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# **Detection of Exam Cheating through Surveillance using Face Detection with AI**

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**ABSTRACT:** Exam security is a crucial aspect of academic integrity, and traditional methods of supervision are often inadequate in preventing cheating. This project proposes an **AI- powered Exam Cheating Detection System** that utilizes **Raspberry Pi Pico, ESP32- CAM, and a monitor**, along with a database-driven approach for real-time **face detection and anomaly recognition**. The system captures live video feeds from ESP32- CAM, processes them using AI algorithms to detect suspicious behavior, and stores relevant data in a database for analysis. By integrating **machine learning models for facial recognition, posture analysis, and object detection**, the system can identify unauthorized individuals, multiple faces, and unusual activities during exams. The Raspberry Pi Pico acts as a processing unit to handle sensor inputs and communication, while the ESP32-CAM transmits video data. A connected **monitor displays real-time alerts**, enabling invigilators to intervene when necessary. This approach enhances the security and fairness of examinations by leveraging AI-driven automation, reducing human bias, and improving surveillance efficiency.

**KEYWORDS:** Raspberry Pi Pico, Esp32 Cam, Monitor

## **I. INTRODUCTION**

Academic integrity is foundational to the credibility and fairness of educational institutions. However, maintaining strict examination protocols has always been a challenge, especially with growing class sizes, limited human resources, and the increasing sophistication of cheating techniques. Traditional methods of invigilation, which primarily depend on human supervision, are often inadequate in detecting subtle forms of misconduct such as covert communication, impersonation, or the use of unauthorized electronic devices.

In response to these limitations, the integration of artificial intelligence (AI) and embedded systems presents a promising solution. This project proposes an **AI-powered Exam Cheating Detection System** that leverages low-cost, accessible hardware components—**Raspberry Pi Pico** and **ESP32-CAM**—in combination with intelligent software capabilities. The objective is to create an automated, efficient, and accurate surveillance system capable of real-time monitoring, detection of suspicious behaviors, and alerting of invigilators during exams.

By employing computer vision and machine learning techniques, the system enhances surveillance by reducing human bias, minimizing manual intervention, and providing a scalable approach to secure exam environments. This project not only strengthens exam integrity but also sets a precedent for smarter educational technologies in the future.

## **II. PROPOSED SYSTEM**

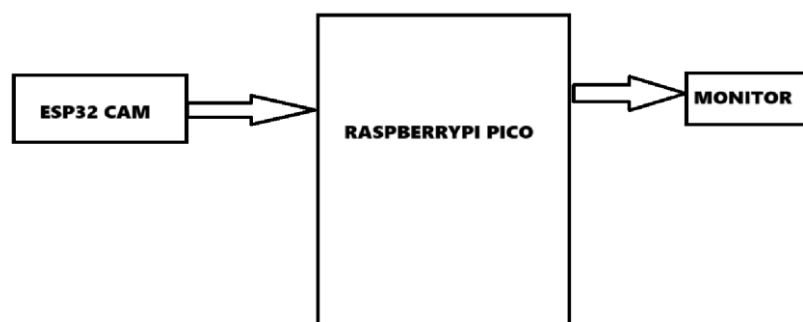
The proposed **AI-powered Exam Cheating Detection System** is designed to monitor and detect instances of cheating during examinations through the integration of embedded hardware and intelligent software. It leverages real-time video surveillance, AI-based behavior analysis, and database logging to create a robust and automated proctoring solution.

The system primarily consists of three main components: the **ESP32-CAM** module for video capture, the **Raspberry Pi Pico** for control and communication, and a **monitor** for displaying real-time alerts. Together, these components work in synchronization to detect and flag suspicious behaviors and activities in the exam hall.

**Core Features of the Proposed System:**

1. **Live Video Surveillance:**
  - The ESP32-CAM captures continuous video footage of the examination environment.
  - Positioned strategically, it covers multiple angles or individuals depending on the layout.
  - Video data is streamed wirelessly for processing and analysis.
2. **Artificial Intelligence-Based Detection:**
  - **Facial Recognition:** Compares detected faces with a database of registered students to prevent impersonation.
  - **Multiple Face Detection:** Flags scenarios where more than one face appears in the frame, indicating possible collaboration or impersonation.
  - **Posture Analysis:** Detects unnatural or suspicious body movements such as leaning, looking away repeatedly, or gestures indicating communication.
  - **Object Detection:** Identifies unauthorized objects like mobile phones, earbuds, or notes that may aid in cheating.
3. **Embedded System Processing:**
  - The **Raspberry Pi Pico** acts as the main microcontroller to manage sensor data, trigger alerts, and facilitate communication between modules.
  - It handles inputs from auxiliary sensors (if any) and supports decision-making based on AI inferences.
4. **Real-Time Alert System:**
  - A monitor connected to the system displays real-time video feeds with visual cues (such as red boxes, pop-up messages, or sounds) when anomalies are detected.
  - This allows invigilators to monitor multiple students simultaneously and take immediate action when necessary.
5. **Database-Driven Logging:**
  - All flagged events, along with timestamps, face IDs, and image snippets, are logged into a centralized database.
  - This allows for post-exam review, data analysis, and audit trails in case of disputes or further investigations.
6. **Scalability and Modularity:**
  - The system is modular and can be scaled to cover larger exam centers by adding more ESP32-CAM units.
  - Wireless communication between units ensures minimal setup time and hardware complexity.

**Block Diagram:**





### III. EXPERIMENTAL RESULTS

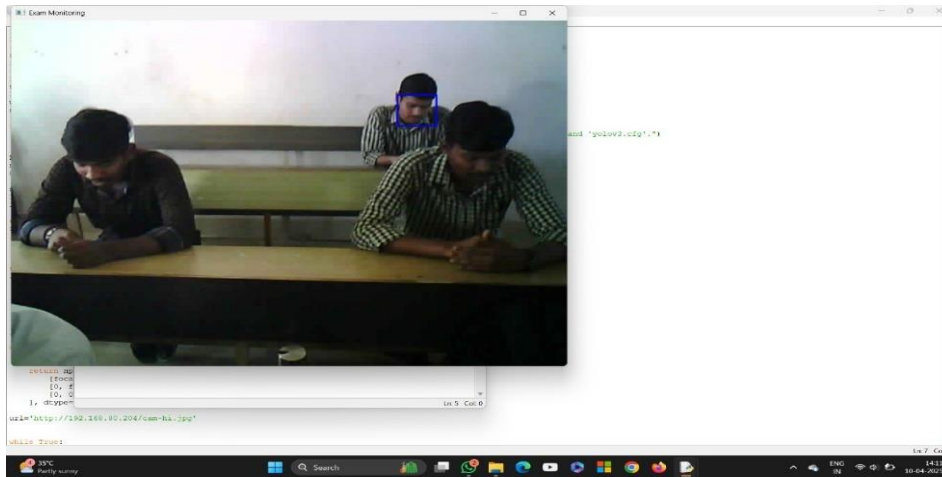


Fig.1: Display of no cheating

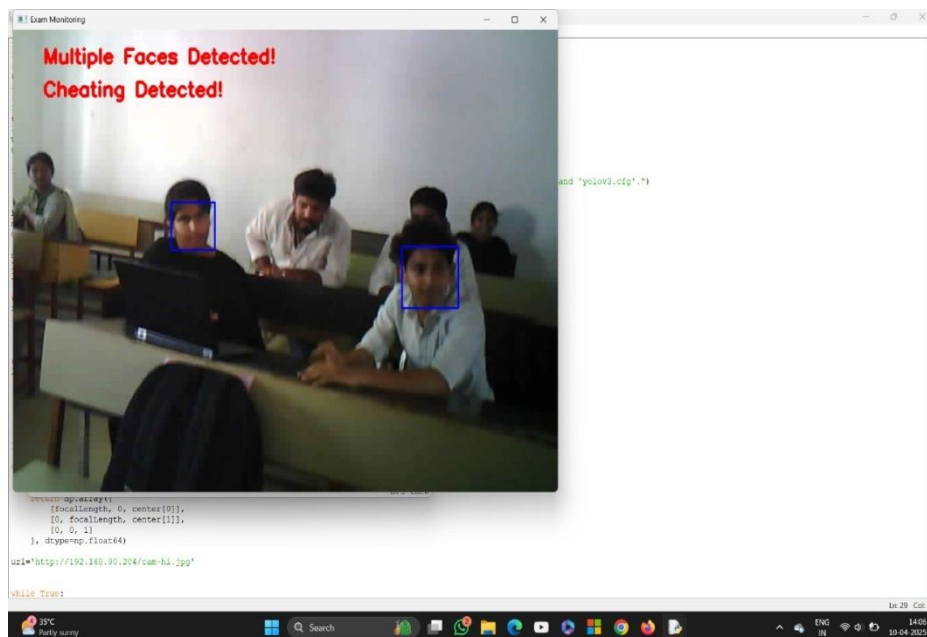


Fig.2: Display of cheating Detected

### IV. CONCLUSION

The implementation of an AI-driven exam cheating detection system using Raspberry Pi Pico, ESP32- CAM, and a monitoring setup effectively enhances the integrity of examination processes. By integrating real-time face detection and database-driven surveillance, this system provides a robust mechanism to identify and prevent unauthorized activities. The use of AI ensures accurate and automated detection, minimizing human intervention while maintaining fairness and transparency in examinations.

Furthermore, the incorporation of a centralized database allows for efficient data storage and retrieval, enabling administrators to review incidents and take necessary actions. The ESP32-CAM captures live footage, while the

Raspberry Pi Pico processes the data, ensuring a seamless and lightweight system. The real-time monitoring feature displayed on a dedicated screen enhances invigilators' ability to oversee multiple examination venues simultaneously.

This system not only addresses current challenges in academic integrity but also sets a foundation for future advancements in AI-based surveillance. With further improvements, such as enhanced facial recognition algorithms and integration with biometric authentication, the system can become a comprehensive solution for secure and fair examinations in educational institutions worldwide.

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