Stochastic Modelling and Computational Sciences

PREDICTION OF IMPROVEMENT IN STUDENTS ACADEMIC PERFORMANCE WITH IMPLEMENTATION OF EXPERIENTIAL LEARNING USING CLASSIFICATION MODELS

Ms.Naznin Burbere[1] and Mrs. Apurva Rupesh More[2]

[1]IT/CS Department,S.K.College of Science and Commerce
[1]nazninbubere.skc@gmail.com and [2]apurva.salokhe65@gmail.com

ABSTRACT
The National Education Policy (NEP) is a comprehensive framework designed to bring about significant improvements to a nation's educational system. One of the main goals of the NEP 2020 is to encourage students to engage in "experiential learning and critical thinking."Experiential learning is vital because it engages learners actively in the learning process, fostering deeper understanding and retention of knowledge. Through hands-on experiences, individuals can apply theoretical concepts to real-world situations, enhancing their problem-solving skills and critical thinking abilities. Additionally, experiential learning promotes personal growth, encourages creativity, and cultivates a sense of self-efficacy and confidence in learners. The main goal of this paper is to predict how this experiental learning can bring improvement in students academic performance using classification models

Keywords: AI, Classification, Decision tree, Random Forest, Nep 2020 ,ML

I. INTRODUCTION
An extensive framework for the advancement of education in India is provided by the National Education Policy (NEP) 2020. On July 29, 2020, the Union Cabinet of India gave it approval. Its goal is to modernize the educational system to suit the demands of the twenty-first century. The National Policy on Education, 1986 was superseded by the NEP 2020, which was developed following considerable stakeholder input and consultations from a range of industries. In India, experiential learning is a fundamental part of the National Education Policy (NEP) 2020. The policy places a strong emphasis on the value of practical, hands-on learning experiences that help students apply their theoretical knowledge to actual situations. Students' overall growth is aided by experiential learning, which encourages active learning, skill development, creativity, and community involvement. The objective of this paper is to predict how implementation of Experiential Learning will impact students academic performance through application of Decision tree and Random Forest classifier.

II. CLASSIFICATION
A given dataset is classified into classes using supervised machine learning techniques called classification, which are based on one or more factors. To precisely forecast whether or not data will fall into predefined categories, a classification issue can also be applied to both structured and unstructured data.In machine learning, classification may necessitate two or more categories within a given data set. As a result, it creates a likelihood score to classify the data into a certain category, such male or female, red or green, sickness or not, spam or not, and so on.

Classification trees come in various forms, each with unique traits and variants.

Binary Decision Trees: Decision trees in binary form are the most basic type, with each internal node having exactly two branches that lead to two child nodes. Each internal node divides the data into two groups by making a decision based on the value of a feature.

Multiway Decision Trees: These decision trees permit more than two branches at each internal node, in contrast to binary decision trees. This implies that nodes can have many branches corresponding to distinct feature values in place of binary splits.

Categorical Decision Trees: Decision trees that are specifically made for datasets that contain categorical (nominal) attributes are known as categorical decision trees. Because these trees naturally handle categorical data, splits based on discrete categories as opposed to continuous values are possible.

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Regression Trees: A type of decision tree used for regression tasks, regression trees are not the same as classification trees. Regression trees predict continuous values as opposed to class labels. Although the leaf nodes of the tree have anticipated numerical values instead of class labels, the tree structure is nonetheless identical.

Random Forests: Using several decision trees, random forests are an ensemble learning technique that enhances prediction accuracy and minimizes overfitting. A random subset of features is taken into consideration for splitting at each node in the random forest, and each tree is trained using a bootstrap sample of the data.

Gradient Boosting Trees: This method of ensemble learning also constructs decision trees in a step-by-step fashion, with each tree aiming to rectify the mistakes caused by its predecessors. XGBoost and LightGBM are two popular gradient boosting methods that are utilized for both regression and classification applications.

III. **METHODOLOGY**

Fig 1

The model construction procedure, which involves five steps, is depicted in Fig. 1. To begin with, creating a questionnaire is regarded as a phase in the data collection process. The data set must be cleaned, the data range must be converted, and a derived column must be created in the second phase. Grades are assigned according to the following criteria: 1-A+ (above 80%), 2-A(75%-80%), 3-B(65%-75%),4-B(60%-65%),5-C+(50%-60%),6-C(45%-60%),7-P(40%-45%), and8-F (40% and Below).The third stage involves choosing relevant attributes from the dataset. Using random forest and decision tree classifiers is the fourth step. Assessing the accuracy of the models used in the fifth.

Data Processing and Attribute Selection

Variable	Description	Possible Values
No of Experiential learning techniques	Internships, Industrial Visits, Simulation, Project-Based Learning, Experiential Workshops, Labs, Case Studies, none	0-7
Studying hours	Hours per week	0-18
Motivation	Scale yourself on ((1 - highly motivated, 5-Not motivated)	1-5
Grade	1-A+(above 80%),2-A(75%-80%),3-B(65%-75%),4-B(60%-65%),5-C+(50%-60%),6-C(45%-60%),7-P(40%-45%),and8-F (40% and Below	1-8

Fig II

Algorithm
Decsiion Tree and Random Forest is used to perform classification.Sklearn library from python provides metrics that can be used for classification.

Training
DecisionTreeClassifier() and RandomForestClassifier() is used to train the dataset.

Prediction:
Predict ()is used to perform prediction

Plotting Decission Tree:
Plot_tree() is used to plot Decission tree

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Accuracy:

accuracy_score() and classification_report() is used to evaluate accuracy of the classifier

IV. RESULTS

Classifier	Accuracy	Precision	F1 score
Decision Tree	0.5714285714285714	1.00	0.67
		0.50	0.40
		0.00	0.00
		0.33	0.40
		0.00	0.00
		1.00	1.00
		1.00	0.80
Random Forest	0.6428571428571429	1.00	0.86
		0.50	0.50
		0.00	0.00
		0.67	0.80
		0.00	0.00
		1.00	1.00
		0.67	0.67

Fig III

Prediction:

Classifier	No of Instances(test set)	Correct Prediction	Incorrect Prediction
Decision Tree	14	9	6
Random Forest	14	11	3

Fig IV

Descission tree could Classify data with accuracy of 0.57 and random forest could do it with accuracy of 0.64.
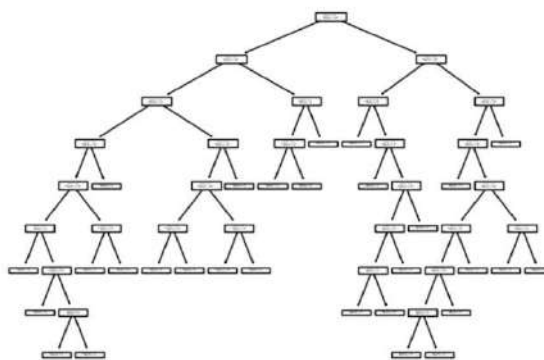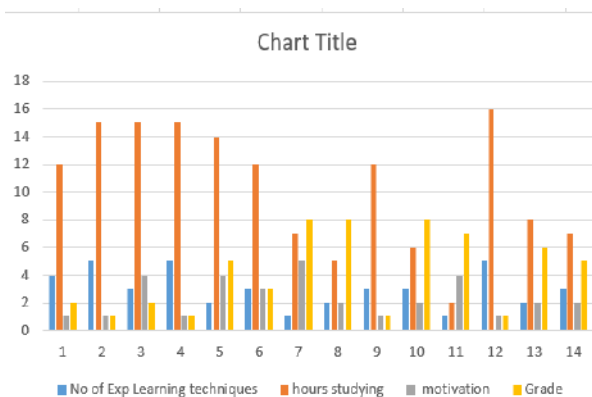
V. CONCLUSION

If students are exposed to more experiental learning techniques and are motivated to study more hours week we can see probability of securing good academic score increases.

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