**Student Performance Predictor Using Machine Learning**

**1. Introduction**

In the modern educational environment, understanding the factors that influence student performance is essential. Many elements such as study time, attendance, sleep patterns, and health directly affect academic outcomes. However, students and educators often lack tools to effectively analyse and act upon this data.

The **Student Performance Predictor** is a mobile application designed to fill this gap. It uses **machine learning** to predict a student’s academic performance based on a variety of inputs and provides intelligent insights and tips for improvement.

**2. Objective**

The main objective of this project is to:

* Predict student academic performance using key behavioural and academic factors.
* Provide a user-friendly mobile interface for students to track and analyse their progress.
* Encourage data-driven self-improvement and academic planning.

**3. Problem Statement**

Students often struggle to understand which habits or behaviours are positively or negatively affecting their performance. While institutions collect a lot of data, it's rarely personalized for the student’s self-assessment. There's a need for a **smart, accessible, and interpretable system** to bridge this gap.

**4. Technologies Used**

**➤ Frontend (Mobile App)**

* **Framework:** React Native with Expo
* **Language:** TypeScript
* **Navigation:** React Navigation
* **UI Design:** Custom styles with icon libraries like lucide-react-native

**➤ Backend (Machine Learning)**

* **Language:** Python
* **Libraries:** pandas, scikit-learn, NumPy, Matplotlib, Seaborn
* **Model:** Classification (e.g., Decision Tree, Random Forest)

**➤ Communication**

* **API:** Flask or FastAPI to expose the ML model
* **Data Format:** RESTful API using JSON

**➤ Dataset**

* **Source:** UCI Machine Learning Repository
* **Dataset Name:** [Student Performance Dataset](https://archive.ics.uci.edu/ml/datasets/Student+Performance)
* **Features:** Includes inputs like study time, school support, parental education, absences, alcohol consumption, and more.

**5. Functional Features**

1. **Login & Registration:**  
   Secure user authentication for accessing personalized predictions.
2. **Input Parameters:**  
   Users input their habits (study hours, attendance, sleep, etc.) through clean, user-friendly forms.
3. **Predictive Results:**  
   Using the trained ML model, predictions are returned instantly with a performance rating (e.g., Pass, At Risk, Excellent).
4. **Visualization:**  
   Charts or graphs display trends, comparisons, and historical data.
5. **Tips & Suggestions:**  
   Based on the input, the app recommends personalized tips to enhance academic performance.

**6. Machine Learning Model Details**

* **Data Preprocessing:** Handling missing values, encoding categorical variables, feature selection.
* **Model Used:** Random Forest Classifier (for interpretability and accuracy)
* **Evaluation Metrics:** Accuracy, Confusion Matrix, F1 Score
* **Model Training:** Performed on local Jupyter environment and integrated via Flask API

**7. Outcome**

* Students gain a personalized view of how their habits affect academic outcomes.
* Encourages healthy behaviours through insights and tips.
* Helps educators better understand which students might need help.
* Creates a scalable base for future smart-education applications.

**8. Future Enhancements**

* **Firebase Integration** for real-time data storage and authentication.
* **Detailed Analytics** dashboard with predictive progress reports.
* **AI-based Chatbot** for answering student queries.
* **Notifications** and reminders for study planning and goal tracking.
* **Gamification** elements to encourage continuous improvement.

**9. Conclusion**

The **Student Performance Predictor** bridges the gap between raw academic/lifestyle data and meaningful insights. With an intuitive frontend and powerful backend, it empowers students to take charge of their academic journey using data science. The project not only has academic value but also potential for real-world impact in education systems worldwide.