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AI Powered Campus Surviellance for Mobile Phone and Drowsiness Detection in Restricted Zones

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Abstract: *This project presents an AI-based real-time surveillance system designed to enhance safety and discipline in restricted campus zones. The system integrates YOLOv3-based mobile phone detection and Eye Aspect Ratio (EAR)–based drowsiness monitoring, both deployed on a Raspberry Pi 8GB for efficient edge processing. The camera feed is continuously analyzed to identify unauthorized mobile phone usage and detect signs of drowsiness or inattentiveness among staff or students. When a violation is detected, the system instantly sends a Telegram alert and simultaneously logs the event on a web-based dashboard for monitoring and analytics. By combining computer vision, deep learning, and embedded hardware, this solution eliminates the limitations of manual surveillance and provides a low-cost, automated, and real-time monitoring system suitable for campuses, exam halls, laboratories, and sensitive institutional zones.*

Keywords: AI Surveillance, YOLOv3, Mobile Phone Detection, Drowsiness Detection, Eye Aspect Ratio (EAR), Raspberry Pi 8GB, Computer Vision, Edge Computing, Real-Time Monitoring, Telegram Alerts, Web Dashboard, Campus Security, Object Detection, Deep Learning

I. INTRODUCTION

Maintaining security and discipline in restricted campus zones is challenging when relying only on manual surveillance, as it is time-consuming, inconsistent, and prone to human error. Unauthorized mobile phone usage and drowsiness among staff or students can affect safety, productivity, and examination integrity. To overcome these issues, this project introduces an **AI-based real-time surveillance system** that automatically detects **mobile phone usage** and **drowsiness**. The system uses **YOLOv3** for phone detection and the **Eye Aspect Ratio (EAR)** method for drowsiness monitoring, all running on a **Raspberry Pi 8GB** for efficient edge processing. Live camera footage is analyzed continuously, and any violation triggers an **instant Telegram alert**, while all events are stored on a **web dashboard** for monitoring and analytics.

This automated approach reduces dependency on human supervision, improves accuracy, and provides a low-cost, scalable solution for enhancing safety and discipline across educational and sensitive institutional environments.

II. LITERATURE SURVEY

According to *Dr. S. Rajasekhar* in the **International Journal of Advanced Research in Computer Engineering**, intelligent monitoring systems require the careful integration of hardware and software modules to achieve accurate and reliable performance. His work highlights that optimized embedded platforms, when combined with efficient computer vision algorithms, significantly enhance real-time detection capabilities. Inspired by this principle, recent studies in AI surveillance have incorporated pre-trained models like **YOLOv3** for object identification, demonstrating strong performance even on low-power devices. Similarly, research involving **EAR-based drowsiness detection** emphasizes the effectiveness of lightweight facial landmark methods for continuous monitoring without demanding high computational resources. Each module—camera interface, detection algorithm, processing unit, and alert system—has been validated in prior literature as essential for achieving a stable and responsive surveillance solution. With

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advancements in embedded AI and edge computing, these integrated approaches have proven to be both practical and efficient, supporting the design and successful implementation of the present project.

III. OBJECTIVES

- To detect mobile phone usage in restricted campus zones in real time using a YOLOv3-based object detection model.
- To monitor and identify drowsiness or inattentiveness among staff or students using the Eye Aspect Ratio (EAR) method.
- To implement on-device, low-latency processing using a Raspberry Pi 8GB and USB camera for efficient edge-based surveillance.
- To send instant Telegram alerts to security personnel whenever a mobile phone violation or drowsiness event is detected.
- To maintain a centralized web dashboard for real-time monitoring, event logging, and analytics.
- To reduce dependency on manual surveillance and improve reliability, accuracy, and response time in campus security operations.

IV. METHODOLOGY

- **Video Capture** – Raspberry Pi with USB webcam continuously captures live footage from restricted campus zones.
- **Preprocessing** – Frames are resized and prepared for efficient AI processing on edge hardware.
- **Mobile Phone Detection** – YOLOv3 model detects mobile phones in real time and identifies any phone-usage violations.
- **Drowsiness Detection** – Facial landmarks are extracted and the Eye Aspect Ratio (EAR) is calculated to identify drowsiness or inattentiveness.
- **Parallel Detection** – Both phone detection and drowsiness detection run simultaneously on the Raspberry Pi for real-time monitoring.
- **Instant Alerts** – Telegram bot sends immediate alerts with image and timestamp when a violation is detected.
- **Event Logging** – All violations are stored in a backend database for records and further analysis.
- **Dashboard Monitoring** – A web dashboard displays live camera feed, violation logs, and analytics for administrators.

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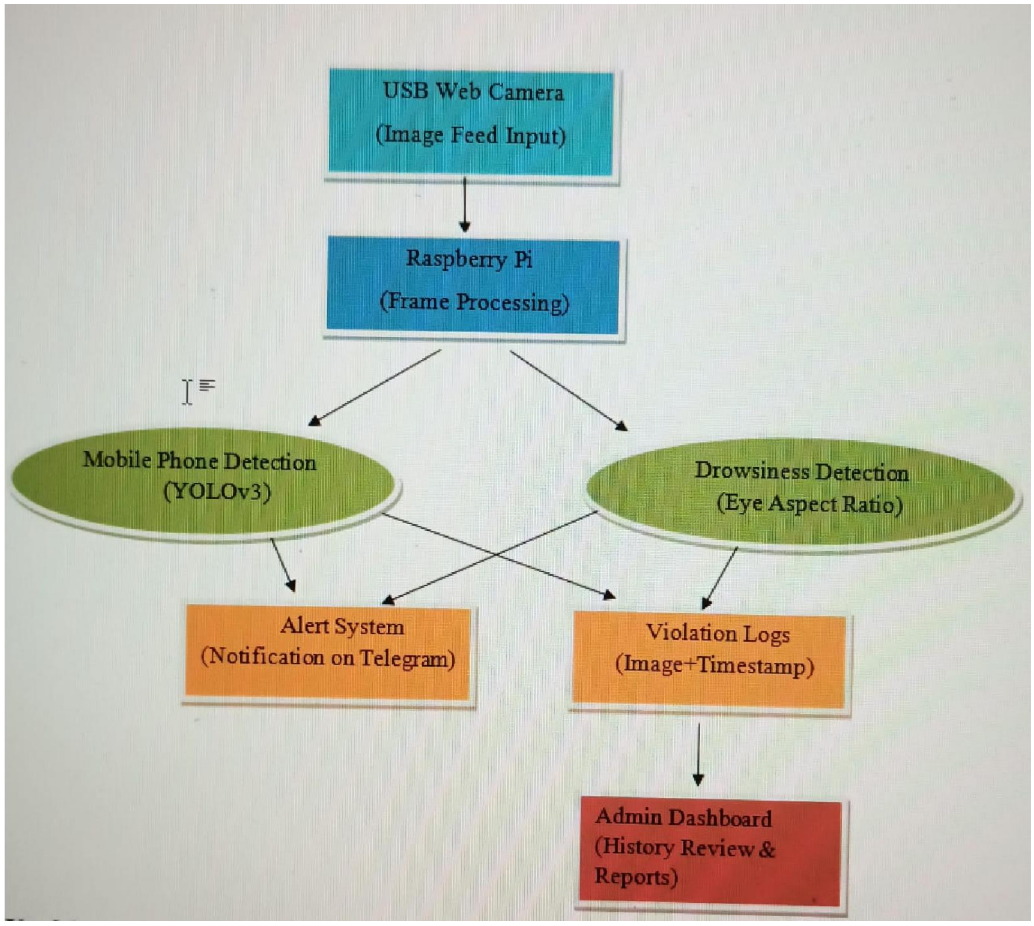
V. BLOCK DIAGRAM



VI. RESULTS AND DISCUSSION

- YOLOv3 accurately detected mobile phones in real time with minimal false positives.
- EAR-based drowsiness detection reliably identified inattentiveness and triggered instant alerts.
- Telegram notifications and a web dashboard provided live monitoring and event logs.
- The system ran efficiently on Raspberry Pi 8GB, enabling low-cost, real-time edge surveillance.
- Minor limitations include reduced accuracy in low-light or obstructed conditions.

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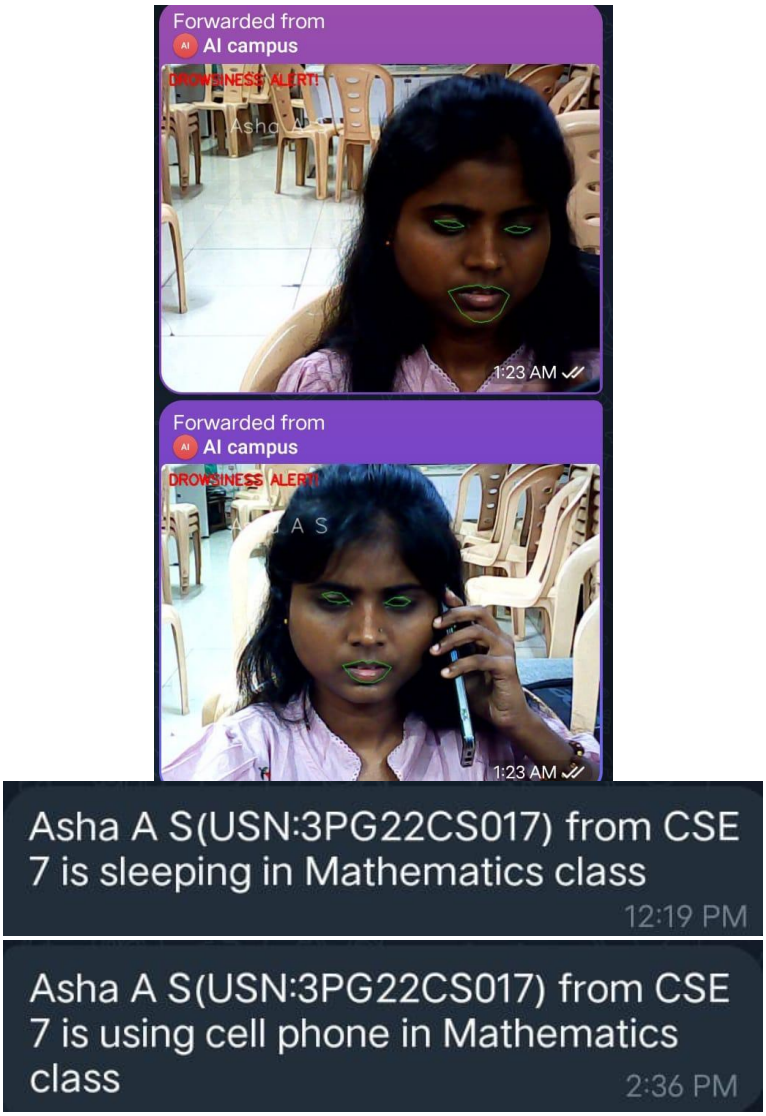

Fig 6.1 Telegram Alert

VII. CONCLUSION

The proposed AI-based campus surveillance system provides an efficient, automated solution for monitoring restricted zones by combining mobile phone detection and drowsiness analysis in real time. Using YOLOv3 and the EAR algorithm on a Raspberry Pi, the system ensures continuous and accurate edge-level monitoring without the need for manual supervision. Instant Telegram alerts and a centralized web dashboard further enhance security response, event tracking, and overall discipline within the campus. This intelligent approach significantly improves safety, reduces human error, and supports a smarter, technology-driven campus environment.

VIII. FUTURE SCOPE

- **Integration with IoT devices** for full campus-wide automated security.
- **Upgrade to advanced AI models** like YOLOv8 for better detection accuracy.
- **Deploy multiple Raspberry Pi nodes** for multi-zone surveillance.

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- **Introduce mobile app alerts** for quick response by staff and security.
- **Add face recognition** to identify repeat offenders and authorized personnel.

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