

Squid Examiner: Student Behavior Analysis Exam Surveillance System

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Abstract

The Squid Examiner system is an innovative solution designed to enhance examination security through automated cheating detection using real-time video surveillance. While offering real-time monitoring and detailed reporting, it faces privacy concerns, potential accuracy issues, and high initial costs. The system's future scope includes AI improvements, multi-modal surveillance, and global expansion, with a focus on continuous innovation and feedback from educational institutions and students.

Keywords: Squid Examiner system, examination security, cheating detection, real-time video surveillance, privacy concerns, accuracy issues, initial costs, AI improvements, global expansion Innovation, feedback

1. Introduction

In an era where education is evolving rapidly, maintaining the integrity of examinations has become a paramount concern for educational institutions worldwide. The proliferation of technology and the internet has made it increasingly challenging to prevent academic dishonesty, including cheating during exams. To combat this issue and ensure a fair evaluation process, innovative solutions are needed. This synopsis introduces "Squid Examiner," an Intelligent Exam Supervision System designed to revolutionize the examination process by harnessing the power of video surveillance and artificial intelligence.

"Squid Examiner" represents a cutting-edge solution that addresses the age-old problem of cheating in examination classes. It leverages the advancements in computer vision, machine learning, and video analytics to create a robust system capable of real-time cheating detection. By automating the monitoring and supervision of examination environments, "Squid Examiner" aims to enhance the overall fairness and credibility of the evaluation process.

This synopsis provides an overview of the key features and functionalities of "Squid Examiner." It delves into the technology behind this system, outlining how it identifies and flags instances of cheating, whether through unauthorized devices, communication, or other deceptive practices. Moreover, it highlights the advantages of using an automated system like "Squid Examiner," including its potential to reduce the burden on human proctors, increase efficiency, and minimize false positives.

In a world where academic integrity is paramount, "Squid Examiner" offers a promising solution to one of the most pressing challenges faced by educational institutions today. This synopsis will explore how this innovative system can reshape the landscape of examination supervision, ensuring a level playing

field for all students and restoring trust in the assessment process.

2. Literature Survey for problem identification and specification

Numerous systems are proposed in the existing literature on inactivity detection of humans and video surveillance. For the detection of human activities, the general network includes various steps like motion detection, background and foreground modeling, segmentation, classification, object tracking, and the identification of the person's behavior & activities along-with person face recognition. Students and examination supervisors, by using their smartphones or computers, can access a web application called the Squid Examiner. These systems have various details in modules such as student's details, staff details, and hall details with proper explanations and descriptions.

2.1 Fatima Mahmood, Jehangir Arshad, Mohamed Tahar Ben Othman, Muhammad Faisal Hayat: Implementation of an Intelligent Exam Supervision System Using Deep Learning Algorithms 2022

Examination cheating activities like whispering, head movements, hand movements, or hand contact are extensively involved, and the rectitude and worthiness of fair and unbiased examination are prohibited by such cheating activities. The aim of this research is to develop a model to supervise or control unethical activities in real-time examinations. Exam supervision is fallible due to limited human abilities and capacity to handle students in examination centers, and these errors can be reduced with the help of the Automatic Invigilation System. This work presents an automated system for exams invigilation using deep learning approaches i.e., Faster Regional Convolution Neural Network (RCNN).

2.2 Adil, M.; Simon, R.; Khatri, S.K. Automated Invigilation System for Detection of Suspicious Activities during Examination. In Proceedings of the 2019 Amity International Conference on Artificial Intelligence (AICAI), Dubai, United Arab Emirates, 4–6 February 2019; pp. 361–366

In their research, Adil, Md. proposed a model that will help schools and universities monitor and detect various suspicious or unethical activities like whispering or hand contact, etc. in the classroom during examinations. The system detects hand-contacts of students, identifies and detects students who are looking at another's answer sheet. The methodology is based on certain threshold levels, a certain threshold or grid is formed around the student and whenever a student moves his hand beyond this level, it will be detected. They used the voila jones algorithm and the Adaboost algorithm for their proposed model. Based on color and grid formation, the direction of the head and hand contact is detected, and the face is recognized by using the voila jones algorithm. The drawback of this algorithm is that it requires multiple cameras to capture students from different angles which requires high processing power and grid overlapping may occur when there is less space in students sitting arrangement.

2.3 Wan, Z.; Li, X.; Xia, B.; Luo, Z. Recognition of Cheating Behavior in Examination Room Based on Deep Learning. In Proceedings of the 2021 International Conference on Computer Engineering and Application (ICCEA), Kunming, China, 25–27 June 2021; pp. 204–208.

Zhenhong, Wan represents a deep learning module for the identification of cheating behaviour during examinations. An object detection algorithm YOLO is implemented to detect the boundary box for each student along with that another algorithm which is open pose used to identify and recognize student correct posture and position and label them as suspected or non-suspected. A deep learning algorithm that used as a binary classifier in this model get trained on the training dataset. The training dataset consists of only

two classes of cheating: peeping in to another student paper, and sharing or exchanging answer sheets. For testing the speed and accuracy of the proposed model, a surveillance camera is used to make a video of students during examination, the inter-frame difference method is also implemented to enhance the detection speed and accuracy of the proposed model to extract multiple frames or images from the surveillance video and then pass these images to the model for student cheating behaviour detection.

2.4 Wassay, M.A.; Sivaram, P.; Anand, A.; Alsaud, Y.; Dara, S. Smart Invigilation System: Examinations through IoT to Avoid Academic Dishonesty (SIS-eAAD); No. 5954; EasyChair: Chandigarh, India, 2021.

Md, Abdul developed an invigilation system which is based on the Internet of things(IOT) to supervise the students in Examination Hall with a camera in order to reduce the cheating activities in an examination hall. The IOT hub is connected to camera, the database system of the university and also to the examination department to monitor the students’ activities during the examinations. It is important to monitor students online via camera because sometimes teachers cannot catch students who are cheating through different tricks and techniques. To improve the monitoring system of students during invigilation they proposed this model that is IOT based.

2.5 Ketab, S.S.; Clarke, N.L.; Dowland, P.S. A Robust e-Invigilation System Employing Multimodal Biometric Authentication. Int. J. Inf. Educ. Technol. 2017, 7, 796–802.

S. Ketab proposes an Invigilation system with the authentication process of students. The proposed model is a smart authentication and automatic invigilation system for both offline and online examination. Multi-modal Bio-metrics technique is used for the students’ identification along with a 3D facial recognition method. To monitor students during examination, an eye tracker system is implemented to detect suspicious movements of eyes and speech recognition module is implemented to detect any improper voice. Speech recognition is a deep learning module which is trained on speech pattern to detect specific voice note.

3. Problem Statement

Developing an intelligent exam supervision system, named 'Squid Examiner,' that utilizes video surveillance to automatically detect and prevent cheating in examination classes, ensuring a fair and secure testing environment for academic institutions.

4. Methodology and Action Plan for Solving the Identified Problem

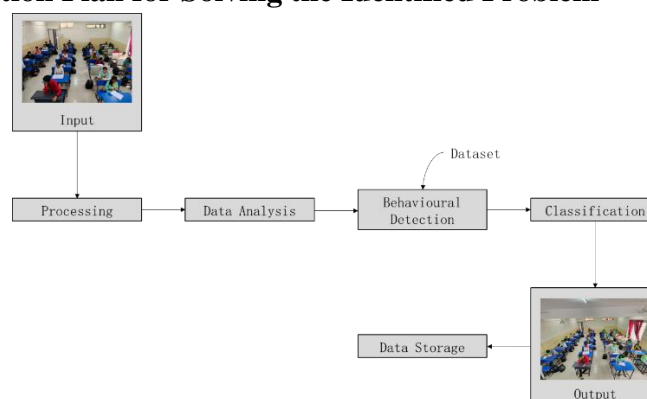


Figure 1: Action Plan for Behavioral Analysis

4.1. Input

- The input to the system includes real-time video feeds captured from surveillance cameras placed in examination halls or classrooms.
- Additional inputs may include student and exam details, such as registration information and exam schedules.

4.2 Processing

- The system processes the incoming video streams using computer vision algorithms to detect and track objects within the examination environment, primarily focusing on student activities.
- Image processing techniques may be employed to enhance the quality of the video feed and improve the accuracy of object detection.

4.3 Data Analysis

- Once the objects (students) are detected and tracked, the system analyzes their behavior in real-time.
- This analysis involves identifying suspicious activities such as unauthorized communication, looking at another student's paper, or using unauthorized devices.

4.4 Behavioral Detection

- The system utilizes a dataset of known cheating behaviors to compare and detect similar patterns in the real-time video feed.
- Machine learning algorithms may be employed to train the system on the dataset, enabling it to recognize and classify various cheating behaviors accurately.

4.5 Classification

- Based on the detected behaviors, the system classifies each student's actions as either suspicious or non-suspicious.
- Classification may involve assigning probabilities or confidence scores to each detected behavior to determine the level of suspicion.

4.6 Output

- The output of the system includes real-time alerts or notifications to exam proctors or administrators, indicating instances of suspicious behavior.
- Additionally, detailed reports may be generated, summarizing the detected activities during the examination period.

4.7 Data Storage

- The system stores both raw and processed data, including video recordings, metadata, and analysis results, in a secure database.
- Proper data management practices are followed to ensure compliance with privacy regulations and to maintain the integrity of the examination process.

5. Advantages and Limitations

5.1. Advantages of Squid Examiner

- Enhanced examination security
- Real-time monitoring
- Efficiency
- Detailed reporting
- Behavior analysis
- User management

- Customization

5.1. Limitations of Squid Examiner

- Privacy Concerns
- High Initial Cost
- Ethical Consideration
- Integration Challenges

6. Future Scope

Future developments for the Squid Examiner system will encompass multi-modal surveillance, blockchain integration, remote proctoring, AI upgrades, and enhanced reporting. It wants to become a worldwide player, improve security, and provide mobile apps that are easy to use. Research and development will provide feedback loops between educational institutions and students for continual enhancement, and will drive ongoing innovations, such as AI-driven authentication and adaptive proctoring.

7. Conclusion

To sum up, the Squid Examiner improves test security and integrity by providing a reliable automatic cheating detection solution. But it needs to handle privacy issues, enhance precision, and control startup expenses. Future developments in AI, worldwide expansion, and continuous innovation to satisfy changing demands in education are all part of its scope.

8. Appendix

The following appendix provides additional information and details related to the Squid Examiner system, including technical specifications, data analysis methods, and supplementary materials referenced in the main content.

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10. References and Bibliography

1. Fatima Mahmood, Jehangir Arshad, Mohamed Tahar Ben Othman, Muhammad Faisal Hayat: Implementation of an Intelligent Exam Supervision System Using Deep Learning Algorithms 2022.
2. Xu, T.; Xiao, H. Application of SSD core detection algorithm in intelligent visual monitoring of examination room. J. Phys. Conf. Ser. 2021, 2037, 012085.
3. Adil, M.; Simon, R.; Khatri, S.K. Automated Invigilation System for Detection of Suspicious Activities during Examination. In Proceedings of the 2019 Amity International Conference on Artificial Intelligence (AICAI), Dubai, United Arab Emirates, 4–6 February 2019; pp. 361–366.
4. Wan, Z.; Li, X.; Xia, B.; Luo, Z. Recognition of Cheating Behavior in Examination Room Based on Deep Learning. In Proceedings of the 2021 International Conference on Computer Engineering and Application (ICCEA), Kunming, China, 25–27 June 2021; pp. 204–208.

5. Wassay, M.A.; Sivaram, P.; Anand, A.; Alsaud, Y.; Dara, S. Smart Invigilation System: Examinations through IoT to Avoid Academic Dishonesty (SIS-eAAD); No. 5954; EasyChair: Chandigarh, India, 2021.
6. Ketab, S.S.; Clarke, N.L.; Dowland, P.S. A Robust e-Invigilation System Employing Multimodal Biometric Authentication. *Int. J. Inf. Educ. Technol.* 2017, 7, 796–802