*International Journal of Engineering Research and Development*
*e- ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com*
*Volume 22, Issue 4 (April 2026), PP 133-136*

# AI-Based Smart Exam Desk for Cheating Detection

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***Abstract:*** *Examination malpractices remain a major challenge in both online and offline examination systems. Traditional methods such as human invigilators and CCTV surveillance require continuous monitoring and are prone to human error. This review paper presents an AI-Based Smart Exam Desk designed to enhance examination integrity using computer vision and intelligent monitoring. The proposed system integrates a Raspberry Pi, spy cameras, RF detection modules, and AI-based behavior analysis to automatically detect suspicious activities such as abnormal head movements, object exchange, and the presence of electronic devices. Unlike conventional surveillance systems, this approach focuses on real-time event detection and alert generation rather than continuous manual observation. Existing research works related to AI-based cheating detection, stress monitoring, and smart surveillance systems are reviewed and compared. The study highlights the advantages, limitations, and feasibility of implementing such a system in Indian examination environments. This review aims to provide a foundation for developing an automated, scalable, and costeffective smart examination desk.*
*This paper reviews and compares existing research works related to AI-based cheating detection, physiological stress monitoring, and smart surveillance systems used in examination environments. The advantages, limitations, and practical challenges of implementing such systems are discussed with special consideration of Indian educational institutions, where large student populations and limited resources are common. The study highlights the feasibility of deploying a desklevel intelligent monitoring system that is scalable, cost-effective, and adaptable to both classroom and examination hall settings. This review aims to provide a strong foundation for future development of automated examination monitoring systems that improve transparency while maintaining student privacy.*

***Keywords:*** *Smart Examination, Computer Vision, AI Monitoring, Raspberry Pi, Cheating Detection, Smart Desk*

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Date of Submission: 22-03-2026 Date of acceptance: 04-04-2026

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## I. INTRODUCTION

Examinations play a crucial role in evaluating a student's knowledge and academic performance. However, cheating and unfair practices have become increasingly sophisticated, making traditional invigilation methods less effective. Human invigilators may miss suspicious activities due to fatigue or limited visibility, while CCTV systems require constant monitoring. With advancements in Artificial Intelligence and embedded systems, automated exam monitoring has become a promising solution. This paper reviews existing research related to AI-based cheating detection and proposes the concept of an AI-Based Smart Exam Desk that can monitor students individually using intelligent vision-based analysis.

## II. LITERATURE SURVEY

### 2.1 AI-Based Cheating Detection Systems

Sharma et al. (2022) proposed an AI-based online exam monitoring system using computer vision to detect eye movement and head direction. The system successfully identified suspicious behavior but suffered from false alerts during normal movements.

### 2.2 Stress and Behavioral Monitoring

Patel et al. (2021) demonstrated the use of physiological sensors such as GSR and heart rate sensors to detect stress during examinations. While effective, the system required physical contact, which may not be suitable for long exam durations. 2.3 Smart Surveillance Systems

Several studies have used CCTV and IoT-based monitoring for examination halls. These systems improved coverage but still depended heavily on manual supervision.

From the reviewed literature, it is observed that most systems either rely on manual monitoring or are not suitable for offline classroom environments. This motivates the need for a desk-level intelligent monitoring system.

## III. PROPOSED SYSTEM ARCHITECTURE

The AI-Based Smart Exam Desk is a conceptual intelligent examination monitoring system designed to observe and analyze student behavior at an individual desk level. The main objective of the proposed system is to reduce examination malpractices by combining embedded hardware and artificial intelligence techniques to enable automated and real-time monitoring without continuous human supervision.

Each examination desk is equipped with a compact spy camera mounted at an optimal position to capture the student's face and upper body movements during the examination. The camera continuously records visual data, which is processed locally using a Raspberry Pi embedded within the desk. The Raspberry Pi acts as the central processing unit of the system, responsible for acquiring sensor data, performing preliminary processing, and executing AI-based behavior analysis algorithms.

In addition to visual monitoring, the system integrates an RF detection module to identify the presence of unauthorized electronic devices such as mobile phones, wireless earphones, or smart gadgets. The RF detector monitors radio frequency signals within a predefined range, and any abnormal RF activity during the examination is flagged as suspicious. Since the RF detector outputs analog signals, an external analog-to-digital converter (ADC) module is used to interface it with the Raspberry Pi.

Artificial intelligence algorithms based on computer vision are employed to analyze student behavior patterns such as head movement, gaze direction, and repeated abnormal gestures. The system is designed to differentiate between normal exam-related movements and potentially suspicious actions, thereby reducing false alerts. Instead of continuous video surveillance, the proposed system focuses on event-based detection, where alerts are generated only when predefined abnormal behavior thresholds are crossed.

All detected events are communicated to an invigilator dashboard through a local wireless network. This selective alert-based approach significantly reduces the monitoring load on invigilators and improves response efficiency. The proposed Smart Exam Desk concept is scalable, cost-effective, and suitable for deployment in large examination halls, particularly in the Indian education system.

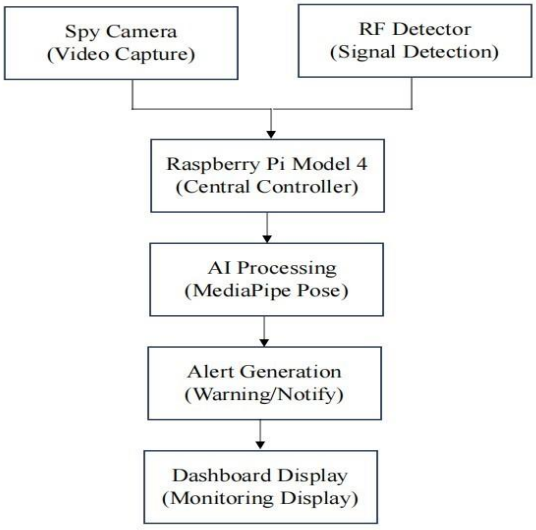


Figure 1. System architecture of the proposed AI-based smart exam desk

## IV. RESEARCH METHODOLOGY TO BE EMPLOYED (SOFTWARE& HARDWARE)

The research methodology for the AI-Based Smart Exam Desk follows a systematic approach that integrates both hardware and software components to achieve intelligent examination monitoring. The methodology is divided into two major parts: hardware methodology and software methodology.

A. Hardware Methodology

The hardware design focuses on capturing visual and radio frequency data from the examination environment and processing it locally at the desk level. Each Smart Exam Desk consists of the following components:

- Spy Camera:

A compact camera is mounted on the desk to continuously capture the student's face and upperbody movements during the examination.

- Raspberry Pi:

The Raspberry Pi serves as the central processing unit, responsible for acquiring data from the camera and RF detector, executing AI algorithms, and managing communication with the invigilator dashboard.

- RF Detection Module:

The RF detector is used to identify the presence of unauthorized electronic devices by sensing abnormal radio frequency signals within the examination area.

- ADC Module:

Since the RF detector produces analog output, an analog-to-digital converter is used to convert the signal into a digital format compatible with the Raspberry Pi.

- Power Supply Unit:

A regulated power supply using a power adapter and DC buck converter ensures stable voltage for all hardware components.

The hardware components are integrated within the desk structure to maintain discreteness and minimize student interference.

B. Software Methodology

The software methodology focuses on intelligent data processing, behavior analysis, and alert generation using artificial intelligence techniques.

- Data Acquisition:

Continuous video frames from the spy camera and RF signal data from the RF detector are collected by the Raspberry Pi.

- Pre-processing:

Captured video frames are resized and filtered to remove noise and improve processing efficiency.

- AI-Based Behavior Analysis: Computer vision algorithms analyze head movements, gaze direction, and repetitive abnormal gestures to distinguish between normal and suspicious behavior.
- RF Signal Analysis:

RF signal strength is monitored and compared against predefined thresholds to detect unauthorized electronic device usage.

- Event Detection and Decision Logic: A rule-based decision system evaluates the combined outputs of vision analysis and RF detection to minimize false alerts.
- Alert Generation:

When abnormal behavior is detected, alerts are generated and transmitted to the invigilator dashboard over a local wireless network.

- Data Storage and Retention:

Examination data is stored temporarily and automatically deleted after a predefined retention period to maintain privacy.

## V. RELEVANCE OF PROJECT

With the increasing scale of examinations and the growing use of electronic devices, maintaining examination integrity has become a significant challenge for educational institutions. Traditional invigilation methods rely heavily on human supervision and conventional CCTV systems, which require continuous manual monitoring and are susceptible to human errors such as fatigue and delayed response. The AI-Based Smart Exam Desk addresses these challenges by introducing an automated, desk-level monitoring approach that enables real-time detection of suspicious activities.

The relevance of the proposed system lies in its ability to provide intelligent and selective monitoring rather than continuous passive surveillance. By focusing on behavior-based event detection, the system enhances the effectiveness of examination monitoring while reducing the workload of invigilators. The concept particularly suitable for Indian examination environments, where large student populations and limited invigilation resources are common.

B. Applications of the Proposed System

The AI-Based Smart Exam Desk can be applied in various examination and assessment scenarios, including:

- University and College Examination Halls: For monitoring large-scale semester and competitive examinations.
- School-Level Examinations:

To ensure fair assessment during board and internal examinations.

- Competitive Examination Centers:

Such as entrance exams and recruitment tests that require high security.

- Training and Certification Centers: For professional certification and skill assessment exams.

- Hybrid Examination Environments: Where both offline and technology-assisted examinations are conducted.

C. Advantages of the Proposed System

The proposed Smart Exam Desk offers several advantages over traditional examination monitoring systems:

- Automated Monitoring: Reduces dependency on continuous human supervision.
- Real-Time Alert Generation:

Enables invigilators to respond immediately to suspicious activities.

- Reduced False Monitoring: Event-based detection minimizes unnecessary alerts and manual review.
- Scalability:

Desk-level deployment allows the system to be expanded for large examination halls.

- Cost-Effective Solution: Uses low-cost embedded hardware such as Raspberry Pi and compact sensors.
- Improved Examination Integrity: Enhances transparency and fairness in examination processes.

Adaptability:

Can be customized according to institutional policies and examination rules.

## VI. CONCLUSION

simulator designed for real-time training and performance analysis. By integrating computer vision and machine learning techniques, the system provides objective, automated, and personalized performance evaluation.
Experimental results validate the effectiveness of the proposed approach in enhancing training outcomes.
Future work will focus on incorporating virtual reality environments, reinforcement learning for adaptive training scenarios, and multimodal data integration for stress and fatigue analysis.

## ACKNOLEDGMENT

Completion of this system is a task which would have not accomplished without cooperation and help from my guide. At the outset, a sincere thanks to guide Dr. J. D. DORVE ( Electronics and Communication Department) for his guidance and constant encouragement, without which it would have not been possible.

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