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Smart Monitor AI – A Secure Online Examination and Malpractice Detection Framework

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Abstract - The rapid expansion of online education has created significant challenges in maintaining academic integrity during remote examinations. To address the limitations of traditional manual and webcam-based monitoring, this project introduces Smart Monitor AI, an AI-powered Automated Exam Proctoring System that combines computer vision, behavioral analysis, and real-time activity tracking to supervise students during exams. The system identifies suspicious activities such as absence of face, presence of multiple individuals, gaze deviation, object detection (like mobile phones or books), tab switching, and unusual posture behavior, while generating instant alerts and detailed violation reports for instructors. By utilizing lightweight, the platform ensures privacy-focused and scalable monitoring without requiring additional software installations. Additionally, it integrates a professional coding environment for programming assessments, making it a secure, efficient, and reliable solution for conducting fair and modern online examinations.

Key Words: AI-based Proctoring, Automated Exam System, Computer Vision, Malpractice Detection, Real-Time Monitoring, Exam Security, Integrated Code Editor.

1. INTRODUCTION

Due to increased usage of online learning platforms, educational institutes have started conducting their exams in online mode on a large scale. Although online mode of examination offers several advantages, there are various problems involved in online mode of examination like cheating, impersonation, and poor supervision. Conventional techniques of exam supervision, which involve active monitoring using video calls by human supervisors, prove to be cumbersome, inefficient, and unmanageable in case of a large number of examinees. Moreover, most of the online exam software available today do not offer advanced technology to detect any form of malpractice during the exams.

2. SYSTEM ARCHITECTURE

The architecture of Smart Student Monitoring System is divided into five core modules:

Module Name	Responsibilities
User Authentication	Controls the login process for teachers and students with role-based permissions.
Exam Management	Permits teachers to set up exams, pose questions, and allocate tests to students.
AI Proctoring	Surveys students in real-time via face recognition, multi-face recognition, and behavior recognition.
Malpractice Detection & Logging	Detects irregularities such as tab swapping and device utilization and logs them.
Reporting & Control	Permits teachers to generate malpractice reports, supervise student conduct, and lock out students when required.

3. METHODOLOGY

3.1 User Authentication and Role Management

- Offers a secure way of logging into the system for students, educators, and admins through role-based authentication.
- Only authorized users are allowed access to functionalities like test creation, test-taking, and system management.
- Provides session-based authentication for secure management of user credentials and access rights.

3.2 Exam Creation and Assignment

- Provides flexibility for teachers to design and administer tests with personalized question types, time allocations, and categorization of subjects.
- Offers features that allow assigning tests to individual students through personalized access codes.
- Assists in systematic organization of tests, along with scheduling and restricted access control to ensure only authorized individuals gain access.

3.3 AI-Based Proctoring and Monitoring

● Records live webcam video and tracks user interaction via the browser at the time of tests.

● Applies local machine learning models (TensorFlow.js, MediaPipe, COCO-SSD) for detecting facial presence, multiple faces, eye deviation, unauthorized items, and unusual postural actions. Detection of Malpractice and Logging.

3.4 Reporting and Teacher Control

● Constantly monitors the suspicious activities like tab switch, device activity, user's departure from the screen, and any other movements.
● Automatically takes screenshots whenever malpractice occurs and saves them to the cloud via the integration with Cloudinary.
● Stores all violations in the database with timestamp.

4. FEATURES

1. Role-Based Login for Teachers and Students
2. Secure Online Exam Creation and Assignment
3. AI-Based Real-Time Student Monitoring
4. Face Detection and Multiple Face Identification
5. Tab Switching and Screen Activity Tracking
6. External Device and Object Detection
7. Automated Malpractice Logging and Reporting
8. Teacher-Controlled Student Blocking System
9. Detailed Exam Logs and Violation Analytics

Fig-1: Secure Login – Student, Faculty and Admin

Fig-2: Student Dashboard

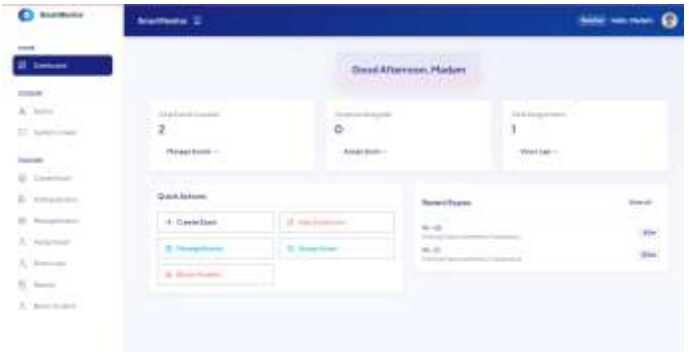

Fig-3: Teacher Dashboard

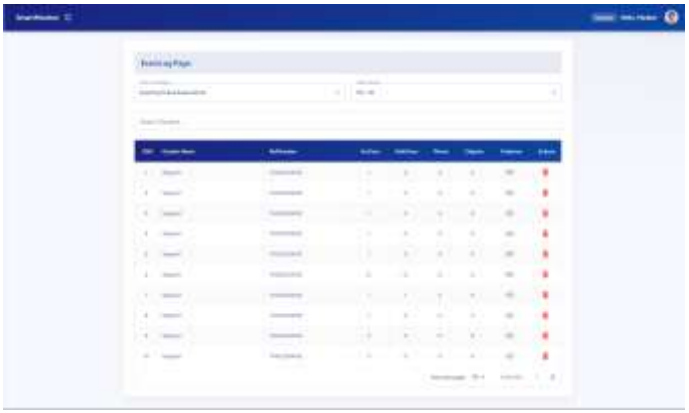

Fig-4: Exam logs & malpractice monitoring

5. CONCLUSIONS

In this paper, Smart Monitor AI, an automated exam proctoring system using Artificial Intelligence, is introduced. This system aims to provide fair and trustworthy assessments during online tests. With the inclusion of technologies like computer vision, behavior analytics, live monitoring, and advanced programming, the automated exam proctoring system uses artificial intelligence algorithms to automate the examination process and minimize the need for human intervention in the exam hall. In addition, this paper discusses how the AI-based system is capable of identifying common cases of malpractice, such as faceless monitoring, multiple faces detection, gaze shifting, utilization of prohibited objects, and tabbing out.

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