

CAPSTONE PROJECT

Smart Student Performance Prediction & Analytics System

PRESENTED BY

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OUTLINE:

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT:

In educational institutions, student performance is evaluated only after examinations. This delayed evaluation prevents early identification of academically weak students. Due to the absence of predictive and analytical systems, educators are unable to take proactive actions, leading to poor academic outcomes and increased failure rates.

PROPOSED SOLUTION:

The proposed system predicts student academic performance using machine learning techniques based on parameters such as attendance, internal marks, and study hours. The system also provides confidence scores, performance grades, and analytical insights to support data-driven academic decision-making.

- **Data Collection**
 - Collect student data such as attendance, internal marks, and study hours.
- **Data Preprocessing**
 - Clean data, handle missing values, and extract relevant features.
- **Machine Learning**
 - Train a classification model (Logistic Regression) to predict **Pass/Fail**.
 - Generate confidence scores and performance grades.
- **Analytics & Visualization**
 - Store prediction results and visualize insights using dashboards.
 - Data can be integrated with **Power BI** for advanced reporting.
- **Deployment**
 - Develop a web-based application.
 - Design the system to be **cloud-ready for Azure deployment**.
- **Result**
 - Accurate predictions with clear analytics supporting data-driven academic decisions.

SYSTEM APPROACH:

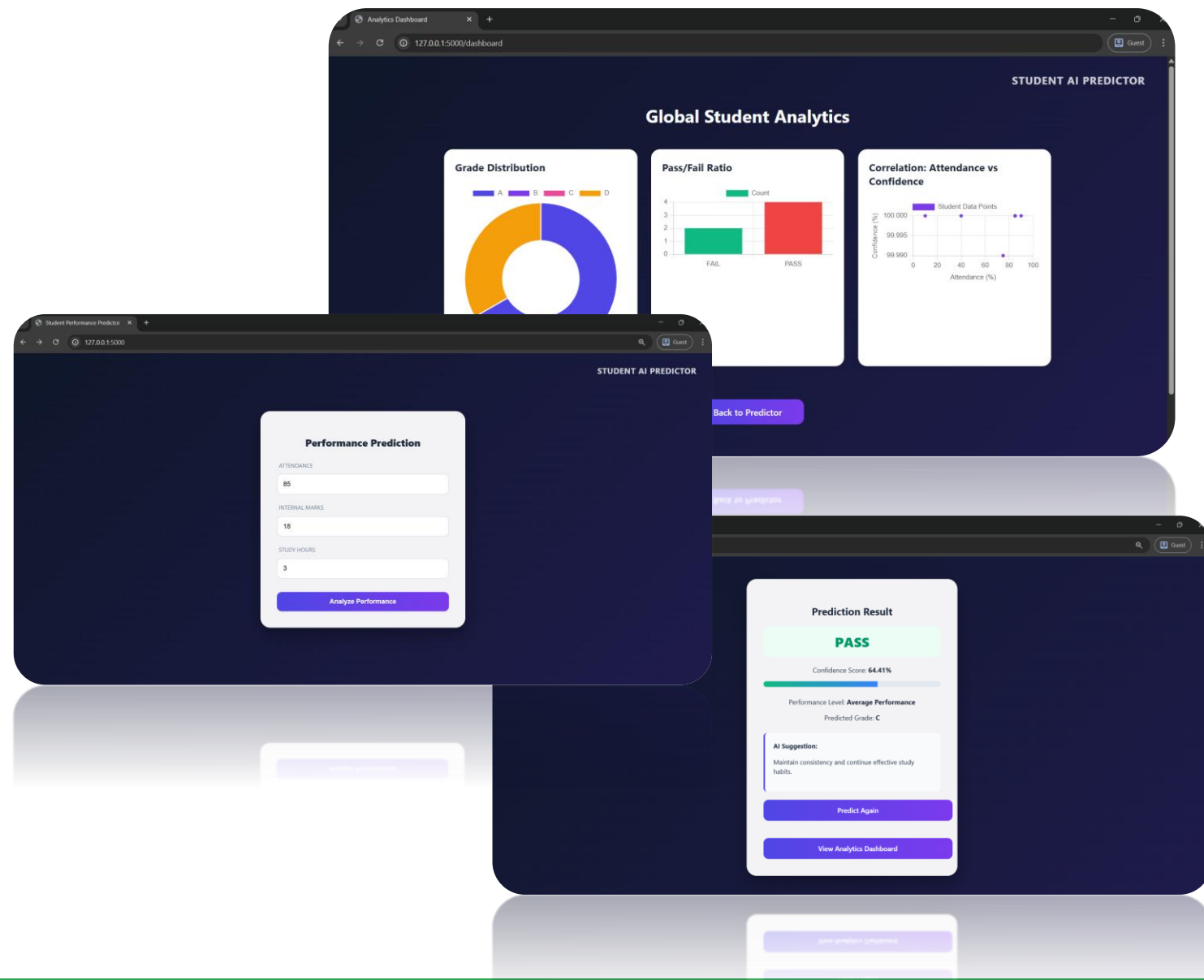
- **Data Collection:**
Student academic records including attendance, marks, and study hours.
 - **Data Preprocessing:**
Data cleaning, feature selection, and normalization.
 - **Model Training:**
Machine learning model trained using historical data.
 - **Prediction & Analysis:**
Performance prediction with confidence score and grade classification.
 - **Visualization:**
Analytical insights displayed using dashboard-based visualizations.
- **Technology Used:**
 - **Common Technologies:**
 - Python
 - Flask Framework
 - HTML, CSS, JavaScript
 - Machine Learning (Scikit-learn)
 - Chart.js (Visualization)
 - **Azure Fundamentals (Conceptual):**
 - Azure Machine Learning Studio
 - Azure App Service
 - Azure Blob Storage
 - **Power BI (Conceptual):**
 - Web-based Analytics Dashboard
 - Power BI Integration (Future Enhancement)

ALGORITHM & DEPLOYMENT:

- **Algorithm Selection:**
 - A **Logistic Regression classification model** is selected due to its simplicity, interpretability, and effectiveness for binary classification problems such as **Pass/Fail prediction**.
- **Data Input:**
 - Input features include:
 - Attendance percentage
 - Internal assessment marks
 - Study hours per day
- **Training Process:**
 - The model is trained using historical student academic data.
 - Data preprocessing and feature scaling are applied to improve prediction accuracy.
- **Prediction Process:**
 - The trained model predicts student performance outcomes along with a confidence score.
 - Predictions are categorized into grades for better understanding.
- **Deployment:**
 - The model is integrated into a **Flask-based web application**.
 - The system is designed to be **cloud-ready** and can be deployed on **Azure App Service**.
 - Prediction data can be used for analytics and visualization through dashboards or **Power BI**.

RESULT:

- **Model Output:**
- Predicted Result: Pass / Fail
- Confidence Score (%)
- Performance Grade (A/B/C/D)
- AI-based academic suggestions
- **Dashboard Output:**
- Grade distribution
- Pass vs Fail analysis
- Attendance vs Confidence visualization



RESULT:

STUDENT AI PREDICTOR

Performance Prediction

ATTENDANCE

e.g. 80%

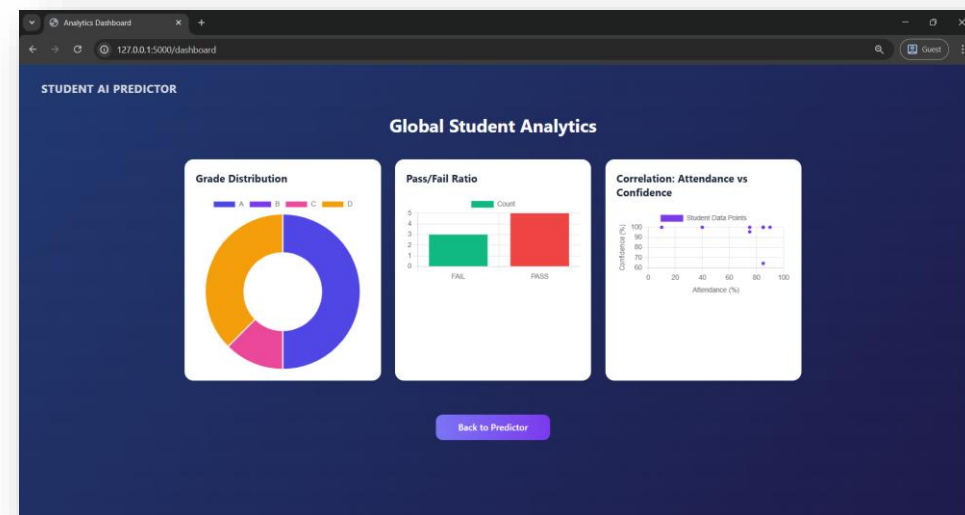
INTERNAL MARKS

e.g. 18

STUDY HOURS

e.g. 5

Analyze Performance



Prediction Result

PASS

Confidence Score: 64.41%

Performance Level: Average Performance

Predicted Grade: C

AI Suggestion:

Maintain consistency and continue effective study habits.

Predict Again

View Analytics Dashboard

Prediction Result

FAIL

Confidence Score: 95.51%

Performance Level: At Academic Risk

Predicted Grade: D

AI Suggestion:

Increase study hours and improve attendance urgently.

Predict Again

View Analytics Dashboard

CONCLUSION:

The Smart Student Performance Prediction System successfully demonstrates the use of machine learning for early academic performance analysis. The system provides meaningful predictions, confidence scores, and analytical insights. The integration-ready architecture supports scalability, cloud deployment, and advanced analytics, making it suitable for real-world educational applications.

FUTURE SCOPE:

- Integration with real-time student data systems
- Cloud deployment using Azure services
- Full Power BI Service integration
- Advanced ML models for grade prediction
- Institutional-level academic monitoring dashboards

REFERENCES:

- Microsoft Azure Documentation
- Scikit-learn Official Documentation
- Flask Documentation
- Machine Learning Research Papers on Student Performance Prediction

GitHub Link: <https://github.com/SwarajAmbawade/Smart-Student-Performance-Prediction-Analytics-System>

Thank You