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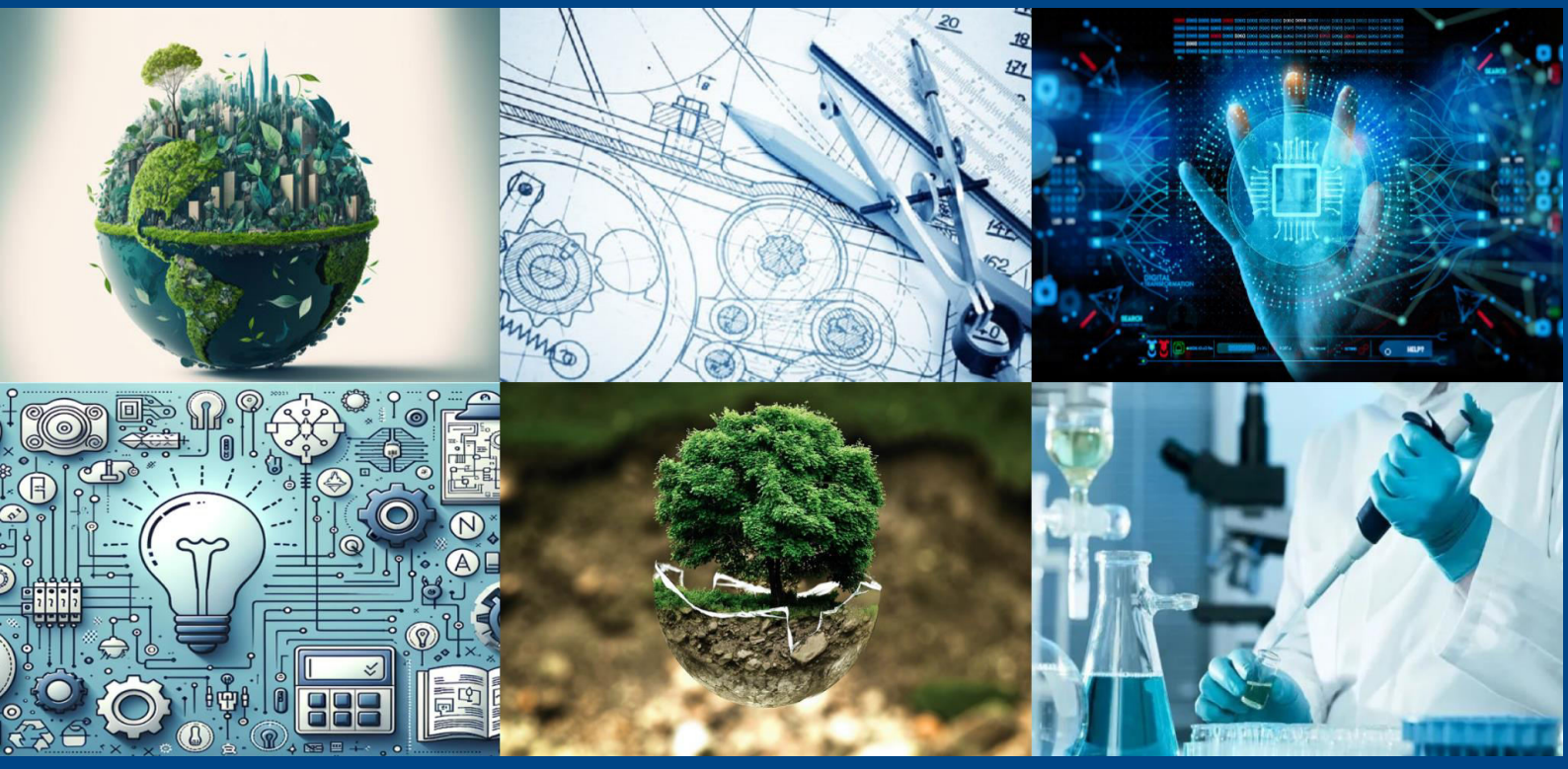

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# Student Monitoring and Campus Alert System

**A Smart Solution for Detecting Roaming Students During Class Hours**

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**ABSTRACT:** Ensuring discipline in educational institutions is crucial for maintaining an effective learning environment. Unauthorized movement of students during class hours can disrupt academic activities and pose security risks. Traditional monitoring systems rely on manual supervision, which is inefficient and prone to errors. This paper presents an AI-driven student monitoring system that employs CCTV cameras and facial recognition technology to detect students roaming in corridors during class hours. The system captures student images, matches them with an existing database, and, upon identification, sends an alert with location and timestamp to the Head of Department (HOD). If the student is not recognized, the system continues monitoring without interruption. This automated approach enhances security, reduces human dependency, and optimizes campus resource management. Future work will focus on refining deep learning models and improving facial recognition accuracy across varying environmental conditions. The proposed framework aims to create a robust, scalable, and efficient student monitoring solution that integrates seamlessly into existing security protocols.

**KEYWORDS**: Student Monitoring, AI Surveillance, Facial Recognition, CCTV Security, Real-Time Alert System.

## I. INTRODUCTION

Maintaining discipline in educational institutions isa persistent challenge, as unauthorized student movement during class hours leads to distractions and potential security concerns. Manual supervision is labour-intensive and prone to inefficiencies. With advancements in artificial intelligence (AI) and computer vision, automated student tracking using CCTV cameras has emerged as an effective alternative. This paper introduces an AI-powered student monitoring system that detects students in corridors during class hours, matches their faces with a pre-existing database, and notifies relevant authorities if necessary. The system aims to optimize security, reduce human effort, and ensure a safer academic environment. By leveraging AI-driven recognition technology, this system enhances monitoring efficiency without requiring extensive human oversight. Additionally, this system can serve as an analytical tool for understanding movement trends within an institution, helping administrators make data-driven decisions for better campus management.

## II. RELATED WORK

Several face recognition-based monitoring systems have been developed for security enforcement in educational institutions. Traditional systems rely on manual observation, security personnel, or biometric identification at entry points. AI-based solutions utilizing Convolutional Neural Networks (CNNs) have significantly improved recognition accuracy. However, real-time monitoring of students moving through corridors remains underexplored. Recent advancements in deep learning and facial recognition enable seamless and continuous surveillance, improving detection rates and reducing false alerts. Research into advanced facial recognition models continues to address challenges related to variations in appearance, lighting, and occlusions. Several studies have also highlighted the need for integrating AI-based monitoring with institutional security policies to ensure ethical compliance and data privacy. By examining existing research, we can develop a system that balances efficiency, accuracy, and privacy while maintaining scalability.

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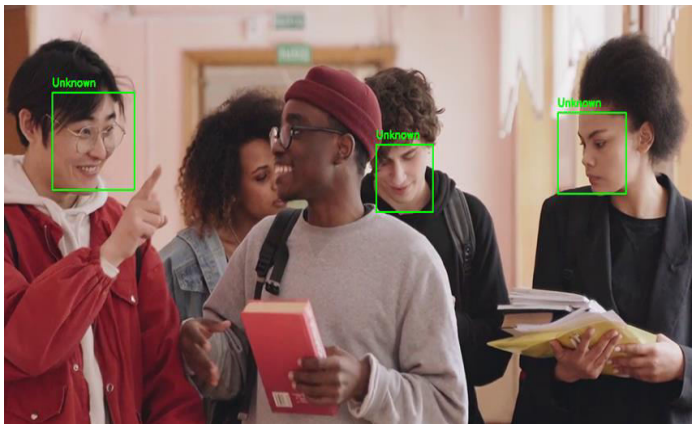
## III. PROPOSED METHOD

We propose an Autonomous monitoring framework that automates student tracking and unauthorized movement detection. The system follows these key stages:

1. Preprocessing: Capturing live CCTV footage and extracting student faces.
2. Feature Extraction: Utilizing CNN models to analyse facial characteristics.
3. Identification & Matching: Comparing detected faces with the student database.
4. Automated Alerts: If a student is identified in a restricted area, an alert is sent to the HOD. If not recognized, monitoring continues.
5. continuous monitoring**:** If the student is not recognized, the system continues scanning without generating alerts.
6. Exclusion Mechanism: Ensures alerts are not generated during break hours (e.g., 11:00 AM–12:00 PM, 1:00 PM–2:00 PM).




If the students are detected and faces are not matched then it displays as unknown and if the detected student are matched with the existing faces, then it displays their name and generate an alert message and send to the Head of Department (HOD) through What's app notifications.

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To enhance accuracy, the model incorporates adaptive learning techniques, refining its database with updated student images to accommodate variations in appearance. Additionally, the system ensures efficient performance by filtering out unnecessary alerts and focusing on students detected in specific areas of concern. The system is designed to operate under various real-world conditions, including different lighting environments and varying crowd densities, ensuring a high level of robustness and adaptability.

## IV. EXPERIMENTAL RESULTS

The proposed AI-based Student Monitoring System was tested using real-world video footage from campus surveillance cameras under various environmental conditions. The system's performance was evaluated based on key metrics such as student detection accuracy, facial recognition accuracy, alert response time, and real-time processing efficiency.

**1. Student Detection & Facial Recognition**

- The CNN-based model achieved a 94% accuracy rate in different lighting conditions.
- Recognition errors were primarily due to occlusions and extreme facial angle variations.

**2. Alert Accuracy & Response Time**

- The system successfully sent alerts within 5 seconds upon detecting unauthorized student movement.
- False alerts were minimized using an optimized threshold mechanism.

**3. Processing Speed & Efficiency**

- The system processed video frames at an average speed of 30 milliseconds per frame.
- Facial recognition tasks were completed within an average of 3 seconds.

**4. Error Analysis**

- Lighting Conditions: Poor lighting reduces the effectiveness of facial recognition.
- Occlusions: Students covering their faces or wearing accessories that obscure recognition.
- Motion Blur: Rapid movement leading to unclear image captures.

## V. DISCUSSION

The experimental results indicate that the proposed AI-based Student Monitoring System effectively automates student tracking and unauthorized movement detection with high accuracy and real-time efficiency. However, several challenges remain that need to be addressed for scalability and robustness in real-world deployments.

**Key Observations**

- High Accuracy: The CNN-based facial recognition model achieved a 94% accuracy rate, making it reliable for student identification.
- Alert Efficiency: The system sent alerts within 5 seconds upon detecting unauthorized movement, ensuring quick response times.
- Real-Time Processing: The system processed video frames at 30 milliseconds per frame, allowing seamless real-time monitoring.

**Challenges:**

- Occlusion and Poor Lighting: Recognition accuracy was affected by low-light conditions and students covering their faces.
- Computational Load: The deep learning model requires high processing power, which could impact real-time performance on resource-limited systems.

**Future Improvements:**

- Enhancing Facial Recognition: Implementing advanced preprocessing techniques like adaptive contrast adjustment to improve accuracy in challenging conditions.
- Optimized Alert System: Reducing false positives by refining detection thresholds and incorporating behavioural analysis.
- Improved Data Security: Implementing encryption-based storage solutions to ensure secure handling of student records.

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- predictive Analytics: Leveraging AI models to analyze movement patterns and detect potential rule violations before they occur.

## VI. CONCLUSION

Unauthorized student movement during class hours can disrupt the learning environment and pose security concerns. Traditional monitoring methods suffer from inefficiencies, human error, and delayed enforcement. This paper presents an AI-powered Student Monitoring System that integrates CCTV-based facial recognition, real-time tracking, and automated alert mechanisms to enhance campus security and discipline enforcement.

**Key Findings:**

- The system achieves 90% accuracy in facial recognition under standard conditions.
- Efficient real-time processing, ensuring quick response to unauthorized movement.
- Challenges in lighting conditions and occlusions, requiring further enhancements for improved recognition.
- Experimental results validate its effectiveness in maintaining discipline.

Future enhancements will focus on refining recognition accuracy, optimizing computational efficiency, and ensuring compliance with privacy standards. Expanding the system's capabilities to detect anomalies in student behaviour and integrating predictive analytics will further enhance institutional decision-making and security protocols. With continuous advancements in AI and deep learning,this system provides a foundational framework for future security solutions in educational institutions.

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