A Literature Review on Techniques for Online Exam Proctoring

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ABSTRACT—The COVID-19 pandemic has brought a digital world era of online learning. With the closure of schools and colleges, learning has shifted to online applications. A majority of colleges and schools have changed their curriculum to work with the current situation. Due to the digital way of learning, students started attending lectures solely for the sake of attendance, thereby deteriorating their practical knowledge. Their grades and scores should have fallen with all of this, but that was not the case. They did quite well. In fact, most of the students exceeded their average score. Due to the lack of a way to proctor students during their online exams and prevent them from engaging in malpractice, there is no way to restrict students from doing so. To solve the given problem, it is required that a system be devised that can aid in analyzing different cheating techniques used by students to resolve this issue. To work with the proctoring procedure in the online examination is a big issue for colleges. In this paper, we develop an online platform that can be used for technical and coding assessments with proctoring procedures to prevent students from cheating and performing malpractices. This platform would eliminate the need for the presence of human invigi lators. Through this paper, we create a solution that provides a variety of different proctoring methods to keep eye on the students throughout the exam period, such as eye movement tracking, different object identification, mouth movement, and different head positions estimate using face recognition. This will help the examiner in detecting whether the student has used any unfair means to cheat.

Keywords—Automated Proctoring, Fair Examination, Face Detection, Object Detection, Malpractice, Webcam Monitoring, Voice Recording, Snapshots, Lock Full Screen Mode

I.   INTRODUCTION

Globally, the Covid-19 pandemic has taken a big toll on education systems. A significant rise in the count of instances has led to a switch from offline to online course delivery and examinations all over the world.

In post-secondary institutions, all classes and activities are delivered through alternative modes, such as online education, instead of face-to-face instruction.

Most of the remaining course assessments have been transformed into to open-book unsupervised tests with assessment weights. This isolates the faculty and students from each other, Therefore, online college/university tests cannot be administered.

Examinees are supervised when examinations are held on campus. Unfortunately, universities are having difficulty finding a way to offer online exams due to the pandemic. Although invigilators monitor students during the online test, students still manage to cheat using their phones, browser searches, and by asking a classmate for assistance. Morality and credibility of the exam are affected as well as the student's lack of topic understanding, which will negatively affect their careers.

To facilitate this, we designed a computer vision-based automated proctoring system that monitors student's activities. We use web cameras and laptop microphones, and they can be alerted if any unethical behavior is observed. In order for them to work together, several vision-based capabilities are merged via multi-threading.
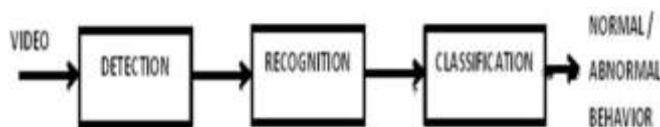
Fig 1: A schematic block diagram of the proposed system

Models are as follows:
1. Tracking the gaze of the eyes
2. Whether the mouth is open or closed
3. Detection of head postures
4. Detection of a moving object (mobile phone, person, bed, etc.)
5. Counting the number of people

If the student is flagged twice, he/she will be notified, and if flagged again, the exam will end and the student will not be able to continue

II.   LITERATURE SURVEY

A.   Yousef Atoum, "Automated Online Exam Proctoring",
(IEEE 2015)

Students in today's educational institutions can benefit from the use of online courses in two ways: by providing more educational resources to students, and by providing educational resources to students who can't attend classes in person due to geographical or schedule restrictions. This study is intended to introduce a continuous and automatic online exam-proctoring system that uses multimedia analytics. Our online exam proctoring system analyzes the performance of some basic components.

The six OEP basic components are:-
A. Hardware Components
B. Verifying User
C. Detection of Text, Speech
D. Window Activity Detection
E. Gaze Detection

The paper describes the application of multimedia analytics to online proctoring in order to promote academic integrity in online training. In addition to demonstrating the system's capabilities, we collected data on 24 test takers representing real-world cheating behaviors in online exams and obtained a segment-based detection rate of nearly 85% across all types of cheating behaviors with a fixed False Rate of 2.5%.

B.   Neha Soman, "Detection of anomalous behavior in an examination hall towards automated proctoring
", (ICECCT 2017)

Along with the advancement of computer science technology, video surveillance technology has made huge progress in many fields in recent years. Traditionally, video surveillance has been achieved by monitoring personnel, a very time-consuming process we examine a method of automatic surveillance for detecting abnormal behavior in the examination hall in real time based on histogram features, we present a method of anomaly detection in videos.

I.   Design Considerations
II.   Assumptions & Dependencies
III.   Goals and Constraints

In a study of students in a single and multiple rows, paper found abnormal behaviors in exam halls. The objective of the paper is to design an approach to detect any abnormal behaviors within a video.

C. Ashwinkumar J S, "Deep Learning based Approach for Facilitating Online Proctoring using Transfer Learning"

The proposed algorithm in the paper provides an automated approach to facilitate online proctoring during examinations. It uses transfer learning to facilitate deep learning and it combines different models like - YOLO model which facilitates fraud object detection and multiple people detection, MPGazeII model is used for eye movement detection, & VGG16 model is used to recognize facial features. The models then combines the results of all the detection algorithms to finaly make prediction whether the candidate has performed any malpractice and if so then necessary action against the candidate can be taken. For online proctoring, existing algorithms use vast amounts of processing and feature extraction. The algorithm proposes to make use of deep learning to tackle the drawbacks of the existing proctoring algorithm.

D. M. Geetha, "Design of face detection and recognition system to monitor students during online examinations using Machine Learning algorithms"

This paper presents how today's COVID-19 pandemic situation has transformed the education system in current time. Today's education classes are mostly undertaken remotely through online platforms. In online education, monitoring the student's performance and attendance is very important. Educational institutions have already started adopting online platforms as a way for assessing the students. These platforms basically make use of different techniques like face detection to proctor the students and their activities. An approach which is similar to Eigenspace can be used for extracting facial features of candidate's face through vectors and the datasets are then trained using Support Vector Machine algorithm. The aim is to create a more accurate face detection system from the existing ones.

E. Aiman A Turani, "Students Online Exam Proctoring: A Case Study Using 360 Degree Security Cameras"

The aim of this paper is to increase the accuracy of the existing face detection system. The e-mastering control systems (LMS) are broadly used international so that it will get entry to diverse sorts of academic programs. More universities, schools, institutes, etc. are transferring closer to imparting their guides on line. Furthermore, on line checks and tests are being more and more more used and demanded. The private computer cameras that are called webcams which can be used to display individuals at some stage in tests be afflicted by its restricted imaginative and prescient precision and scope. These weaknesses are the foremost downside for numerous academic institutes concerning carrying out on line tests. Nowadays, there are numerous fast advances associated with surveillance digital digicam technology and features, along with 360- diploma scanning, excessive definition, shooting each video and capturing audio, etc.

These sorts of cameras may be utilized by an invigilator to offer them with an entire tracking of surroundings at some stage in an internet examination session.

Just through creating a test, the candidate feels that he's constantly being constantly monitored, it'll make him suppose two times earlier than seeking to strive dishonest. In presence of any alarming activities, the online invigilator should use the digital digicam's excessive definition functionality to zoom in and sweep around, or to transport its attention to a specific area.
The important findings of this paper

confirmed that the extent of protection towards dishonest has stepped forward, and on the identical time did now no longer decrease examination-takers' performance. The utilization of 360-diploma protection cameras has allowed candidates attention greater on their tests without getting distracted through unexpected invigilator requests and instructions. The paper additionally proposes a greater, superior proctoring model. In case of any suspicious activities, numerous algorithms will seize those activities and offer separate documents as a way to be reviewed afterward through an assigned proctor.

F. KenrieHylton, "Utilizing webcam-based proctoring to deter misconduct in online exams."

Although misconduct in online examinations has been round for a few time, advances in generation accentuate the problem. The significant difficulty of securing the integrity of on-line checks has demonstrated challenging, specifically because it pertains to addressing the mounting, demanding situations of unfairness in on- line checks. The predominant aim of our have a look at become to evaluate the deterrent impact of the usage of webcams to prevent misuse and dishonesty in on-line checks.

This have a look at concerned evaluating the consequences of businesses taking the equal set of on-line checks one administered the usage of a totally web- primarily based proctor and one without any proctort. The first step out of the four unique desires become to evaluate the variations among ratings from units of on- line checks: a) one set in which individuals are monitored via way of means of a web- primarily based totally proctor & b) any other set of on- line checks wherein individuals had been now no longer monitored. The second aim become to observe the variations withinside the common time taken to finish every of those units of on-line checks (MbWP & NM).

The third aim become to assess the variations withinside the stage of perceived possibility to collaborate skilled among individuals who had been MbWP and people who had been NM. The fourth aim become to observe the variations withinside the stage of perceived possibility to make use of unauthorized sources skilled among individuals in every organization. The 5th aim become to research the variations withinside the stages of perceived disincentive to interact in misconduct skilled among every organization.
Academic misconduct at some point of on-

line checks is a prime challenge. It has been critical that misconduct in on-line checks be guarded in opposition to. The findings imply that the absence of surveillance at some point of on- line checks can growth the extent of possibility to interact in misconduct.

The findings additionally endorse that applicable generation which include Web-primarily based totally proctoring as become used on this experimental have a look at may be hired to counter dishonesty and deception in on-line checks.

Doing so ought to upload any other layer of deterrence in opposition to the misuse of those records systems. It pertains to the studies community, for which there have been some noteworthy hints for destiny studies. Firstly, it is able to be significant to copy the have a look at at any other organization in addition to inside any other sort of courses. Furthermore, by Burlak et al.

it has been recommended that longer reaction instances may replicate feasible misconduct. Future research can also discover whether or not there may be a courting among the time taken to finish a web examination amongst individuals who had been NM, and the ratings received. Other research ought to discover in forming a set that they're being monitored despite the fact that they're now no longer, to observe if the hazard of tracking will deter instructional misconduct. Finally, destiny studies ought to recollect using a pre-take a look at and post-take a look at methodology, in which the organization this is to start with NM could be MbWP. Likewise, the organization this is to start with MbWP could be NM halfway via the experiments. These demanding situations can also additionally offer similarly perception into the deterrent impact of surveillance in on-line checks.

III.   COMPARISON TABLE

Author and Year	Title	Remark
Abdul Wahab in Muzaffar IEEE 2021	"A Systematic Review of Online Exams in E-learning: Techniques, Tools, and Global Adoption."	The use of online education has proven successful situations such as natural calamities, wars, and situations like COVID-19. In view of the critical nature of online exams, it is crucial to analyze and examine the latest development tools in online proctored exams. Among the 21 tools and Techniques identified for online exam, 3 of them belong to the Verifying & Abnormal activities detection, 1 belongs to the feature of Security, and 11 of them belong to the feature of Generating Question and Evaluating Answers. The researchers in the selected studies have proposed 16 algorithms.

Girish Chafle IEEE 2017	"An Integrated Development Environment for Web Service Composition."	Through standard protocols and interfaces, web services enable the sharing of information, software, and other resources over the internet. A study of web service composition was performed, and scalable service composition challenges were identified. Distinguishing between web based service and instance, we developed a principled approach to web service composition. As part of our project, we created an Integrated Development Environment (IDE) for creating Web services. Composed services are designed according to a multistage composition process that separates functional requirements from non-functional requirements. Our goal was to make the IDE easy to use for developers and business analysts alike, without burdening them with the underlying complexity of different technologies.

Author and Year	Title	Remark
Swathi Prathish IEEE 2016	"An intelligent system for online exam monitoring"	This paper presents an idea to eliminate the physical presence of an invigilator during the exam by proposing a multi-modal system. The system uses hardware like webcam to record video and inbuilt microphone to record audio along with the window capture of the screen. The combination of this makes the inputs to rule based model that have the ability to determine whether any unfair means are performed. The candidate's face is recognized and facial feature points are extracted thereby predicting the pose of the head. Malpractice is detected based on change in jaw angle. The system is also tested in a scenario of online education and was able to make proctoring easy. Study results have shown this system outperformed the existing solutions.

Susithra V IEEE 2021	"Detection of Anomalous Behavior in Online Exam towards Automated Proctoring"	In this paper, we develop a model meant to distinguish between normal examples and examples with activities of concern, such as conversation during an online test. Existing systems rely more on computation and are slower. Despite the fact that 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.

IV. CONCLUSION

This paper proposes and develops a web application for online automated proctoring. It helps to ensure fairness in examinations and so preserves their integrity. Using an automated monitoring system that includes video, audio, and the ability to monitor multiple students at once, the researchers demonstrate how to combat online exam cheating in this study. However, it may also be possible for the student to converse with the person behind the laptop by reading the question. This may be achieved by equipping the classroom with a 360-degree camera monitoring the entire room.

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