



ACADEMIC PERFORMANCE ANALYZER USING AI

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Abstract:

The increasing demand for personalized education and timely academic intervention highlights the need for intelligent systems to monitor and predict student performance. Traditional evaluation methods are often periodic, reactive, and unable to provide continuous tracking, resulting in delayed identification of at-risk students. This review paper focuses on an AI-based student performance prediction system integrated with RFID hardware to improve accuracy, enhance efficiency, and enable real-time monitoring in educational environments.

The system uses RFID technology to record student attendance and engagement data automatically, while machine learning algorithms analyze this data along with academic records to predict performance. The integration of Artificial Intelligence and IoT enables continuous data collection, real-time analysis, and remote monitoring by educators.

The paper reviews recent advancements, design approaches, and implementation strategies, highlighting cost-effective and scalable solutions suitable for modern educational institutions and smart campus applications. By analyzing various methodologies, the study emphasizes the potential of AI-driven systems to improve academic outcomes, enable early intervention, and reduce manual effort.

Overall, the review highlights the importance of adopting intelligent, AI-based technologies combined with RFID hardware to achieve efficient, data-driven, and proactive student performance management.



Keywords: Student Performance Prediction, Artificial Intelligence, RFID, IoT, Machine Learning, Smart Education, Academic Analytics.

1. INTRODUCTION

The rapid growth of digital education, increasing student enrollment, and the need for continuous academic evaluation have created new challenges in monitoring student performance. Educational institutions often struggle to track student progress effectively due to limited real-time data and reliance on traditional assessment methods. These conventional methods focus mainly on periodic exams and do not provide continuous insights into student behavior, attendance, and engagement. As a result, identifying students who are at risk becomes difficult, which affects overall academic outcomes. Therefore, an efficient system for continuous monitoring and early prediction of student performance is essential for improving the quality of education.

Traditionally, student performance is evaluated using manual methods such as attendance records, assignments, and examination results. These methods require significant human effort and are often time-consuming. They also lack accuracy due to human errors and do not provide real-time insights. In addition, manual tracking makes it difficult for educators to take timely actions for students who need support. These limitations show the need for an automated system that can monitor, analyze, and predict student performance efficiently with minimal human involvement.

Recent advancements in Artificial Intelligence and embedded systems have enabled the development of intelligent student performance prediction systems. These systems use machine learning algorithms to analyze various parameters such as attendance, academic records, and student behavior. RFID technology is used to automatically capture attendance data without manual intervention. The collected data is processed using computational models, which help in predicting student performance based on patterns and trends.

In recent years, the integration of Artificial Intelligence with Internet of Things (IoT) has further improved the effectiveness of such systems. IoT-enabled RFID systems allow real-time data collection and monitoring of student activities. This data can be accessed remotely by educators, making it easier to track performance continuously. The combination of AI and IoT helps in better decision-making and allows early identification of students who may require additional support.

Another important factor in these systems is their design and scalability. Developers are focusing on creating systems that are cost-effective, easy to implement, and suitable for different educational environments such as schools, colleges, and universities. These systems are designed to be flexible so that they can be integrated with existing academic platforms and upgraded in the future. This ensures wider adoption and usability even in institutions with limited resources.

The implementation of AI-based student performance prediction systems provides several advantages, including improved academic monitoring, early identification of weak students, and reduction in manual workload for teachers. By using accurate data and predictive analysis, these



systems help educators take timely actions to improve student outcomes. They also contribute to a more efficient and data-driven education system.

This review paper aims to study various AI-based student performance prediction systems integrated with RFID technology. It focuses on their working methods, technologies used, benefits, and challenges. The paper also examines recent developments and research trends in this field. By providing a detailed analysis, the study highlights the importance of intelligent systems in modern education and their role in improving student performance and institutional efficiency.

2. LITERATURE SURVEY

Anagha Dinesh et al. (2025) presented a study on student performance prediction using machine learning techniques. The research highlights that analyzing academic and behavioral data helps in identifying students who are at risk. The system improves educational outcomes by enabling early intervention.

Pan Jialun et al. (2025) conducted a survey on academic performance prediction using machine learning approaches. The study explains that accurate prediction helps institutions provide personalized learning support and improve student success rates.

Rui Ma et al. (2025) proposed a deep learning model for predicting student learning outcomes. The model considers academic data along with behavioral factors such as attendance and study habits. The results show improved prediction accuracy compared to traditional methods.

Ritik Atri et al. (2025) developed an AI-based student performance prediction system using machine learning algorithms such as Random Forest and Support Vector Machine. The system analyzes attendance, assignments, and exam data to predict student outcomes.

Munaf Al-Din et al. (2024) presented a systematic review on student performance prediction using educational data mining. The study analyzed multiple research works and highlighted that machine learning models play an important role in handling large academic datasets and improving prediction accuracy.

Yadav N. and Deshmukh S. (2023) reviewed various machine learning techniques used for predicting student performance. The study shows that classification algorithms help in identifying patterns in student data and support decision-making in education systems.

Materials Today Proceedings (2023) presented a model for classification and prediction of student performance using data mining techniques. The study emphasizes that analyzing past academic data helps institutions reduce failure rates and improve overall performance.

Md. Shahariar Nafiz et al. (2023) discussed machine learning-based prediction systems that improve accuracy in academic performance forecasting. The system performs better than traditional evaluation methods and supports intelligent decision-making.

Odeyemi et al. (2025) proposed a web-based attendance prediction system using machine learning.

The system uses historical attendance data to predict future attendance patterns and helps institutions take early action.

Hemalatha A. et al. (2019) developed a student performance analyzing system using RFID and Raspberry Pi. The system automatically records attendance and uses collected data for performance analysis. It improves accuracy and reduces manual effort.

Kashif Ishaq et al. (2023) reviewed IoT-based RFID attendance systems. The study highlights that RFID technology enables automatic attendance tracking, reduces errors, and ensures reliable data collection.

Al-Dowah et al. (2021) focused on intelligent prediction of student academic performance using data mining techniques. The study shows that combining multiple features such as attendance, grades, and behavior improves prediction results.

3. PROPOSED METHODOLOGY

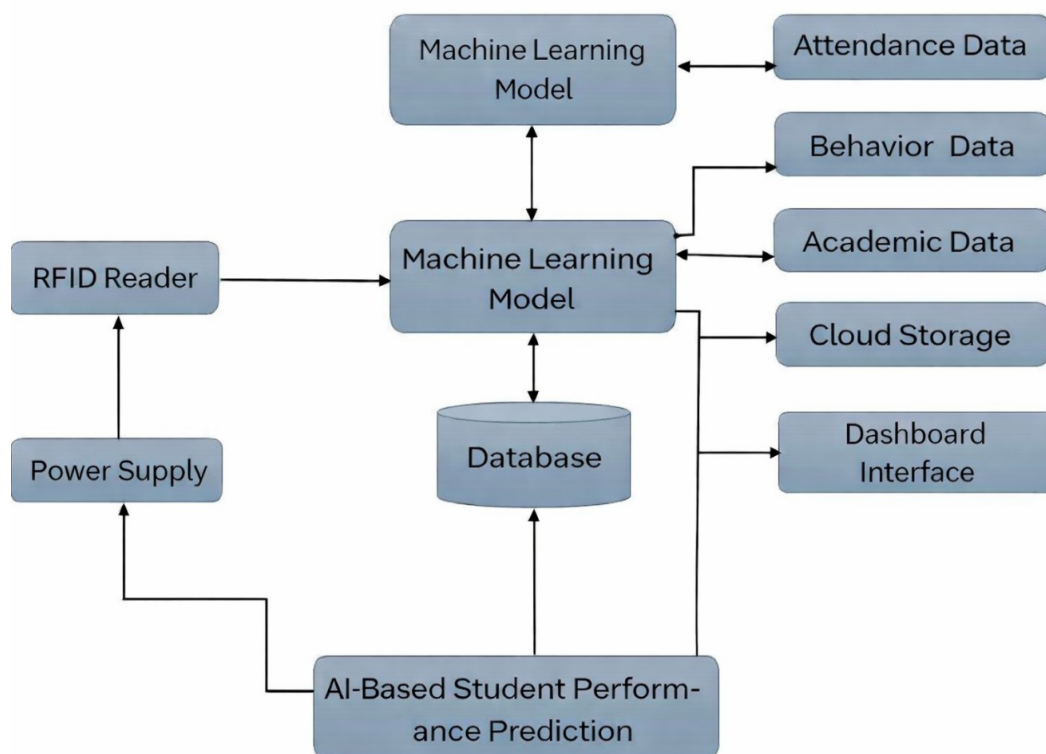


Figure 1 Block Diagram of Proposed System

The AI-based student performance prediction system with RFID is designed to automatically monitor, record, and analyze student data to predict academic performance. The system uses RFID technology, sensors, a microcontroller, and machine learning algorithms to ensure accurate and efficient monitoring. The overall system works in a structured and continuous manner, enabling real-time tracking and prediction.



The process begins with the power supply unit, which provides the required electrical energy to all components of the system, including the RFID reader, microcontroller, and communication modules. A stable power source is necessary for proper system operation.

Each student is provided with an RFID tag, which contains a unique identification number. When a student enters the classroom or institution, the RFID reader scans the tag automatically. This eliminates the need for manual attendance marking and ensures accurate data collection.

Once the RFID tag is detected, the RFID reader sends the data to the microcontroller (ESP32). The microcontroller processes the received data and records the student's attendance along with the timestamp. This data is then stored locally or transmitted to a cloud database using IoT connectivity.

In addition to attendance, the system can also include other inputs such as assignment scores, test results, and participation data. These inputs are collected and stored in the system for further analysis.

The core of the system is the AI-based prediction model, which acts as the decision-making component. Machine learning algorithms analyze the collected data to identify patterns and trends in student performance. Based on historical and real-time data, the system predicts whether a student is performing well or is at risk.

After analysis, the system generates performance reports and predictions. These results can be accessed by teachers through a dashboard interface. The system helps in identifying students who require additional attention or support.

The system also supports real-time monitoring using IoT technology. Teachers and administrators can access student data remotely, making it easier to track progress continuously and take timely actions.

The entire system works in a continuous cycle, where data is collected, processed, analyzed, and updated regularly. This ensures that the predictions remain accurate and up-to-date.

In conclusion, the working of the AI-based student performance prediction system integrates data collection, processing, and intelligent analysis to achieve effective academic monitoring. The combination of RFID technology, microcontroller, and AI ensures reliable operation, while IoT enables real-time access and management. This system plays an important role in modern education by improving academic outcomes and reducing manual workload.

4. CONCLUSION

The AI-based student performance prediction system with RFID represents a significant advancement in modern education by automating the process of attendance tracking and performance analysis. Through the integration of RFID technology, machine learning algorithms, and IoT, the system provides accurate and continuous monitoring of student activities. This



automation reduces manual effort, improves accuracy, and supports timely academic intervention.

The study highlights that such intelligent systems help improve student outcomes and support data-driven decision-making in educational institutions. However, challenges such as implementation cost, data privacy concerns, and model accuracy still exist. Future improvements can focus on enhancing prediction models, ensuring data security, and making the system more scalable and affordable.

Overall, AI-based student performance prediction systems play an important role in developing smart education environments and improving the quality of learning.

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