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AI-Based Student Performance Tracker : A Smart Web-Based Platform for Academic Monitoring, Predictive Analysis, and Personalized Learning

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Abstract: *The AI-Based Student Performance Tracker is a web-based system that uses artificial intelligence to monitor and improve students' academic performance in real time. It provides secure login access for students, teachers, and administrators, where teachers can update attendance, marks, and feedback, and students can view their progress through a personalized dashboard with study recommendations. The system collects and manages data like attendance, test scores, and activities in one place, reducing manual work and improving transparency. Using machine learning algorithms, it analyzes student performance, identifies weak areas, and predicts at-risk students, helping teachers and institutions take timely actions and improve overall learning outcomes.*

Keywords: *Student Performance Tracker*

I. INTRODUCTION

The AI-Based Student Performance Tracker is designed to improve how student performance is monitored and analyzed in educational institutions. In the current education system, traditional methods mainly focus on exam results and often fail to capture a student's overall progress, learning behavior, and skill gaps, making it difficult for teachers to provide proper guidance and for students to understand where they need improvement. To overcome this problem, this project uses artificial intelligence and modern web technologies to create a smart and integrated system that collects and analyzes data such as attendance, assignments, quizzes, and exam results in one place. The system provides role-based access for students, teachers, and administrators, allowing teachers to update records, track progress, and give feedback, while students can view their performance through a dashboard and receive suggestions for improvement. It uses machine learning techniques to identify weak areas, detect at-risk students, and provide personalized learning recommendations. All data is stored securely in a centralized database, ensuring accuracy, transparency, and easy access. Overall, this system reduces manual work, supports better decision-making, and creates a more efficient, intelligent, and data-driven learning environment for both students and institutions.

II. RELATED WORK

Several educational institutions currently use Learning Management Systems (LMS) and student information systems to manage academic records and monitor student progress. These systems allow basic features such as attendance tracking, grade management, and report generation, helping teachers and administrators maintain centralized data. However, most of these platforms focus mainly on data storage and do not provide advanced analysis or intelligent insights into student performance. Some research studies have proposed web-based student performance tracking

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systems developed using technologies like Angular, ASP.NET, and SQL databases. These systems support features such as student registration, performance recording, and administrative monitoring, making data management easier and more organized. Despite these advantages, they often lack real-time analysis, predictive capabilities, and personalized feedback for students. Additionally, many traditional systems depend on manual evaluation and do not effectively identify weak areas or at-risk students in advance. With the increasing use of artificial intelligence in education, modern systems are now focusing on integrating machine learning techniques to enhance performance analysis. AI-based models can analyze large amounts of academic data, detect hidden patterns, and provide personalized recommendations. However, only a few existing platforms fully combine AI, real-time analytics, and user-friendly web interfaces into a single system.

III. LITERATURE REVIEW V. PROPOSED SYSTEM OVERVIEW

1. AI-Based Student Performance Prediction System
Authors: A. Sharma, R. Gupta, S. Verma, P. Singh
Explanation:
This system uses machine learning algorithms to analyze student data such as attendance, marks, and participation to predict academic performance. It helps teachers identify weak students and take early action to improve results. The system provides basic dashboards and performance reports. Additional Issues: Limited real-time analysis and lacks personalized recommendations for students.

2. Student Monitoring and Analysis System
Authors: K. Patil, S. Deshmukh, R. Kulkarni, A. Jadhav
Explanation:
A web-based application that tracks student attendance, assignments, and exam results. It allows teachers to manage student records and generate reports, while students can view their academic progress online.
Additional Issues: Does not include AI-based prediction or advanced data analysis features.

3. Smart Learning Analytics Platform
Authors: M. Joshi, P. Mehta, D. Shah, N. Patel
Explanation:
This platform uses data analytics to study student learning patterns and performance trends. It helps in identifying areas where students need improvement and supports better teaching strategies.
Additional Issues: Lacks integration of real-time feedback and user-friendly dashboards for all stakeholders.

4. AI-Driven Personalized Learning System
Authors: S. Iyer, R. Nair, V. Menon, T. Krishnan
Explanation:
An intelligent system that provides personalized learning recommendations based on student performance and behavior. It adapts learning content according to individual needs and improves student engagement.
Additional Issues: Needs better integration with academic data systems and real-time performance tracking.

IV. PROBLEM STATEMENT

In the current education system, monitoring and improving student performance is a major challenge due to the limitations of traditional evaluation methods. Most institutions rely on exam results and manual record-keeping, which do not provide a complete view of a student's progress, learning behavior, or skill gaps. Teachers often find it difficult to identify weak students at an early stage, and students do not receive proper guidance to improve their performance. Scattered data, lack of real-time analysis, and absence of personalized feedback lead to inefficiency and poor decision-

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making. The proposed AI-Based Student Performance Tracker addresses these challenges by providing a smart and user-friendly platform that collects, analyzes, and manages .

V. PROPOSED SYSTEM OVERVIEW

The proposed AI-Based Student Performance Tracker is a smart web-based platform that connects students, teachers, and administrators in a single system to improve academic performance monitoring and analysis. It aims to provide real-time insights, identify weak areas, and support personalized learning for students. The system includes an Angular-based frontend and a backend integrated with AI models and a centralized database. Users can log in based on their roles, where teachers can update attendance, marks, assignments, and feedback, while students can view their performance through dashboards and receive improvement suggestions. All student data is securely stored and processed to generate meaningful insights. The system uses machine learning algorithms to analyze performance, detect at-risk students, and predict outcomes. Administrators can manage user accounts and monitor overall academic performance.

VI. SYSTEM ARCHITECTURE

The AI-Based Student Performance Tracker is a web-based platform that connects students, teachers, and administrators within a single integrated system. Its main objective is to simplify the process of tracking and analyzing student performance, ensure transparency, and securely manage academic data using modern web technologies and a centralized database. The system uses an Angular-based frontend for user interaction and a backend integrated with AI models to process and analyze data in real time.

1. Modules

1.1 Admin Module

In this module, the administrator can securely log into the system and manage overall operations. After logging in, the admin can add, update, or delete user accounts for students and teachers. The admin is responsible for managing academic data, monitoring system activities, and ensuring that all records such as attendance, marks, and performance reports are properly maintained. The admin can also view overall performance analytics, generate reports, and track trends at the institution level. Additionally, the admin ensures data security, controls access permissions, and maintains smooth functioning of the system.

1.2 Recipient Module

Teachers can create an account and securely log into the system to manage student academic activities. After logging in, teachers can enter and update student data such as attendance, assignment marks. The system analyzes this data to show performance trends and identify students who need improvement. Teachers can view detailed reports, monitor student progress, and provide feedback or remarks. They can also track weak areas of students and take necessary actions to improve their performance.

1.3 Student Module

Students can create an account and securely log into the system to view their academic performance. After logging in, students can access their personal dashboard, which displays details such as attendance, assignment marks, quiz scores, and exam results. The system analyzes their data and highlights performance trends, helping students identify their strengths and weak areas. Students can also receive personalized suggestions and recommendations to improve their performance. Additionally, they can track their progress over time and stay informed about their academic status..

2. Backend Architecture (ASP.NET & AI Integration)

The system uses ASP.NET and AI-based services to manage authentication, data processing, and performance analysis:

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• Authentication (ASP.NET Identity): Ensures secure login and role-based access for students, teachers, and administrators.
• Database (SQL Server): Stores structured data such as student details, attendance, marks, assignments, and performance.
• AI Integration (OpenRouter / ChatGPT APIs): Used to analyze student performance data, predict outcomes, identify weak areas, and provide personalized suggestions forimprovement.
• Backend Logic (ASP.NET APIs): Handles data processing, communication between frontend and database, and real-time performance analysis.

3. Approval and Notification Workflow
• Teachers enter and update student data such as attendance, marks, and assignments.
• The system processes and analyzes the data using backend logic and AI models.
• Based on the analysis, performance insights, predictions, and suggestions are generated.
• If any student is identified as at-risk or underperforming, the system highlights it and generates alerts.
• Notifications and updates are sent to students and teachers regarding performance, improvements, and important changes.

VII. IMPLEMENTATION DETAILS

The implementation of the proposed AI-Based Student Performance Tracker consists of four main steps: Data Entry and User Registration, Performance Analysis, AI-Based Prediction and Recommendation, and Notifications and Reports.

User Input and Registration
Users, including students, teachers, and administrators, securely log into the application. Students provide basic details and can view their academic records, while teachers enter student-related data such as attendance, marks, assignments, and feedback. Administrators manage user accounts and system data. All input data is validated and securely stored in the database to ensure accuracy, consistency, and data integrity.

Performance Analysis and Matching (AI Processing)
When teachers enter student data, the system processes the academic dataset to analyze performance. The AI model evaluates factors such as marks, attendance, and participation to identify patterns. Based on this analysis, the system highlights weak areas, predicts performance levels, and categorizes students (e.g., good, average, at-risk). A detailed performance report is generated and shared with both students and teachers for review.

Teacher Review and Validation
Teachers review the analyzed data, performance reports, and AI-generated insights to ensure accuracy. They can verify student progress, add remarks, and take necessary actions such as providing extra support or modifying teaching strategies. If needed, teachers can update or correct data, ensuring reliable and meaningful results for students.

Notifications and Updates
The system sends real-time notifications to students and teachers regarding performance updates, alerts for low performance, and important changes. Students receive suggestions and improvement tips, while teachers get alerts about at-risk students. All users can track updates through dashboards, ensuring timely actions and better communication.

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History and Reusability

The system stores all past student records, performance reports, and AI analysis for future reference. Teachers and administrators can track student progress over time, compare past and current performance, and make better decisions. This feature helps in long-term academic planning and allows quick access to previous data for continuous improvement.

SYSTEM AECHITECTURE

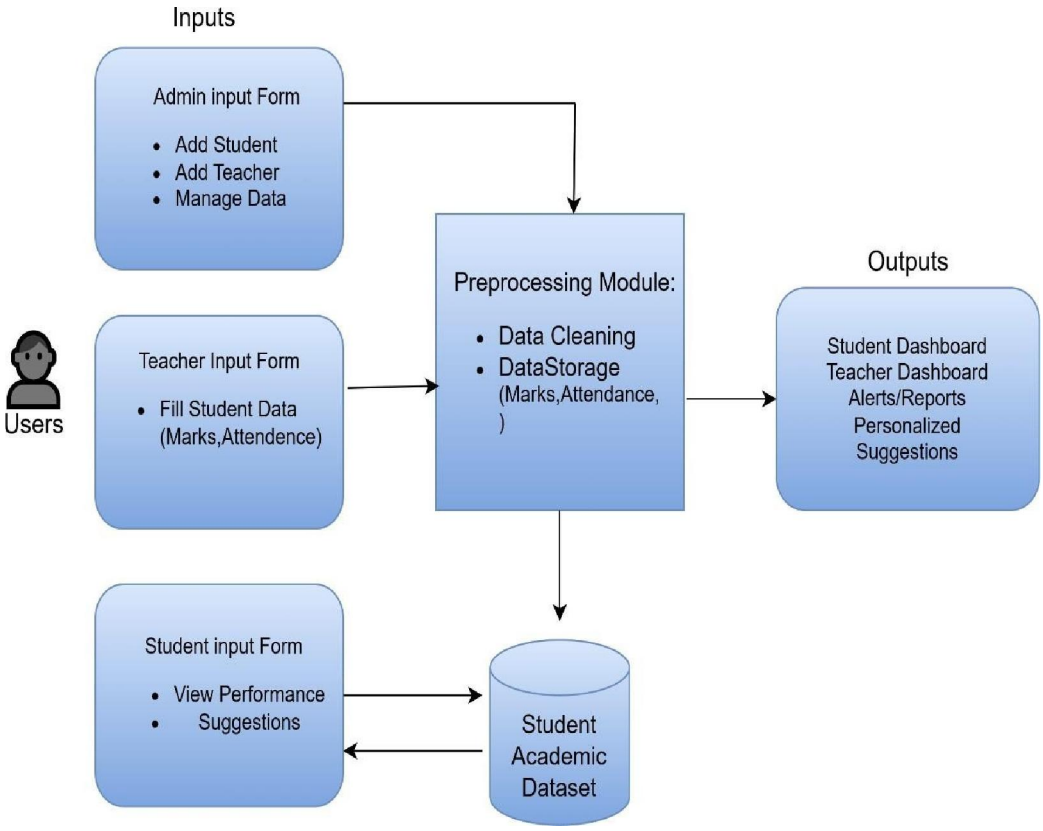

Figure 1: System architecture

VIII. PROPOSED SYSTEM

System Architecture :

System Architecture is shown in Figure 1.

Our proposed system will function in the following steps:

Step 1: User Registration

Students, teachers, and administrators register in the system with their basic details.

Step 2: Login & Authentication

The system verifies users through secure authentication using ASP.NET Identity and role-based access.

Step 3: Data Entry (Academic Input)

Teachers enter student data such as attendance, marks, assignments, and performance details into the system.

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Step 4: Data Processing and Analysis
The system processes the entered data and analyzes it using backend logic and AI models to identify patterns and trends.

Step 5: AI-Based Prediction and Suggestions
The AI model predicts student performance, identifies weak areas, and provides personalized suggestions for improvement.

Step 6: Dashboard and Notifications
Students and teachers receive real-time updates, performance reports, alerts, and can view insights through dashboards.

IX. ANALYSIS OF PROPOSED SYSTEM

1. Enhanced Efficiency and Real-Time Insights:
The proposed AI-Based Student Performance Tracker improves the efficiency and accuracy of monitoring student performance. By integrating web technologies with a centralized database and AI models, the system provides real-time updates, dashboards, and performance insights to students, teachers, and administrators, reducing delays and manual effort.

2. Intelligent Analysis and Prediction:
The automatic matching engine analyzes donor and recipient details such as blood group, organ type, and age, ensuring faster and more accurate matches. Doctor verification adds a layer of medical safety, minimizing errors and ensuring that only com-patible and medically approved matches are processed.

3. Secure Role-Based Access :
The platform provides role-based access control for students, teachers, and administrators. Each user can access only relevant features, ensuring data security, privacy, and proper system management.

4. Improved Decision-Making and Transparency:
Compared to traditional systems, this platform centralizes all academic data, improves communication, and provides clear insights through reports and dashboards. helps teachers make better decisions and allows students to track their progress effectively, creating a transparent and reliable system.all data, and improves coordination among.

3. MODULES
The proposed AI-Based Student Performance Tracker is divided into four main modules: Student, Teacher, Admin, and Notification. Each module is designed to handle specific functionalities and ensure smooth operation of the system.

1. Student Module
This module allows students to view their academic performance, including attendance, marks, and progress reports. Students can identify their strengths and weak areas and receive personalized suggestions for improvement. It also maintains a history of their performance for future reference.

2. Teacher Module
Teachers use this module to enter and manage student data such as attendance, assignments, and exam results. They can monitor student progress, analyze performance trends, and provide feedback. This module helps teachers identify weak students and take necessary actions.

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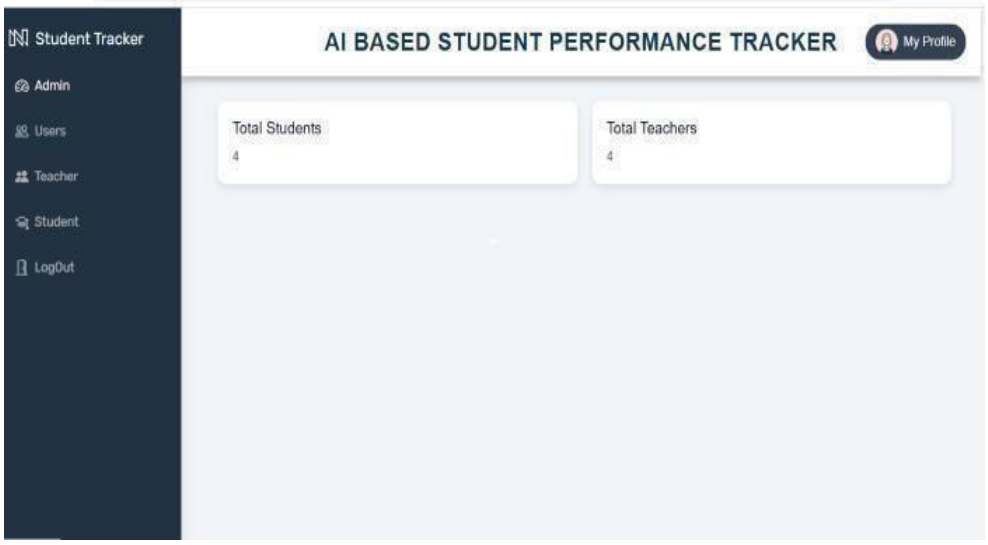
3. Admin Module

The Admin Module manages the entire system, including student and teacher accounts. It controls the database, ensures data accuracy and security, and monitors overall academic performance. The admin can also generate reports for analysis and decision-making.

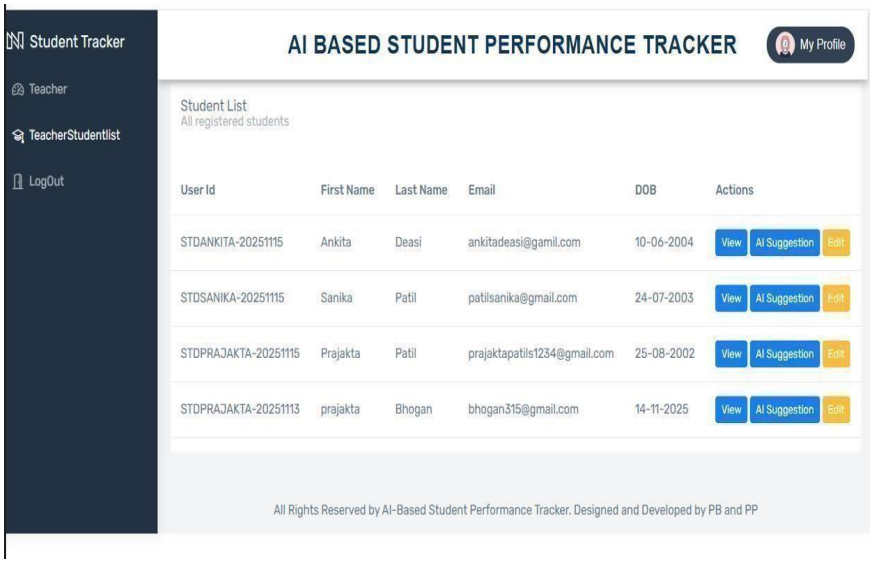
4. Notification Module

The Notification Module sends real-time updates and alerts to users. Students receive performance updates and improvement suggestions, while teachers get alerts about at-risk students. This module ensures smooth communication and timely actions within the system.

RESULTS



Admin Dashboard



Student List:

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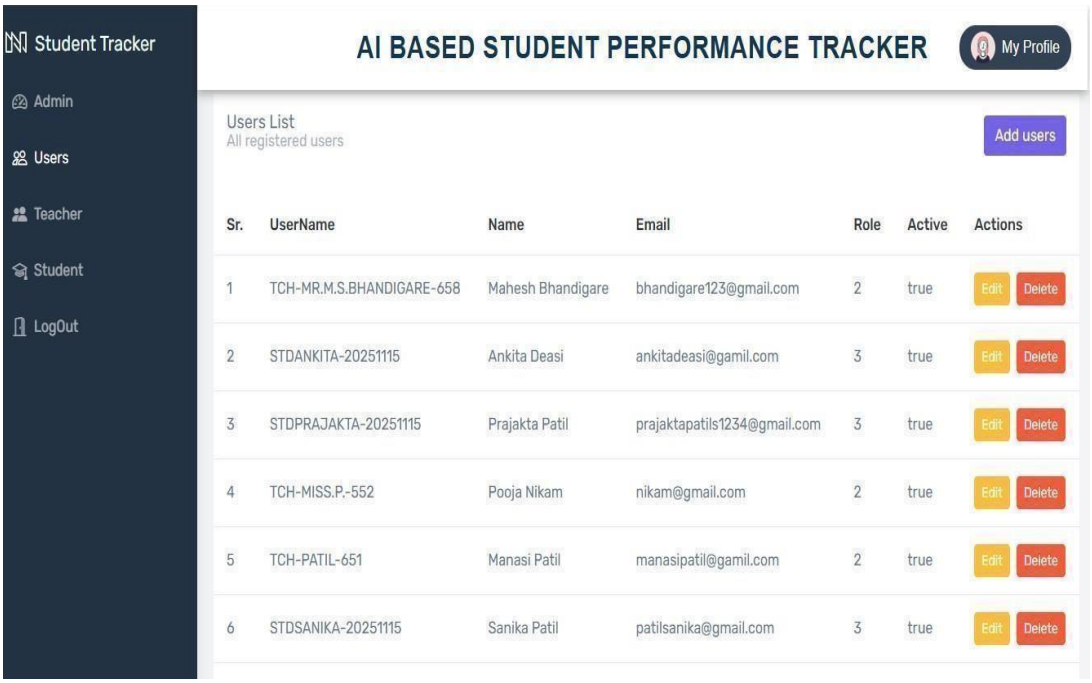
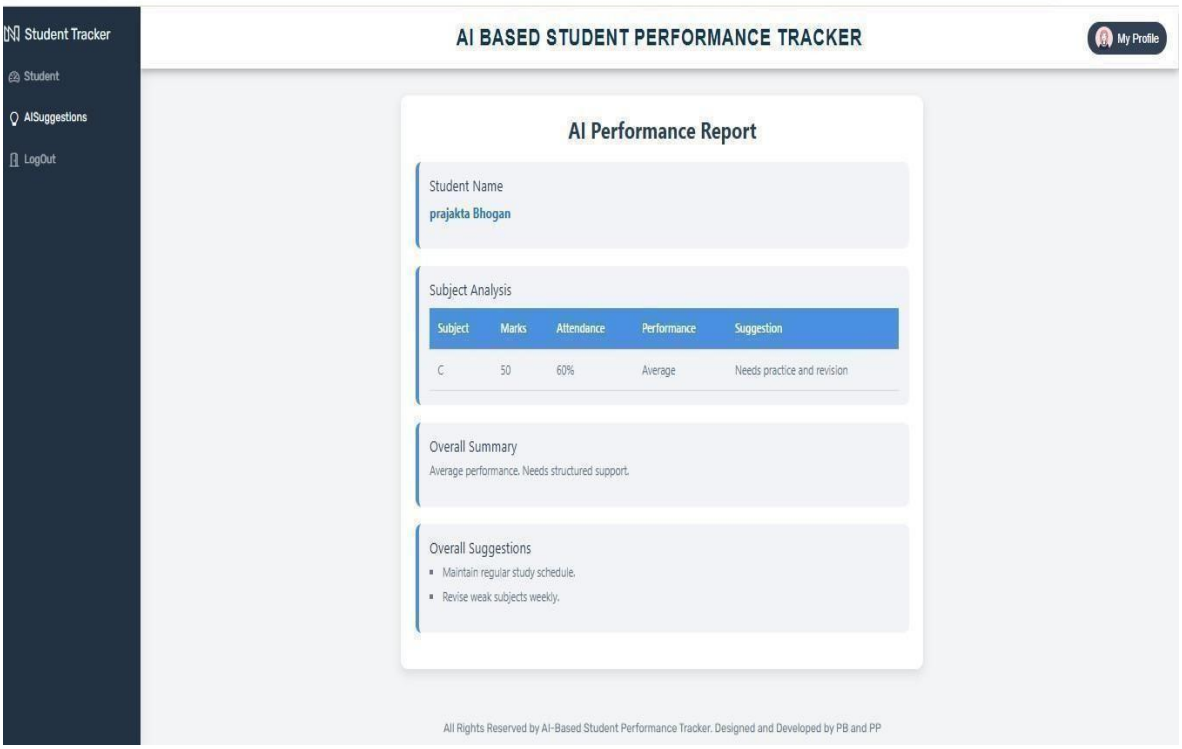


Add User:



AI Suggestion for Student:

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X. CONCLUSION

The AI-Based Student Performance Tracker System provides an intelligent, efficient, and user-friendly solution for monitoring and improving student academic progress. By integrating artificial intelligence with student performance data, the system automatically analyzes marks, attendance, and other parameters to generate insightful reports and personalized recommendations. It simplifies academic management by combining data storage, performance tracking, and AI-based analysis into a single platform. Developed using Node.js, Angular, and SQL Server, the system ensures high performance, scalability, and seamless user interaction. Overall, this project bridges the gap between education and technology by offering a smart, data-driven, and practical approach to enhance teaching effectiveness, support informed decision-making, and help students achieve better academic outcomes.

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