

Prediction on Impact of Electronic Gadgets in Students Life using Machine Learning

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Abstract

Nowadays electronic gadgets play an important role in students' life as a source of learning. The Dependency of services provided by electronic gadgets has reached a large scale. Electronic gadgets like smart phones have a major impact on people in their day-to-day life. Among all, students are the important one, as they rely on electronic gadgets for their academic activities. The major impact is that it can affect the students mental and physical health. Students are getting addicted to these electronic gadgets as it becomes inevitable. This study uses machine learning techniques to demonstrate how gadgets affect students' daily lives. To examine the addictiveness of gadgets among the students, a questionnaire has been circulated to get to know the student's necessity on electronics. The parameters include how many electronic devices they use and how long they use them for, whether the usage of electronic gadgets shows any improvement in their academic performance. Machine learning employs the pre-programmed algorithms, to predict output values for the given input data. It is considered to be an aspect of artificial intelligence. Machine learning algorithms are used in a variety of fields, such as computer vision, voice recognition, medicine etc. Where it is difficult or impractical to create conventional algorithms to perform the necessary tasks. The collected dataset is taken to analyse the performance of prediction for various Machine Learning algorithms like K-Nearest Neighbour, Random Forest, Decision Tree, Logistic regression, Support Vector Machine. As a result of this study, accuracy of several performance measures were evaluated. In the future the performance of an algorithm can be improved by using optimization techniques.

Keywords— *Electronic gadgets, students, Machine learning algorithms, Academic performance, improved performance.*

I. INTRODUCTION

One of the most amazing electronics, is that uses electricity to do specific tasks. The actions can be efficiently carried out by electronic devices at a given time. Because it improves the quality and effectiveness of people's lives and save time.

Electronic devices help the young generation to improve their listening abilities and improve communication skills. They promote independent learning among young people. The significant use of gadgets rises among the young people too soon. Each student can customize their electronic devices to match their unique needs.

In the 20th century, the technological devices reached its worldwide popularity. They eventually help the students on their study works mainly during the phase of self-study on pandemic. The study says that the visual representation helps them to stimulate their senses and can understand the concepts more than the text books. Students are so dependent on their smartphones and laptops that they frequently stay up all night studying, playing games, chatting, and surfing the web. Too much screen time of gadgets lead them towards vision impairment, anxiety, sleeplessness, obesity and depression as the students eventually get addicted to the devices. It leads to the clash of social-life balance of the students as they start to lose their interest in their surroundings. The common misconception among the students is that they can multitask while using electronic gadgets, which are now a major part of their lives and a major source of knowledge.

Without technological devices, individuals are now unable to envision their future. Particularly, students are more negatively impacted than other groups by their addictiveness on electronic devices. This is because students are now relying on the devices for their day-to-day activities and academic studies. The World Health Organization has reported that electromagnetic radiation can damage the DNA. It further triggers the release of the free-radical which can lead to the immunity loss, changes in metabolism level and the brain impairment. Machine learning predicts the result by using past information as input. It involves analysing computer algorithms, which may develop dynamically using experience and data. However, multitasking is a myth in accordance with the students' studies and concentration. A supervised learning algorithm's outcome variable must be predicted from a specified set of predictors. KNN, Logistic Regression, SVM, Random Forest, Decision Tree and some others are examples of supervised learning.

The phrase "Machine Learning" denotes artificial intelligence (AI). This software tool helps you to become more effective at anticipating outcomes without having to actively design it. There is a fundamental methodology for machine learning algorithm that accepts both the program's input and output and perform certain tasks as shown in Fig. 1. The ML algorithm creates a model using data samples known as training data. Machine learning is concerned with training computer programmers to access and utilize information to analyse on their own.

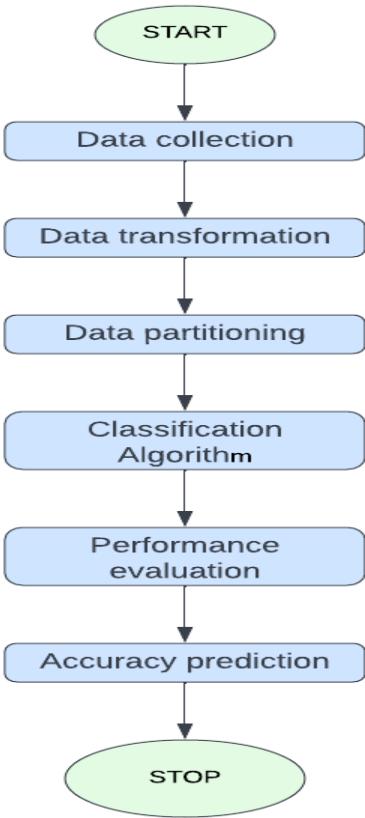


Fig.1 Workflow Diagram

II. LITERATURE REVIEW

H.M. Rafi Hasan, A. S. A. Rabby, M. T. Islam and S. A. Hossain, (2019) presented Machine Learning Algorithm for students' performance prediction by collecting the students' performance mark, attendance mark, presentation mark and assignment mark in the paper. They concentrated mainly to find whether the students are in their learning progress or not. Also, they eliminated the unnecessary data records like subjects. They collected the dataset with 1170 records and predicted the performance of the future result with the help of machine learning algorithms like K-Nearest Neighbors Algorithm(K-NN), Support Vector Machine Algorithm (SVM), Decision tree classifier and Random Forest classifier. They achieved 80% accuracy in all different algorithms. They plan to implement the model with application and added some features in order to help the students, teachers and parents [1].

Lidia Sandra 1, Ford Lumban Gaol, Tokuro Matsuo, (2020) analyzed the Machine learning algorithms to predict the students' performance. Their research paper says that the prediction of students' performance can see as an early intervention on the potential failure to achieve learning. They used 284 articles as an research articles and used the 2019-2020 research papers as an reference one. They handpicked and selected 284 research papers that obeys the inclusion criteria. And after the stability criteria, they left 11

papers that obey the inclusion criteria (5 in IEEE Access Database and other 6 in Science Direct database). The 11 selected sample research papers discussed the Machine learning implementation in students' academic performance. They analysed the data using the selected sample literature review based on required questions. They used the Naive bayes Algorithm, Artificial Neural Networks (ANN), Decision Tree, Logistic regression and Support Vector Machine (SVM)A lgorthm to predict the performance of the students. Their result is classified into two to three classifications such as Good/bad or Good/bad/excellent. The Artificial Neural Networks (ANN) shows the best levels of accuracy among all the algorithms they had used. The richness of their dataset are the additional challenges to their research prediction [2].

Anusha M, K Karthik, P Padmini Rani, Srikanth, (2019) analysed Prediction of Student Performance using Machine Learning. They explained about all the dataset and the big data with good explanation. They considered Big data because it was a cheap, affordable open source and the fast processoios. They used the K-means clustering method to unravel the well-known clustering problems, also used Naive bayes as is its simple and fast to execute the records and even used the Logistic regression. They used Exploratory Data Analysis (EDA) for the data analysis. They explained every single step of execution and made it very useful for the future and further studies. They achieved nearly 0.82% accuracy after training and predicting using the test data [3].

Kran Shahzadi, Muhammad Shahzad Sarfraz, Mazhra Saqib Hamza Mansoor Shah (2020) presented the Machine learning methods for analyzing the impact of social media on students' academic performance. They importantly talk about the Social Networking Sites (SNS) like twitter and facebook as they widely connecting the large number of people. They used two datasets contains around 900 records and they are multivariant This research says that most of the students have their mobile phones and an internet. In addition, their screen time is nearly 4 hours nearly .They used Python as tool. They used K-Nearest Neighbor (K-NN), Support Vector machine (SVM) Algorithm and the linear regression methodologies. They shared that they don't achieve 100% accuracy as their goal is mainly based on Twitter and Facebook [4].

J. Dhilipan, N. Vijayalakshmi , S. Suriya , Arockiya Christopher (2021) presented the Prediction of students performance using Machine Learning, the real goal which is to have an overview of the AI systems that are used to find academic development. They also focus on predicting the student data using prediction algorithms. They are convinced that they could help the students and the academic institutions can benefit and can have an impact. They collected the 10th,12th and previous semester marks for the dataset. They used Education Data Mining (EDM) for data classification. They collected data from the students and transformed those data into features. Then they trained the model and deployed it. Clustering technique was used to analyse data, as the data is large. They used the Entropy, K-Nearest Neighbour (KNN), Logical regression and the

Decision Tree technique for research. They achieved nearly 85% of accuracy in all algorithms [5].

Vladimir L. Uskov, J. P. Bakken, A. Byerly and A. Shah,(2019) presented Machine learning based predictive analytics on student's performance in STEM Education. They analysed and tested various algorithms including K-Nearest Neighbors(K-NN) Algorithm, Decision Tree, Naive bayes classification, Artificial Neural Network(ANN) regression etc,. They also performed the formative surveys of graduate students to understand their opinion on Machine Learning [6].

Mostafa Zafari, Abolghasem Sadeghi-Niaraki, Soo-Mi Choi, Ali Esmaily. (2021) developed a Practical model for the evaluation of the high school students Performance based on machine learning. They collected the dataset from the 480 high school students studying different courses and fields. Their dataset included the features of students including the school-life, home-life in all aspects. They used the machine learning models like Logistic regression, Decision tree and the Support Vector Machine (SVM) algorithms. Their paper supported the cross validation is a useful method for evaluating and comparing the learning algorithms. They gained 83% accuracy in logistic regression ,76% accuracy in decision tree. They achieved 83% average accuracy in overall research [7].

Sharma, Rahul and Maurya, Satyam Kumar and Kishor, Kaushal, (2021) presented the Student Performance Prediction using Technology of Machine Learning. They used various effective machine learning algorithms for the prediction. They mainly focussed algorithms are linear Regression, Decision Tree, K-nearest Neighbors (K-NN) and the Naive bayes classification. They shared that the improvements has been carried out throughout the research. They conducted the survey around various environments to understand the criteria [8].

Ajay Choudhary, Omansh Kumar Singh, Kailash Yadav, Manisha Singh (2019) developed the Tracking and Predicting Student Performance in Degree Programs Using Machine Learning Approach. They collected the dataset from the students of different backgrounds. The dataset contains 250 records with the required attributes for the prediction. They predicted the performance of the students and gave the results in the values like good, average, above average and excellent categories [9].

Durdević Babić, Ivana, (2017) performed Machine learning methods in predicting the student academic motivation. They shared that it is important to predict the students' academic motivation to improve their results as it helps students. They used many algorithms such as Support Vector Machine (SVM), Decision Tree and included the RBF kernel too. Where the Support vector Machine (SVM) shows the lowest accuracy in result analysis. In their research, the Neural Network model showed the most successful Prediction based on their behaviour course [10].

III. PREDICTION ON IMPACT OF ELECTRONIC GADGETS

Usage of electronic gadgets of the students are obtained in the form of a questionnaire based on average hours spent on the devices on gender. For easy understanding the dataset is converted into bar graph representation that of depicted as in Fig.2. By performing statistical calculations, the software was better able to understand the data. 70% of the data are used to train the model, while 30% are used to test it. This data split is in a 70:30 ratio. This proposed work used the information from 115 participants. The data are categorized using the machine learning method. To assess how well the model generalizes from training data to unknown data and to reduce the risk of over-fitting, partitioned the original dataset into a variety of training and test subsets.

A. Abbreviations and Acronyms

DNA	Deoxyribonucleic acid
KNN	K-Nearest Neighbor
SVM	Support Vector Machine
AI	Artificial Intelligence
ML	Machine Learning

B. Dataset Description

The dataset used here is a primary dataset. Primary dataset is a questionnaire form which consists of 120 records. After a pre-processing done on data, the dataset has 115 records. The prediction on impact of electronic gadgets in student life dataset is based on the parameters such as Id, Gender, Year of study, Devices, Previous CGPA, Current CGPA, CGPA, Hours and Marks as shown in Table 1.

Name	Dataset Name	Values	Representation
Gender	Gender	categorical	0-Male 1-Female
Year	year	Integer	year
Devices	devices	Integer	-
Previous CGPA	previous	Float	-
Current CGPA	current	Float	-
CGPA	CGPA	Integer	Range
Hours	hours	Integer	Hours

Name	Dataset Name	Values	Representation
Marks	marks	categorical-	

Table.1 Dataset description

From the primary dataset we have differentiate the students current CGPA and Previous CGPA marks, that are shown in Fig.2 and Fig.3.

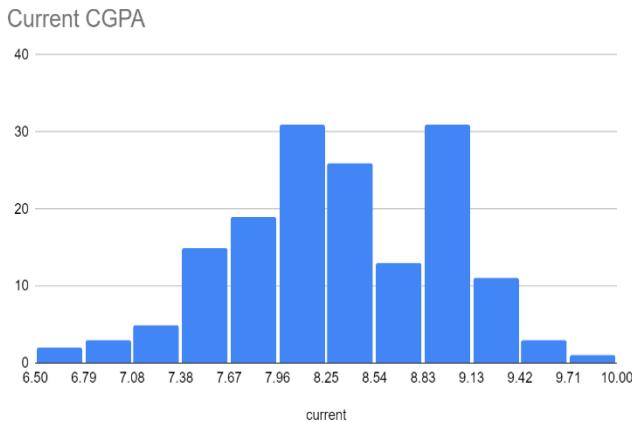


Fig.2 Current CGPA

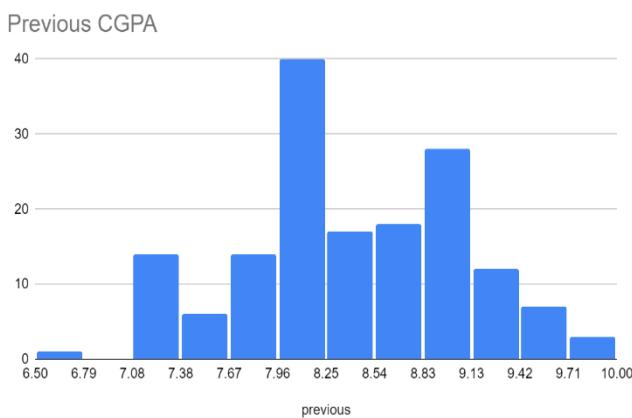


Fig.3 Previous CGPA

As we can refer from the above listed figures, we can see that the CGPA of the students are decreased in the range 9.00-10.00 and are increased in the 7.00-8.00 range.

C. Performance Measure

This section discusses the performance metrics necessary for the experiment. A crucial component of reliable opinion mining is performance metrics. The performance is validated using the most widely used performance criteria, including recall, accuracy, precision, F1 score, and support. The confusion matrix is employed for estimating the performance metrics. The confusion matrix must be scaled using the true positive, true negative, false positive, and false negative values.

D. Confusion matrix

The many outcomes of the categorization tasks' results and predictions are represented by a confusion matrix. The classification results can be seen more clearly with the help of True Positive, False Positive, True Negative and False Negative values as shown in Table 2. We can evaluate the model qualification's quality with its assistance.

TP	FP
FN	TN

Table .2 Confusion Matrix

E. Equations

Precision:

How closely the estimated results match one another is a measure of precision.

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}} \quad (1)$$

Recall:

The recall is determined as the proportion of Positive samples that were properly identified as Positive to all Positive samples.

$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}} \quad (2)$$

F1-Score:

The F1 score is a machine learning assessment statistic that assesses the precision of a model.

$$\text{F1-Score} = \frac{\text{TP}}{\text{TP} + 1/2[\text{FP} + \text{FN}]} \quad (3)$$

Accuracy:

Accuracy refers to how near a measurement is to its true value.

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{FP} + \text{FN} + \text{TN}} \quad (4)$$

Error rate:

Error rate is a measurement of how far a model deviates from the genuine model in terms of its predictions.

$$\text{Error Rate} = \frac{\text{FP} + \text{FN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}} \quad (5)$$

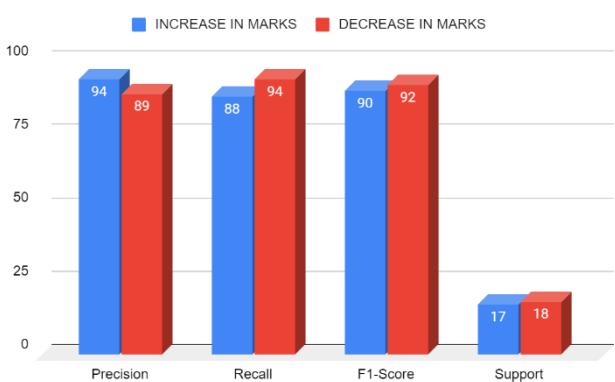


Fig.4 Comparison of predicted values

The above Fig.4 shows the comparison of Increase in Marks and Decrease in Marks based on Precision, Recall, F1-Score and support Equations.

IV. RESULT AND DISCUSSION

The results for algorithms such as Decision Tree showed results with 82%, Random Forest with 85%, SVM with 90% and K-NN with 91% accuracy and Logistic Regression with 91.43% as tabulated below (Table.3). So, Logistic Regression algorithms outperformed other algorithms with 91.43% accuracy which is shown in Fig.5.

ALGORITHM	ACCURACY
K-NN	91%
Decision Tree	82.86%
Random Forest	85.71%
Logistic Regression	91.43%
SVM	90.15%

Table.3 Accuracy evaluation of algorithms

comparison of algorithm accuracy

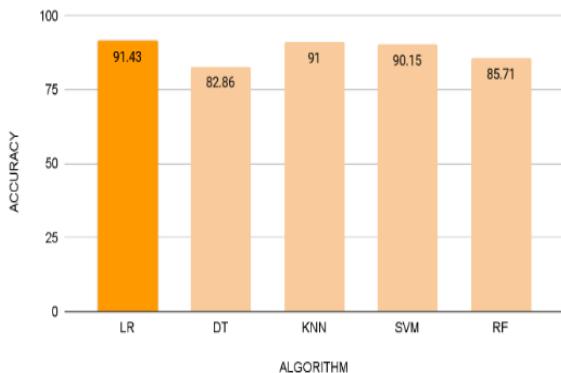


Fig.5 Comparison of Algorithms evaluation

V. CONCLUSION

The prediction on impact of electronic gadgets in students' life using machine learning was made with machine learning algorithms like K-NN, Decision tree, Random Forest, SVM and Logistic Regression. Logistic Regression shows that highest accuracy of 91.43% among all algorithms.

VI. FUTURE SCOPE

Further, the algorithms can be hybridized to reduce the error rate. The dataset can be further increased by including all types of people. And, the large number of dataset helps to provide more information about the data.

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