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IMPLEMENTATION OF INTELLIGENT EXAM INVIGILATION SYSTEMUSING DEEP LEARNING ALGORITHM

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Abstract - *Educational institutions rely on exams to assess students' abilities, yet cheating persists. A computer vision- based method is proposed, utilizing CCTV to detect anomalies during physical exams. Employing You Only Look Once with residual networks, the system achieves 90% accuracy in identifying cheating behaviors. This innovative approach enhances exam integrity, employing machine learning and AIto monitor exam halls effectively. The proposed method uses You Only Look Once with residual networks as the backbonearchitecture to inspect cheating in exams. The obtained results show the credibility and efficiency of the proposed method. The experimental results are promising and demonstrate the invigilation of the students in the examination. In this work, achieve 90%accuracy for the detection of cheating in the classroom environment. Thisresearch introduces an innovative approach to bolster the integrity of examinations by developing machine learning andartificial intelligence for the detection of suspicious activities in examination halls.*

Key Words: Video surveillance, Deep learning, Data Preprocessing, segmentation, feature extraction, suspicious activities, CNN.

1. INTRODUCTION

In the context of academic assessments, ensuring the integrity of examinations is crucial to maintaining the credibility of educational systems. With the widespread integration of technology in examination processes, there arises a pressing needfor intelligent solutions that can effectively detect and prevent suspicious activities in examination halls. Traditional methods of invigilation often fall short in addressing the dynamic nature of cheating tactics, prompting the exploration of innovative approaches rooted in machine learning (ML) and artificial intelligence (AI). This study aims to contribute to the enhancement of examination security by proposing a novel system that utilizes advanced technologies to autonomously identify and flag suspicious behaviors during examinations. The integration of ML and AI allows for a more proactiveand adaptive approach to examination monitoring, moving beyond conventional surveillance methods. By analyzing real-time video feeds from examination halls, the system employs computer vision techniques and sophisticated algorithms to recognize patterns associated with potential misconduct. The research addresses the limitations of existing systems by incorporating continuous learning mechanisms, ensuring the adaptability and effectiveness of the proposed solution over time.

2. LITRATURE REVIEW

Intelligent Exam invigilation system is a computer- based system that is used to monitor the students and detect the suspicious activities during examination among the students. It is designed to reduce the incidence of academic dishonesty and fair conduction of the exams by monitoring the students' actions in real-time using a combined versions of computer vision and machine learning algorithms. The purpose of this literature review is to examine the existing research on automated invigilation system for detection of suspicious activities during the examination.

1. "Automated invigilation system for detection of suspicious activities duringexamination". IRJET Published 2023

This system detects the suspicious activities and cheating work done by students during the examination. Detection of cheating activities in classroom is implemented by the system using YOLO (you only look once) algorithm. This model is able to process the real time automated videos using the existing data set of the students and various activities can be analyzed which is happening in the examination. And this model is designed using RCNN and with training accuracy of 99.5% and testing accuracy of 98.5% ,95% accuracy in face recognition. It can track more than 100 students and requires less computing time to get the required result than previous models. The development of quicker invigilation system can further enhance the suggested invigilation system.

2. "Implementation of an Intelligent Exam Supervision Using Deep Learning Algorithms". MDPI Published 2022

In this proposed paper, an automatic invigilationsystem is being implemented to detect unethical activities of students during an examination. Here fast RCNN is implemented as a classifier that is trained on the invigilation data set with the training accuracy of 99.5 and on the testing accuracy of the model is 98.5. here student identification and recognition are done through MTCNN and face recognition module with the accuracy of 95%. The results of both the faster runner classifier and face recognition module are combined, and students' status reports are being generated on excel. The proposed model is better than the existing model has it captures more than 100 students at a time and the computation time to get the desired result is less as compared to other models.

3. **"Detection of Cheating Behaviours in Online Exams Using an Automated Invigilation System" by. Elangovan, N. Rajakumar and S. Suresh (2021).**

In this paper, model is developed which meant to distinguish between normal examples and examples with activities of concern, such as conversation during online test. Existing systems rely more on computation and are slower. Even though it is not much more accurate and can only manage one invigilator per twenty students. An ADA boost and Haar cascade classifier are used along with examples of pre-recorded video clips to determine the identity of highlights based on their textural features. The framework is designed as an emotionally supportive network that can work with the programmed administration of exams and distinguishes misbehavior and malpractice.

4. "A Framework for automated Online Exam Invigilation" by S.Saha, S.Biswas, and R.Choudhary (2020)

The existing invigilator-exam assignment system in the university under consideration has some problems like time and man power needed for constructing the assignment. A user-friendly decision support system based on a multi- objective mixed integer programming model is introduced for invigilator-exam assignment problem with an eye to practical use. The system has a appropriate facilities for providing help to the users to implement an assignment schedule. Comparing with the current invigilator-exam assignments for 2004-2005spring midterm and final exam terms, it is seen that the required time for the assignments is dropped off from a few days to seconds. AIAS reaches optimum results in a fewseconds

Automated invigilation system is an effective way to reduce academic dishonesty during exams. The systems use computer vision and machine learning algorithms to monitor the student actions and detect suspicious activities such as copying pasting switching between windows, and using unauthorized access devices. The existing research on automated invigilation system that these systems are effective in reducing academic dishonesty.

Table -1: Summary of research work

Paper	Methodology	Accuracy
1. Automated invigilation system for detection of suspicious activities during examination. IRJET Published2023	YOLO algorithm, Faster RCNN	5% face recognition ,98.5% testing accuracy
2. Implementation of an Intelligent exam Supervision Using Deep learning Algorithms. MDPI Published 2022	MTCNN, Faster RCNN Algorithm.	9.5% Training accuracy 8.5 % Testing accuracy
3. Detection of Cheating Behaviours in Online Exams Using an Automated Invigilation System 2021	An ADA boost and Haarcascade	Accuracy rate of 84.5%
4. A Framework for automated Online Exam Invigilation" by S. Saha, S.Biswas, and R.Choudhary (2020)	EM Algorithm ana Adaptive threshold	Error rate is less than 10% compared to standard computer vision Algorithm

3. METHODOLOGY

Data Collection and Preprocessing:

Acquire a diverse dataset of video footage from examination halls, capturing a range of scenarios and behaviors. Preprocess the data to enhance quality,normalize lighting conditions and anonymize personally identifiable information.

Feature Extraction and Representation:

Utilize deep neural networks, such as convolutional Neural Networks (CNN), for feature extraction from the video frames. Extract facial features, gaze patterns and object interactions as key indicators of examinee behaviour during examinations.

Model Architecture:

Design a deep learning architecture that integrates multiple components, including CNNs for image based features and Recurrent Neural Networks (RNNs) for

temporal analysis of behaviour sequences. Incorporate pre-trained models for facial recognition to enhance accuracy.

Training the Model:

Train the deep learning model on the pre-processed dataset, using labelled examples of normal and suspicious activities. Implement transfer learning techniques to leverage knowledge from pre-existing models, enhancing the efficiency of model training.

Real-time Video Processing:

Implement edge computing to enable on-site processing of video data in real-time, reducing latency and ensuring immediate response to detect suspicious activities Deploy optimized algorithms for efficient video analysis on edge devices.

Suspicious Activity Detection:

Define thresholds and criteria for identifying suspicious activities based on the output of the deep learning model. Integrate an alert system to notify invigilators or administrators in real time when suspicious activities are detected.

Continuous Learning and Model Adaptation:

Implement mechanisms for continuous learning, enabling the model to adapt to evolving patterns of cheating behaviour. Regularly update the model with new data to improve its accuracy and generalization across diverse examination scenarios.

Evaluation and Validation:

Access the performance of the developed system through rigorous testing using independent datasets and real-world examination scenarios. Validate the system against known instances of suspicious activities and evaluate its false-positive and false- negative rates.

4. IMPLEMENTATION:

The architecture and design of an automated invigilation system may vary depending on the specific features and functionalities it offers.

However, in general, an automated invigilation system consists of the following components:

1. Cameras and microphone.
2. Data storage and processing.
3. Algorithms and machine learning models.
4. Alerting and reporting.
5. User interface.

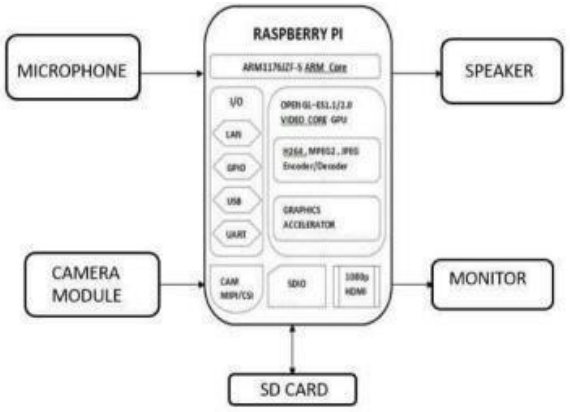

Fig -1: Model of proposed system

Hardware Required:

1. Raspberry pi
2. Camera Module
3. Microphone
4. Buzzer
5. LCD

Ultrasonic SensorSoftware Required:

1. Operating systems: Windows 7/8/10
2. Software tool: Open CV
3. Coding Language: Python
4. Toolbox: Image processing toolbox

The technology uses cameras and microphone to record the exam room and keep an eye on the students' behaviours. These cameras and microphone might have features including screen recording, eye tracking, and facial recognition, the system gathers information from the cameras and microphone, analyses it, and saves it in a safe database. Images, movies, and other pertinent information could be included with the data. The system analyses the data and looks for any unusual activity using algorithms and machine learning models. These models learn to recognize patterns of dishonest behaviours through training on a sizeable dataset of labelled samples.If the system notices any suspicious activity, it notifies human invigilator so they can review the video and respond appropriately. Additionally, the system produces reports that give through details about the activities found during

the examination. The system might have user interface that enables human examiners to keep an eye on the exam room in real time and see the images the cameras and sensors are taking. The design of an automated invigilation system must consider several criteria, including ease of use, security, and privacy. It must make sure that the systems data collection is retained securely and used only for that reason. The system should also ensure that students privacy rights are maintained and set clear instructions on how data will be utilized. Additionally, for invigilators to effectively watch the exam room, the user interface must be simple to use and provide all the information they need

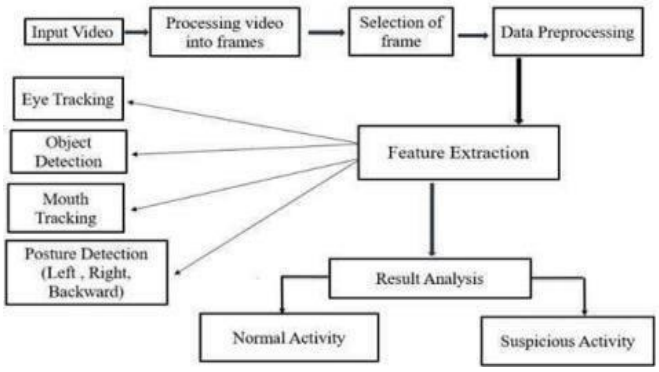

Fig-2 Flow Diagram

RESULT:

The outcome of our project is the combined result of all Five modules each extracting a particular cheating activity in examinations.

The proposed work is implemented for both Online and Offline Exams. We have worked extracting five different features which are classified as suspicious or normal activity.

One of the objectives of the proposed work is to improve the accuracy in detecting object, which was less in the existing work, in this proposed model CNN is used to increase the accuracy in detecting prohibited objects in the examination hall.

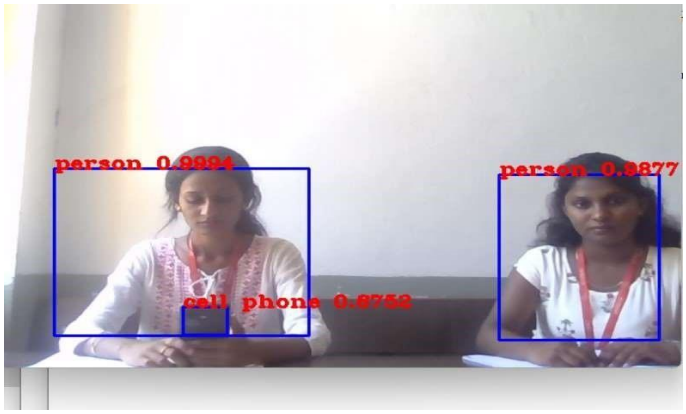

Fig-3 object detection

The above image shows the accuracy of the persons writing the exams and it says about the cell phone which the student is using during the examination.

The second objective of our project is detecting cheating activity by the student's eye movement which is done through gaze tracking. The image below taken from the online exam proctoring which gives more clear resolution of the eye tracker of the student

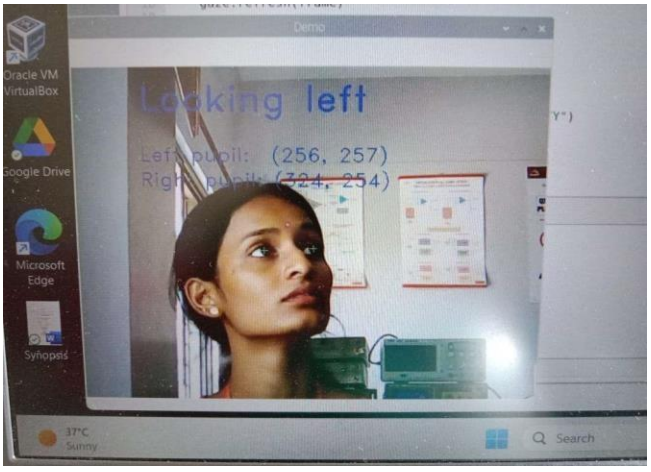

Fig-4(a) Eye Tracking

The fig. 4(a) shows the student is proctored in online exam where she is looking left. For this detection the pupils of the student are tracked.

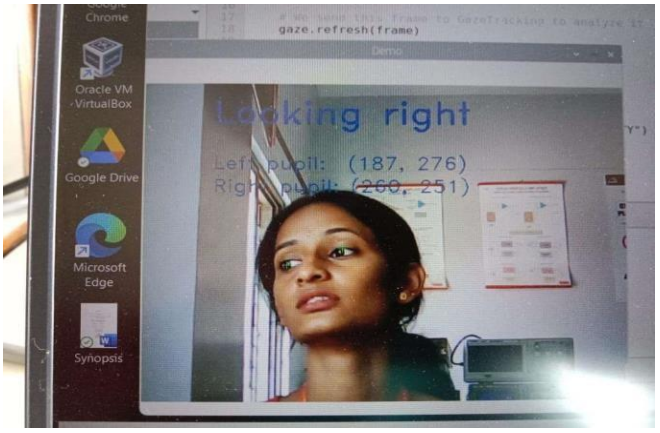

Fig-4(b) Eye tracking

The fig. 4(b) shows the student is proctored in online exam where she is looking right. for this detection the pupils of the student are tracked.

The next objective is to recognize any kind of sound orvoice in the exam hall, which is done through the ultrasonic sensor and the in-built microphone in the camera module.

The ultrasonic sensor is set up in a suitable position where it can effectively detect sound waves. Ensure that the sensor is connected to a microcontroller or a

computer system capable of processing the sensor data. The sensor returns a signal proportional to the time it takes for the ultrasonic waves to travel to the object and back. This signal typically needs to be processed to extract meaningful information about the distance to the object. For sound recognition, you may need additional signal processing techniques to filter out irrelevant noise and focus on sound-related signals.

The recognized voice or sound is recorded and saved in the same folder the programs and libraries installedhave saved. Even after the examination, the invigilating authority can hear what sound as been recorded and then take particular action on the misbehaved students with a proof.

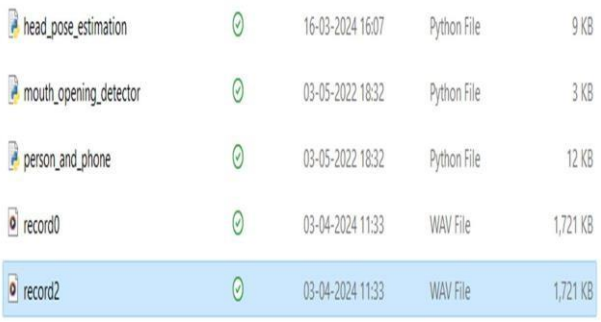

Fig-5 audio Recognition

In the above figure, one can see the recording from the examination hall which has been recorded during examination when the voice recognition file is executed.

Fig-6 output displayed on LCD

Mouth detection file uses Face Detector and Face Landmark library which follows the 68- point Face Landmark model which points particular parts of the face with a landmark point numbering from 1 to 68. It has given a set of landmarks discriminating as outer landmark and inner landmark. When the inner landmark gets highlighted, it has to display MOUTH OPEN in the monitor in case of Online exam and LCD in case of Offline Exam.

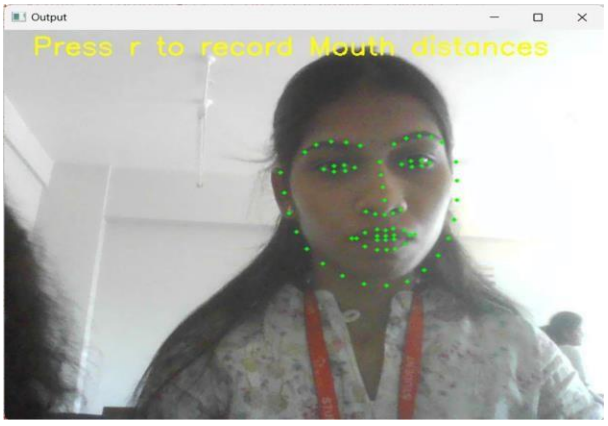

Fig- 7 68-point face landmark detector

The above figure shows the 68-point landmark model working on the students face which is then focused only on the mouth part where inner landmarks are marked between 61 to 67 and theouter land mark are marked between 49 to 59 points of the landmark model.

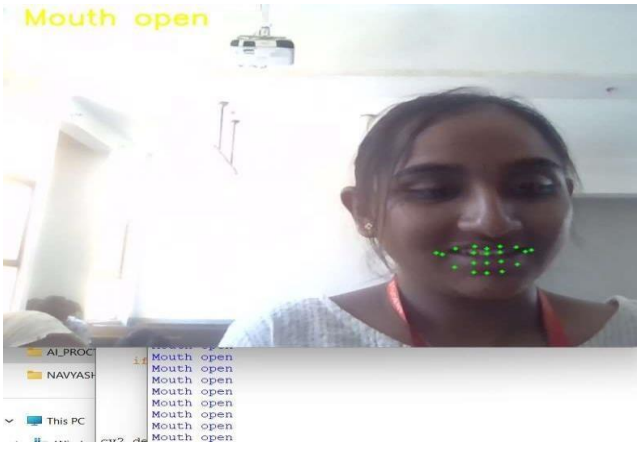

Fig-Mouth tracking

For every frame the activity is detected, the counter counts and if it exceeds a maximum limit initiated in the code, then only the buzzer gets on and LCD will display about the cheating activity.

The other objective of the proposed system is classifying students' activity as suspicious by observing head posture of the students. In the following figure we considered offline exam and based on the region of interest mentioned in the program, angle of the head is calculated where the threshold is compared with the calculated angle and head left, head right, head up is detected by considering the angles. All the students' heads will be detected first and then the two different co-ordinates points are recorded using this co-ordinate points the angle is calculated.

CONCLUSION:

This research used a deep learning and computer vision approach to propose a novel model for the examination invigilation of students. The pupils' head and neck movements were used as a basis for detecting cheating. For the experiments, a local environment produced the data set. The results of the suggested model were also compared to the literature already in existence and to the experiment section. The findings indicate that the suggested model outperformed the alternative in terms of accuracy. Future development will enable the system to recognize additional forms of cheating, such as wisping, exchanging sheets, and gesture recognition. The suggested system for identifying suspicious activity during the inspection is predicated on several computer vision algorithms, including The proposed system for suspicious activities during the examination is based on various computer vision algorithms such as Viola-Jones and related features and AdaBoost algorithms. The head movement and hand contact are based on colour and grid manipulation and face tracking using the trained dataset. The proposed model helps educational institutions, which will be useful in detecting and recognizing cheating activities in the exam hall.

REFERENCES

1. "Automated invigilation system for detection of suspicious activities during examination." IRJET Published 2023".
2. "Educational Innovation faced by Covid-19: Deep Learning for exam cheating Detection." MDPI Published in 2023.
3. "Implementation of an Intelligent Exam Supervision Using Deep Learning Algorithms." MDPI Published 2022.
4. "Design of Class Routine and Exam Hall Invigilation System based on Genetic Algorithm and Greedy Approach" by Prasad, R.; Khan, A.R.; Ahammad in 2022.
5. "Detection of Cheating Behaviours in Online Exams Using an Automated Invigilation System" by Elangovan, N. Rajakumar and S. Suresh 2021.
6. "Deep Learning: New Approach for detecting Scholar Exams Fraud" By Earth Science Department 2021.
7. "A Framework for automated Online Exam Invigilation" by S. Saha, S. Biswas, and R. Choudhary (2020).
8. "Emerging trends in video surveillance Applications", by N. Rajesh, H. Saroja Devi, International Conference on Software and Computer Applications, vol. 9, 2011.
9. "Computer Vision: Algorithms and Applications", by Richard Zaleski, First Edition, Springer, 2010.
10. "A Survey on Behaviour Analysis in Video Surveillance for Homeland Security Applications",by Teddy Co, IEEE Conference on Applied Imagery Pattern Recognition Workshop (AIPR), Pages: 1 – 8, 2008.