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AUTOMATED DETECTION OF EXAM MALPRACTICE

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Abstract: Exam malpractice significantly undermines the reliability of digital and remote examination systems. Traditional manual invigilation lacks scalability and accuracy, leading to inconsistencies in supervision. This project proposes an AI-driven solution integrating Real-time Monitoring**,** Object Detection**,** and Human Monitoring for automated malpractice detection. The system utilizes computer vision and deep learning algorithms to analyze live or recorded video streams, identifying anomalies such as multiple human presences, unauthorized devices, and irregular motion patterns. Through continuous behavioural tracking and object classification, the framework ensures high-precision detection of suspicious activities, thereby enhancing academic integrity, examination security, and operational efficiency in online and offline assessment environments.

Keywords: Real-time Monitoring, Object Detection, Human Monitoring, Academic integrity.

I. INTRODUCTION

Road safety continues to be a major global concern, with driver drowsiness and fatigue contributing to a significant The integrity of academic assessments is fundamental to the credibility of educational institutions. However, exam malpractice—encompassing behaviors such as cheating, unauthorized collaboration, and the use of prohibited materials—continues to challenge the fairness of examinations. With the increasing adoption of remote and online examination formats, particularly accelerated by global events like the COVID-19 pandemic, the traditional methods of invigilation have proven insufficient in curbing dishonest practices. Traditional invigilation relies heavily on human oversight, which is not only resource intensive but also prone to inconsistencies and oversight. In large-scale or remote examinations, maintaining vigilant supervision becomes increasingly challenging, leading to potential lapses in monitoring and increased opportunities for malpractice. Moreover, the manual review of recorded examination sessions is time-consuming and may still fail to identify subtle or sophisticated cheating behaviors

This project aims to develop an intelligent system that utilizes video analysis to detect instances of exam malpractice. The system is designed to process both live-streamed and pre- recorded examination footage, focusing on identifying suspicious activities without attempting to recognize or identify individual examinees, thereby preserving privacy. By automating the detection process, the system seeks to provide a scalable, consistent, and objective method for upholding academic integrity in various examination settings.

By automating this detection process, the system seeks to offer a scalable, consistent, and objective approach to upholding academic integrity, even in remote or large-scale examination settings. The implementation of such a system holds the potential to significantly reduce the incidence of undetected malpractice, thereby enhancing the credibility and fairness of examination outcomes. Furthermore, by reducing the reliance on human invigilators, this system enables educational institutions to allocate resources more efficiently while maintaining the highest standards of assessment integrity.

II. METHODOLOGY

The motivation behind this automated exam malpractice detection system is to improve the integrity and fairness of online and hybrid exams. Traditional manual invigilation methods are often insufficient in digital settings, leading to inconsistencies and inaccuracies. By using a Raspberry Pi 4 (8 GB)**,** the system analyzes live or recorded video streams

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in real-time. The integration of an HD web camera**,** SD card for storage, and network infrastructure for connectivity enables seamless video capture, processing, and storage. The surveillance module detects suspicious activities, while the chatbot provides real-time alerts.

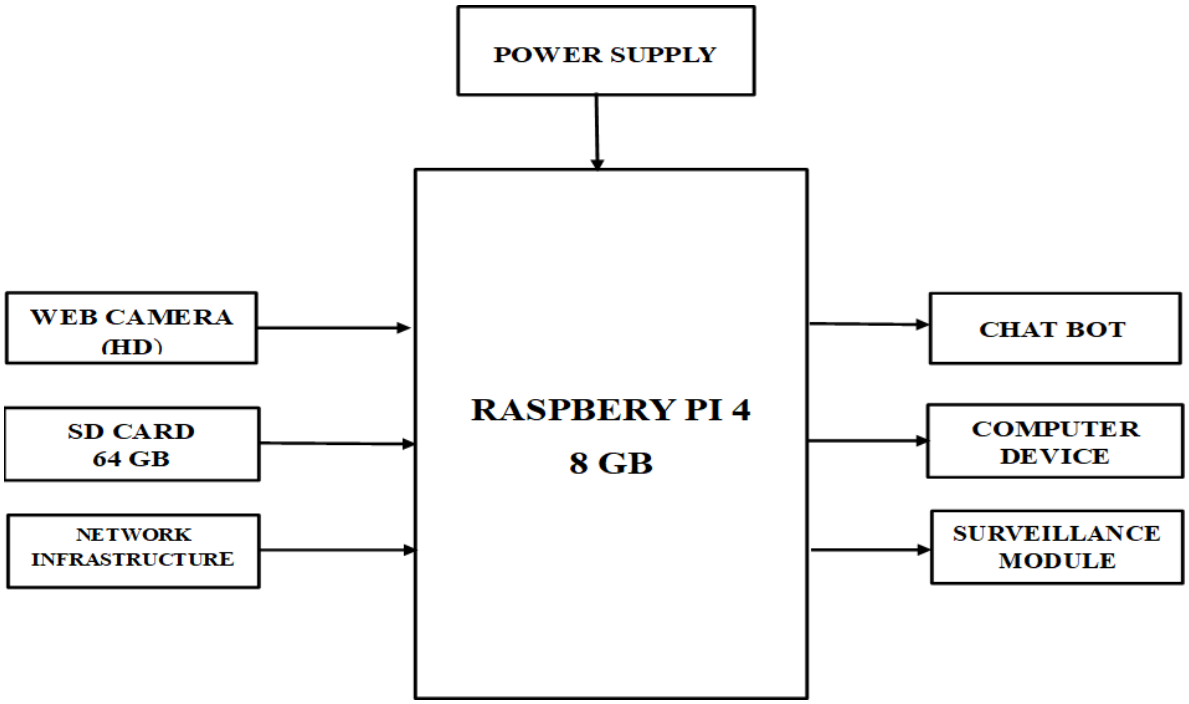

Fig:1. Block diagram of the automated detection of malpractice

- **Power Supply:**This block provides continuous electricity to the Raspberry Pi and all connected components, ensuring the exam monitoring system runs smoothly without interruptions.
- **Web Camera (HD):**The HD camera captures live video of the student and exam environment, sending the footage to the Raspberry Pi for real-time analysis and detection.
- **SD Card (64 GB):**The SD card stores the operating system, AI models, and recorded data, giving the system enough space to save logs and important monitoring files.
- **Network Infrastructure:**This block enables communication between the Raspberry Pi, connected devices, and the chatbot, allowing alerts and data to be sent instantly.
- **Raspberry Pi 4 (8GB):**The Raspberry Pi acts as the main processor, running the AI system, analyzing video, detecting violations, and coordinating all module activities.
- **Chat Bot:**The chatbot sends immediate alerts to the invigilator whenever cheating or suspicious behavior is detected during the exam.
- **Computer Device:**The computer device is used by exam supervisors to view the live video feed, monitoring results, and violation reports generated by the system.
- **Surveillance Module:**This module performs automated monitoring tasks such as behavior analysis and object detection, helping maintain fairness and security in the exam hall.

III. IMPLEMENTATION

3.1 HARDWARE INTEGRATION

The hardware integration of the automated malpractice detection system centers around the Raspberry Pi 4, which acts as the main processing unit. The Raspberry Pi is powered through a stable power supply that ensures continuous operation during the exam. An HD web camera is connected to the Raspberry Pi via a USB port to capture live video of the student. A 64 GB SD card is inserted into the micro-SD slot of the Raspberry Pi to store the operating system, recorded footage, and detection data. The device connects to the network through Wi-Fi or an Ethernet cable, enabling communication with external modules. All hardware inputs—including the camera, storage, and network—feed data into the Raspberry Pi, where the surveillance module processes the video. Finally, the Raspberry Pi sends alerts and monitoring data to a computer device and a chatbot through the network, completing the integration of all hardware components.

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3.2 SOFTWARE INTEGRATION

The software integration of the system is carried out on Raspberry Pi OS, which manages device resources and runs the core monitoring algorithms. OpenCV is integrated for real-time video processing, while machine-learning models using frameworks such as TensorFlow analyze facial movements, object presence, and abnormal behaviors. These components are combined into a unified surveillance module that continuously evaluates the video stream. Networking software and communication APIs enable the Raspberry Pi to send detection results and alerts to the chatbot and monitoring computer, ensuring seamless system operation.

3.3 FLOW OF PROGRAM

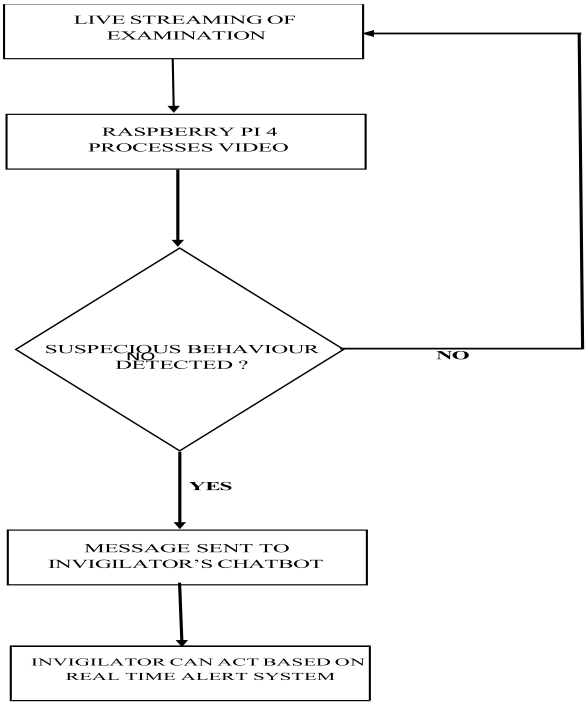

Fig:2 Program flow of automated detection of exam malpractice

The program begins by continuously capturing live video of the student during the examination. This video stream is processed by the Raspberry Pi 4, where the YOLO detection model analyses each frame to identify face orientation, eye movements, and any abnormal actions. The system checks whether these actions match predefined suspicious behaviours such as looking away frequently, using unauthorized devices, or the presence of another person. If no suspicious activity is detected, the monitoring continues smoothly. If the system detects behaviour that indicates possible malpractice, an instant alert message is automatically sent to the invigilator's chatbot. The invigilator receives the alert in real time and can quickly review and take appropriate action based on the situation.

3.4 ALGORITHM FOR PROGRAM FLOW

- Initialize camera, network, and detection models; start live stream.
- Capture video frames continuously at the configured frame rate.
- Preprocess each frame (resize, normalize, crop ROI).
- Run detection models on the frame (objects, faces, gaze, OCR/audio as needed).
- If no suspicious activity, return to step 2 and continue monitoring.
- If suspicious activity is detected, create an alert packet with timestamp, snapshot, short clip, and metadata.
- Send the alert to the invigilator's chatbot/dashboard for real-time review.

3.4.1 ALGORITHM FOR MOBILE PHONE DETECTION

The phone detection process begins by continuously capturing video frames and examining each frame with an object-detection model that identifies mobile-shaped objects. The system then tracks the detected object across the next few frames to confirm that it is not a one-frame false detection. Once the phone appears consistently, the system checks whether the student's hand or face is oriented toward the phone to understand whether the device is being handled or used. When the system confirms the presence and usage of the phone, it records a short evidence clip, stores it securely, and immediately raises an alert to the proctor.

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3.4.2 ALGORITHM FOR LAPTOP DETECTION

The system continuously scans the camera feed to identify any laptop-shaped object using an object-detection model. If a laptop appears in the frame and remains visible across the next few frames, the system confirms it as a prohibited device in the exam area. Once confirmed, it automatically records a short evidence clip and sends an alert to the proctor indicating that an unauthorized laptop has been detected.

3.4.3 ALGORITHM FOR MULTI-PERSON INTERACTION DETECTION

The system monitors all visible students and tracks their face directions. If two or more students repeatedly look toward each other within a short time, it is treated as possible collusion. The system then captures a brief evidence clip and immediately alerts the proctor for review.

3.4.4 ALGORITHM FOR HEAD POSE DETECTION

The system tracks the student's face and checks the direction of their head and gaze. If the student looks away from the allowed forward direction for too long or does so repeatedly, the behavior is marked as suspicious, and a short evidence clip is saved and sent to the examiner.

IV. RESULTS

As discussed above initially the proposed model will be helpful in automated detection of exam malpractice. The result of malpractice detection has been displayed in the below given figures.

The main intention is to minimize human intervention in invigilation and make the examination process more reliable and efficient. The implementation of the automated exam malpractice detection system successfully demonstrated its ability to monitor candidates in real time and identify suspicious activities with high accuracy. By integrating a camera module, object detection algorithms like YOLO, and alert mechanisms, the system effectively detected prohibited objects, abnormal movements, and unauthorized behaviors without human supervision. The real-time processing ensured immediate responses, while the automated alert system minimized manual effort and improved reliability. Overall, the results show that the system can significantly enhance fairness, transparency, and security in online and offline examination environments.

The below fig 3 shows the prototype of automated detection of exam malpractice

Fig:3 Project Prototype

In the fig 4 the student is focused on writing and not showing any signs of cheating. The detection rate and quality mode indicate that the monitoring system is functioning accurately to ensure fair examination conditions.

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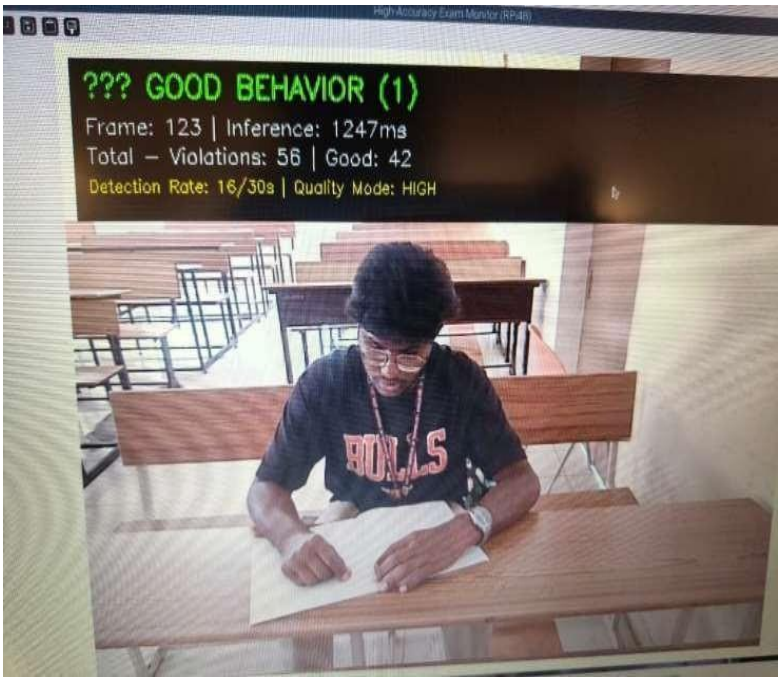

Fig:4 Good behavior

In the Fig 5 The system highlights a book, a mobile phone, and a laptop with red bounding boxes, marking them as violations. The interface displays the number of processed frames and total violations, indicating that the monitoring tool is actively identifying objects that are not allowed during an examination. This setup helps ensure fairness by automatically flagging unauthorized materials in real time.

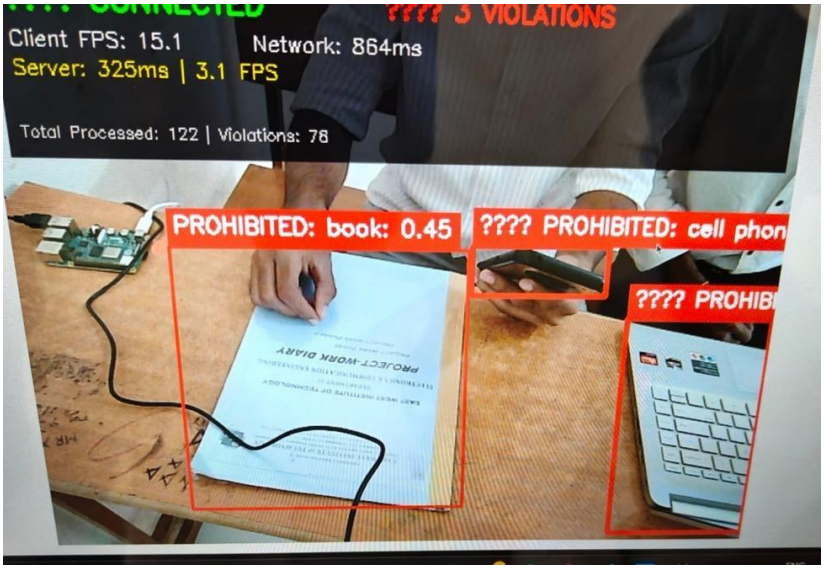

Fig:5 Detecting prohibited items

In the Fig 5 the system highlights the student with a colored box and reports “1 violation detected,” indicating that the student’s sideways head movement or gaze has been flagged as suspicious behavior. Along with this, the display shows frame count, inference time, total violations, and good behavior count. Overall, the system is actively tracking the student’s actions to maintain fair and monitored exam conditions

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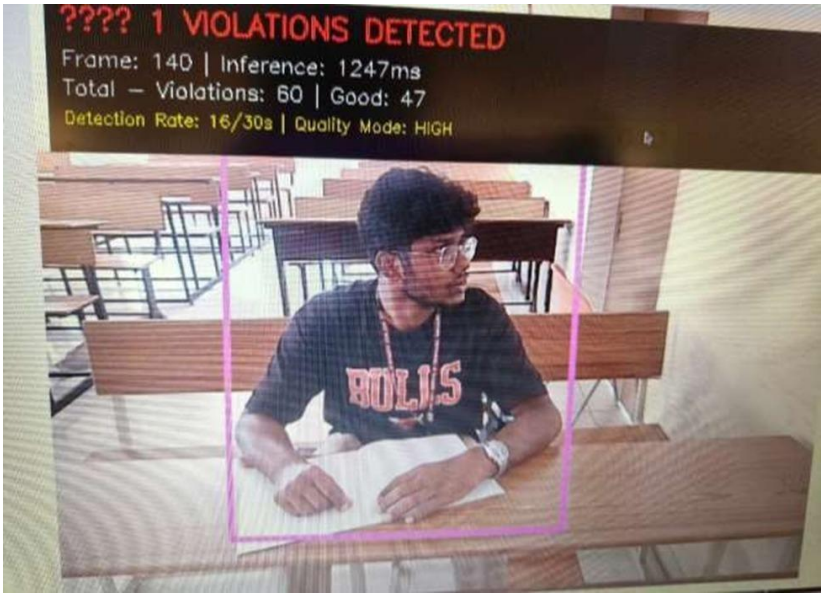

Fig:5 Violation detected Turning Head

In the Fig 6 The image shows a Telegram bot sending real-time alerts from an AI exam-monitoring system. It reports two violations: one for suspicious behavior flagged as possible cheating, and another for detecting a mobile phone. Each alert includes the frame number, time, confidence level, and priority, helping invigilators quickly identify and respond to cheating attempts during an exam

Fig:6 Chat Bot Alert

V. CONCLUSION

This project helps to detect exam malpractice automatically using AI. It monitors students in real time through cameras and identifies suspicious actions like using phones, looking around, or multiple people in a frame. The system improves fairness and reduces the need for manual invigilation. Overall, it makes examinations more secure, reliable, and easy to monitor.

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