

**(For demonstration purposes only)**

**Development of a Machine Learning Model Integrated in a Mobile App to  
Predict Students' Performance**

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**Abstract**

This research explores the creation of a machine learning model integrated into a mobile application to predict students' academic performance. The model, built using a decision tree algorithm, was trained on data from 500 students, including historical grades, attendance records, and study habits. The mobile app, developed using Flutter and integrated with TensorFlow Lite, enables real-time predictions based on student input. The model demonstrated an accuracy of 85%, with key features such as attendance, grades, and study habits being most influential. Usability testing of the app showed that 90% of users were satisfied with the interface and prediction features. This study highlights the potential of combining machine learning with mobile technology to provide valuable insights into student performance and support timely interventions.

**Keywords:** Machine learning, mobile application, student performance prediction, decision tree

**1. Introduction**

In recent years, the use of machine learning (ML) models has significantly improved predictive analytics in various fields, including education. With the growing reliance on mobile technologies, integrating ML models into mobile applications has become a practical solution for real-time data processing and prediction. This research aims to develop a machine learning model that can predict students' academic performance based on historical data, which will be integrated into a mobile app. The purpose is to provide real-time insights to students and educators, allowing for timely interventions to improve learning outcomes.

Previous studies have explored the use of ML for predicting academic performance (Jain & Patel, 2020; Lee & Kim, 2021), but few have focused on integrating such models within mobile applications for real-time predictions. This study seeks to fill this gap by combining a robust ML model with a mobile platform for seamless user interaction and prediction accessibility.

The research question guiding this study is: *Can a machine learning model integrated into a mobile application predict students' academic performance with sufficient accuracy?*

## **2. Methods**

### **2.1 Research Design**

The research followed a quantitative design, utilizing historical student performance data to train and validate the machine learning model. The model was then integrated into a mobile application to make real-time predictions.

### **2.2 Participants and Data Collection**

Data was collected from 500 students from the Computer Science department at Laguna State Polytechnic University-San Pablo City Campus

The data included historical grades, attendance records, participation in extracurricular activities, and study habits. Ethical approval was obtained from the university's research ethics board.

### **2.3 Machine Learning Model**

A decision tree algorithm was chosen for this study due to its interpretability and effectiveness in classification tasks. The model was trained using scikit-learn, a Python library for machine learning. The training set consisted of 80% of the data, while the remaining 20% was used for testing the model's accuracy.

### **2.4 Mobile Application Development**

The mobile app was developed using Flutter, which allows for cross-platform development. The app integrated the trained machine learning model using TensorFlow Lite, ensuring real-time performance on both Android and iOS devices. The app collects real-time student input (e.g., current grades and study hours) and predicts their performance in future exams.

### **2.5 Data Analysis**

The accuracy of the ML model was evaluated using metrics such as accuracy, precision, recall, and F1-score. Cross-validation was performed to ensure the robustness of the model. The performance of the app was evaluated through usability testing with 50 students to assess ease of use and user satisfaction.

## **3. Results**

The machine learning model demonstrated an accuracy of 85% in predicting students' academic performance. The decision tree algorithm showed the highest importance for features such as attendance, grades in previous courses, and study hours. The app's performance was also evaluated, and 90% of users reported high satisfaction with the real-time predictions and user-friendly interface.

The confusion matrix below shows the distribution of true positives, false positives, true negatives, and false negatives in the prediction of students' performance.

**Table 1: Confusion Matrix for the ML Model**

	Predicted Pass	Predicted Fail
Actual Pass	150	20
Actual Fail	30	300

The app's usability testing revealed that 95% of students found the mobile interface intuitive, with an average rating of 4.6 out of 5 for ease of use.

#### 4. Discussion

The findings of this study confirm the feasibility of integrating a machine learning model into a mobile application for predicting students' academic performance. The decision tree model performed well, with an accuracy rate of 85%. This result aligns with similar studies that used ML to predict academic outcomes (Jain & Patel, 2020; Lee & Kim, 2021). The factors that most influenced the prediction were attendance, past grades, and study habits, which are consistent with previous research on academic performance (Agarwal & Mehta, 2019).

The integration of the model into a mobile application proved to be a valuable tool, as students could receive real-time performance predictions, potentially aiding in timely interventions. However, this study has several limitations. The data was limited to students from one university, and the model may not generalize well to other institutions or educational contexts. Future research could explore the use of more sophisticated models, such as neural networks, and evaluate the long-term impact of the app on student performance.

#### 5. Conclusion

This study successfully developed a machine learning model integrated into a mobile application to predict students' academic performance. The results suggest that such tools can provide meaningful insights to students and educators. Moving forward, expanding the dataset and incorporating more advanced machine learning algorithms could enhance the accuracy and applicability of the predictions.

#### References

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