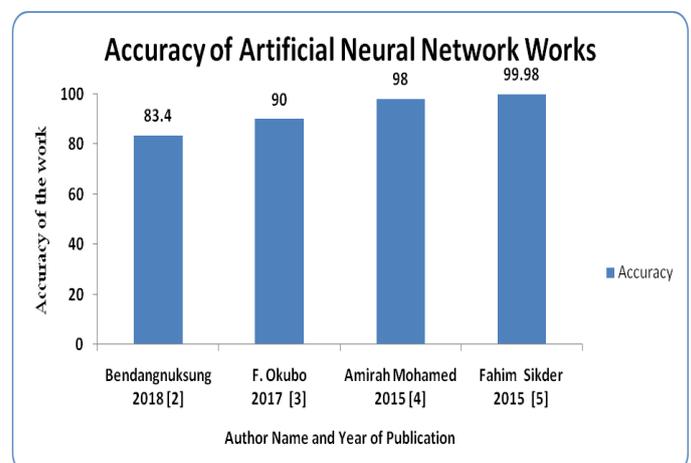

Fig 1:- Accuracy of Literary works on ANN

D. Prediction using Support Vector Machine (SVM)

Eashwar and Venkatesan (2017) implement an SVM based prediction model to identify prospective postgraduate students for perusing doctoral studies. Data were collected from first year, second year and final year students. After

Pre-processing, data were clustered, and classification algorithm SVM was applied. Results reveal that the SVM classifier achieves prediction accuracy up to 96.7%.[6]

Jamuna and Shoba (2017) in their research work compares and analyses various techniques and algorithms. The dataset consists of student's data from a private institute in Punjab. Models were built and results were predicted. It was found out Radial Basis Function Kernel and Polynomial Kernel in SVM had high prediction accuracy of 97.62 % .[7]

Huda et.al (2017) by his literature review points out that the SVM algorithm achieves 82.3% accuracy. Two forecast model based on Support Vector Machine and K - Nearest Neighbor (KNN) was developed. Results show SVM performs well with Correlation Coefficient of 0.96.[8]

Raj Kumar and Ankita (2015) uses SVM and KNN to build a simple prediction system. They use data from B.Tech Computer Science students to train the prediction model. Model built on SVM performs well with an accuracy of 96%. Time taken to build the model was 0.15seconds. [9]
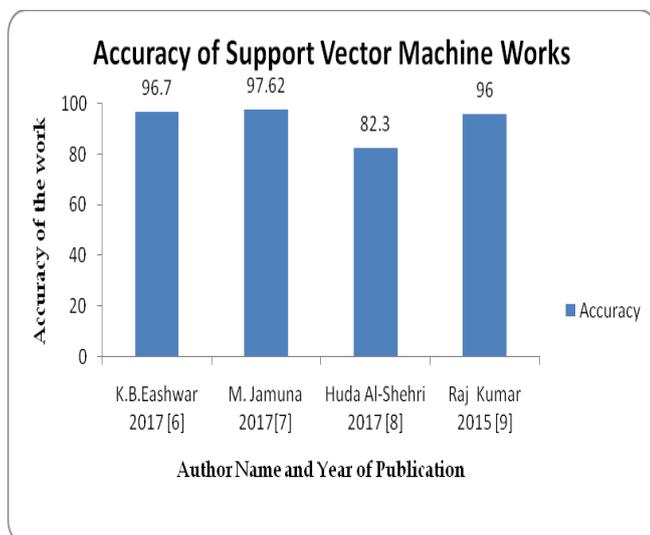

Fig 2:- Accuracy of Literary works on SVM

III. LITERATURE ANALYSIS

From this literature review, we can interpret for performance prediction both Neural Network and Support Vector Machine achieves good accuracy values. The highest accuracy percentage achieved by Neural Networks is 99.98% [5] and Support Vector Machine is 97.62%. [7]

IV. CONCLUSION

From this study, it is concluded, that Neural network outperforms Support Vector Machine in students academic performance prediction.

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