IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 5, May 2022

DOI: 10.17148/IJARCCE.2022.11537

Predictive Analysis of Students Performance Evaluation in Higher Education: A Machine Learning Approach

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Abstract: A comprehensive and relevant performance review procedure should be initiated at the start of the academic year. The increasing number of colleges has expanded in recent years, emphasizing the importance of enhanced approach performance in worldwide competitiveness. Institutions can use performance evaluation to develop future initiatives. Every lecturer must define annual goals for each category.[1] Complete performance evaluations give constructive feedback and direction to help lecturers develop and improve. Using various Machine Learning classifiers and ensemble methods, we have clearly studied, assessed, and predicted the impact of online education systems in this study. The primary objective of this study is to explain the relevance of higher education in performance evaluation of students.

Keywords: Algorithm, Machine Learning, Performance Evaluation, Predictive Analysis.

INTRODUCTION

The evaluation of the student performance in an academic session is the measurement of the student achievements across various academic subjects.[2] Teachers conduct weekly, quarterly, half-yearly, annually exams and student performance is evaluated by the results of these standardized tests. These tests are conducted frequently or within a particular time gap.[3][4] This evaluation is important for the successful development of students. Students who do well in school are better able to make the transition into adulthood and to achieve occupational and economic success and also the test results motivate students to face the challenges and to learn from the failure and to do better next.[5]
Before all the tests are conducted in offline (pen & paper) mode but now-a-days as technology revolving, there is an addition to this area also. Tests are being conducted in digital (computer based) mode.[6][7]

Digital Assessment:-
Digital assessment needs a digital system (smartphone/desktop/laptop), good network connection, knowledge to use the system. There is no need of physical presence at one particular exam hall.[8]
Benefits- Reliability on result, Easy to conduct, Time saving, Reduce paper wastage
Losses- Dependent on network facility availability, Difficulty in maintenance

EXPERIMENTAL OBSERVATIONS

We have taken wekato knowledge analysis tool for the classification and data prediction on the students performance evaluation. The fig.1 shows the dataset preprocessing. We have also examine this using different machine learning algorithms and show the result.

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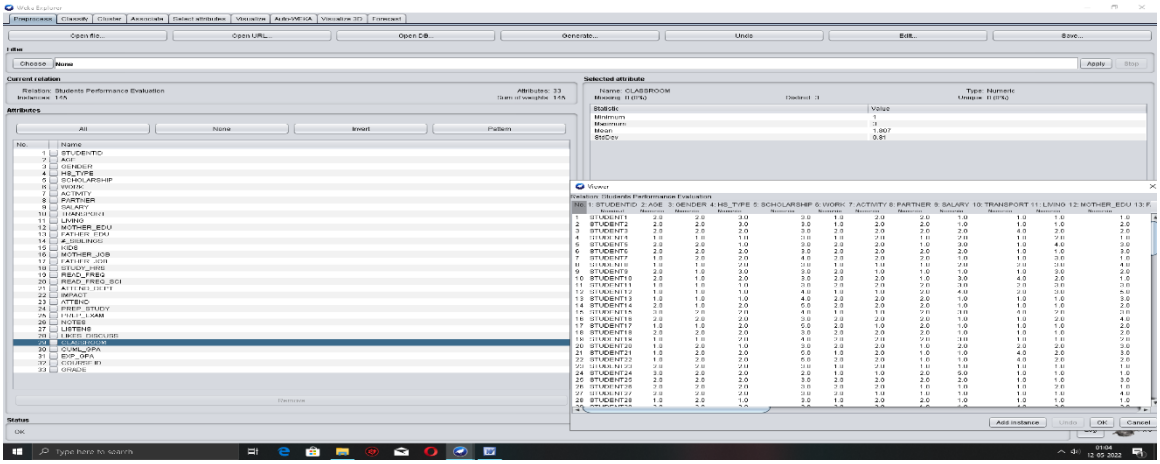

Fig.1. Students Performance Evaluation Dataset Preprocessing Stage

NAME= weka.classifiers.meta.Bagging
Bagging with 10 iterations and base learner
Classifier Output
=== Run information ===
Scheme: weka.classifiers.meta.Bagging -P 100 -S 1 -num-slots 1 -I 10 -W weka.classifiers.trees.REPTree -- -M 2 -V 0.001 -N 3 -S 1 -L -1 -I 0.0
Relation: Students Performance Evaluation
Instances: 145
Attributes: 33
STUDENTID AGE GENDER HS_TYPE SCHOLARSHIP WORK
ACTIVITY PARTNER SALARY TRANSPORT LIVING MOTHER_EDU
FATHER_EDU #_SIBLINGS KIDS MOTHER_JOB FATHER_JOB STUDY_HRS
READ_FREQ READ_FREQ_SCI ATTEND_DEPT IMPACT ATTEND
PREP_STUDY PREP_EXAM NOTES LISTENS LIKES_DISCUSS CLASSROOM
CUML_GPA EXP_GPA COURSE ID GRADE
Test mode: 10-fold cross-validation
=== Classifier model (full training set) ===
weka.classifiers.trees.REPTree -M 2 -V 0.001 -N 3 -S 1 -L -1 -I 0.0
Time taken to build model: 0.02 seconds
=== Cross-validation ====== Summary ===

Correlation coefficient	-0.1552
Mean absolute error	1.9167
Root mean squared error	2.2017
Relative absolute error	100.2314 %
Root relative squared error	100.0017 %
Total Number of Instances	145

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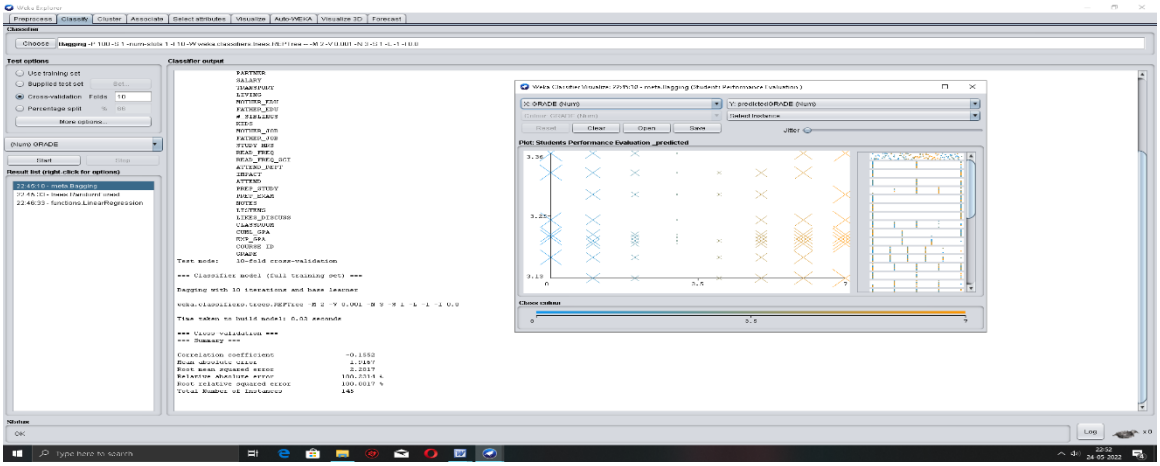

Fig.2. metaBagging Algorithm output with Classifier Error

NAME= weka.classifiers.trees.RandomForest
Classifier Output
=== Run information ===
Scheme: weka.classifiers.trees.RandomForest -P 100 -I 100 -num-slots 1 -K 0 -M 1.0 -V 0.001 -S 1
Relation: Students Performance Evaluation
Instances: 145
Attributes: 33
Test mode: 10-fold cross-validation
=== Classifier model (full training set) ===
RandomForest
Bagging with 100 iterations and base learner
weka.classifiers.trees.RandomTree -K 0 -M 1.0 -V 0.001 -S 1 -do-not-check-capabilities
Time taken to build model: 0.08 seconds
=== Cross-validation ====== Summary ===

Correlation coefficient	0.7061
Mean absolute error	1.5981
Root mean squared error	1.8347
Relative absolute error	83.5682 %
Root relative squared error	83.333 %
Total Number of Instances	145

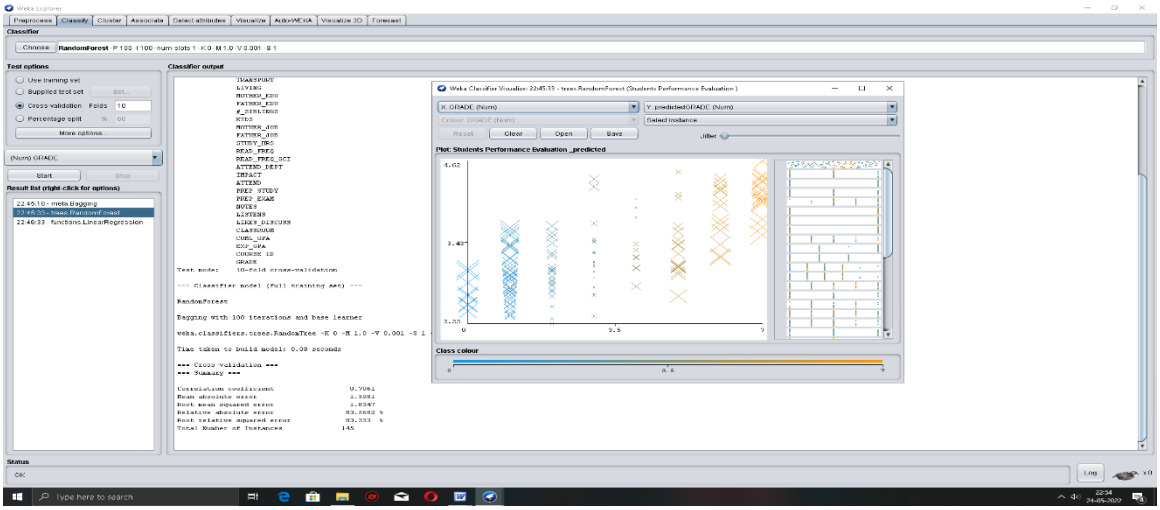

Fig.3. RandomForest Algorithm output with Visualize Classifier Error

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CONCLUSION

In this paper, we have proposed a new methodology based on machine learning algorithms for students' academic performance evaluation based on different ensemble techniques.When the results are evaluated from learning expert system, a difference in outcomes is seen between the traditional and proposed methods based on AI. Where the traditional approach adheres to some constant rule, evaluation with our methods has great flexibility and reliability. In this paper, we have compare the different machine learning method, RandomForest, metaBagging. We have seen that the proposed methods is more suitable for students' performance evaluation.

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