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Online Exam Learning Behavior

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Abstract: *Online exams are becoming very common, but it is difficult to ensure that students do not cheat. This paper presents a smart system that monitors student behavior during online exams in real time. The system can detect if a student is using a mobile phone, if more than one person is present, if the student is looking away frequently, or if they switch tabs during the exam. It uses computer vision and browser tracking with Python and Node.js technologies to identify suspicious activities. The system can give alerts whenever unusual behavior is detected. This solution helps make online exams more fair, reliable, and secure, and can be easily used in real-time exam environments.*

Keywords*:* online exam monitoring, cheating detection, mobile phone detection, multiple face detection, gaze tracking, tab switching detection, computer vision, OpenCV, artificial intelligence, real-time monitoring

I. INTRODUCTION

Online examinations have become widely used in schools, colleges, and competitive assessments due to their convenience and flexibility; however, maintaining fairness and preventing cheating remains a major challenge. Students may use unfair methods such as mobile phones, getting help from others, frequently looking away from the screen, or switching tabs during the exam, which are difficult to monitor using traditional systems. With advancements in computer vision, artificial intelligence, and web technologies, it is now possible to develop smart monitoring systems that analyze student behavior in real time using tools like Python, OpenCV, and deep learning models through a webcam, while also tracking browser activities such as tab switching.

The proposed system focuses on detecting key cheating behaviors including mobile phone usage, presence of multiple faces, abnormal gaze direction, and tab switching, and by continuously monitoring these activities and generating alerts, it helps ensure fairness, transparency, and reliability in online examinations.

II. PROBLEM STATEMENT

Online examinations face serious challenges in maintaining fairness and preventing cheating in real time. Students can easily use unfair means such as mobile phones, assistance from other people, looking away from the screen, or switching tabs during the exam, which are difficult to detect using traditional monitoring methods. Existing online exam systems often lack intelligent mechanisms to track such behaviors accurately and continuously.

Therefore, there is a strong need for a smart, efficient, and cost-effective monitoring system that can detect suspicious activities like mobile usage, multiple faces, gaze deviation, and tab switching in real time. The aim is to ensure exam integrity, reduce cheating, and create a fair and reliable online examination environment.

III. OBJECTIVES

The Primary Goals Of The Proposed System Are:

1) To identify objects and obstacles in real-time using a camera and sensors
2) To decode the captured visual information into significant audio messages
3) To help the visually impaired navigate independently and safely
4) To develop an inexpensive, portable, and user-friendly assistive system

5) To reduce reliance on others and boost confidence while moving around

IV. LITERATURE REVIEW

Various online exam monitoring systems have been proposed in recent years to detect cheating and ensure fairness. Traditional methods such as live invigilation through video calls are not fully reliable and require continuous human supervision. Some systems use basic webcam monitoring but fail to accurately detect activities like mobile phone usage or multiple persons in front of the screen.

Advanced approaches using computer vision and artificial intelligence have improved detection accuracy. Techniques such as face detection, object detection, and eye tracking are widely used to monitor student behavior. However, many existing systems require high computational resources, stable internet connectivity, and expensive infrastructure.

The proposed system aims to overcome these limitations by combining computer vision techniques with browser activity tracking to detect mobile phones, multiple faces, gaze deviation, and tab switching in real time using an efficient and cost- effective approach.

V. PROPOSED METHODOLOGY

The proposed system uses a webcam to capture live video of the student during the online examination. The video stream is processed using OpenCV and deep learning models to detect suspicious activities. Face detection algorithms are used to identify multiple faces, while object detection models are used to detect mobile phones.

Eye tracking techniques analyze the direction of the student's gaze to determine whether they are focusing on the screen or looking elsewhere. In addition, browser-based scripts are used to monitor tab switching and window activity.

Whenever any suspicious behavior is detected, the system generates alerts and records the event. The integration of frontend (Node.js) and backend (Python) ensures real-time monitoring and efficient processing.

VI. SYSTEM ARCHITECTURE

The system architecture consists of both software and hardware components working together:

1. Webcam for capturing live video
2. Frontend (Node.js) for user interface and exam environment
3. Backend (Python Flask) for processing and analysis
4. OpenCV and AI models for detection (face, mobile, gaze)
5. Browser monitoring for tab switching detection

The captured video and browser data are processed in real time to detect suspicious activities. Alerts are generated instantly, ensuring quick response and maintaining exam integrity.

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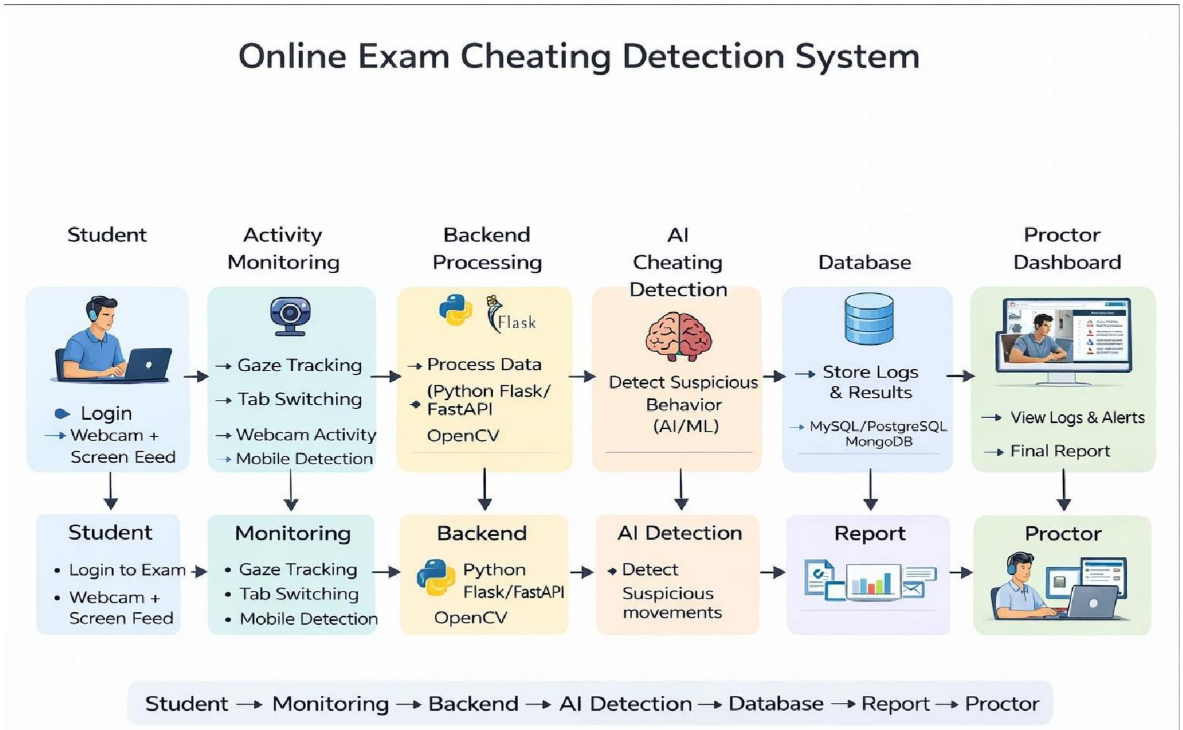

Fig: System Architecture

VII. SOFTWARE REQUIREMENTS

Frontend

• Node.js

Backend / Processing

• Python programming language

• OpenCV library (for face monitoring)

Python Libraries Used

• OpenCV – for face detection and monitoring

• NumPy – for data processing

• mediapipe==0.10.8

• flask==3.0.0

• flask-cors==4.0.0

• pillow==10.1.0

VIII. ADVANTAGES

1) Detects cheating in online exams.
2) Improves exam fairness and transparency.
3) Reduces manual monitoring by teachers.
4) Generates automated cheating reports.
5) Generates automated cheating reports.
6) Can be used by schools, colleges, and universities.

IX. FUTURE SCOPE

Future improvements may include the use of more advanced deep learning models to increase detection accuracy. Integration with cloud-based systems can allow large-scale deployment. Features such as voice detection, emotion analysis, and keystroke monitoring can also be added. Mobile application support and automated reporting systems can further enhance usability and efficiency.

X. CONCLUSION

The proposed system provides an effective and reliable solution for monitoring online examinations. By detecting cheating behaviors such as mobile phone usage, multiple faces, gaze deviation, and tab switching, the system helps maintain fairness and integrity. It reduces dependency on manual supervision and ensures a secure and transparent examination process. The system is efficient, scalable, and suitable for modern online education environments.

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