



Online Proctoring System “ProctR”

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ABSTRACT—

An online proctoring system is described in this abstract to protect the validity of online exams. To verify test takers, observe their behavior, and identify cheating, the system combines computer vision and artificial intelligence. Facial recognition confirms identity, and ongoing webcam and microphone surveillance records audio and video to detect wrongdoing. Keyboard analysis, screen recording, and browser lockdown are a few features that improve security. By comparing comments with preexisting information, the algorithm can potentially identify plagiarism. Data is encrypted, privacy is guaranteed, and it complies with data protection laws. To uphold academic integrity during remote examinations, a reliable option is offered by the online proctoring system.

I. INTRODUCTION

An innovative technological solution called online proctoring was created to guarantee the security and reliability of online exams. The necessity for secure online testing has grown in importance as online learning and remote education gain more and more traction. Systems for online proctoring use software and hardware to track and record student behavior during an online exam. The technology records the student's desktop actions, camera feed, and audio stream, among other features of their exam-taking setting. Different types of monitoring are available with online proctoring systems, including live proctoring, automated proctoring, and a combination of both.

While automated proctoring makes use of AI algorithms to identify and flag suspicious behavior, live proctoring involves a human proctor who watches the student's activity in real-time.

To maintain a safe and fair testing environment, online proctoring systems frequently provide capabilities like facial recognition, keystroke analysis, browser lockdown, and lockdown browser. Online proctoring, which aids in preventing cheating and ensuring the validity of exam results, is a crucial tool for conducting safe and dependable online exams.

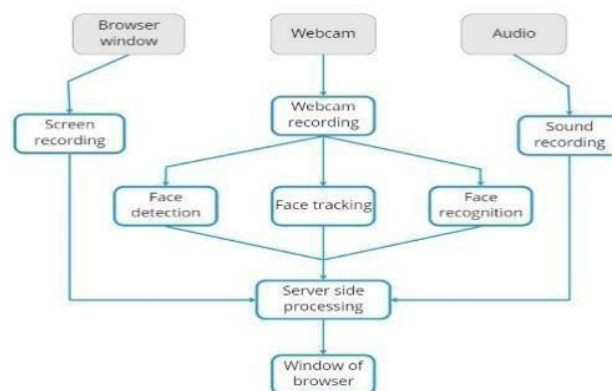


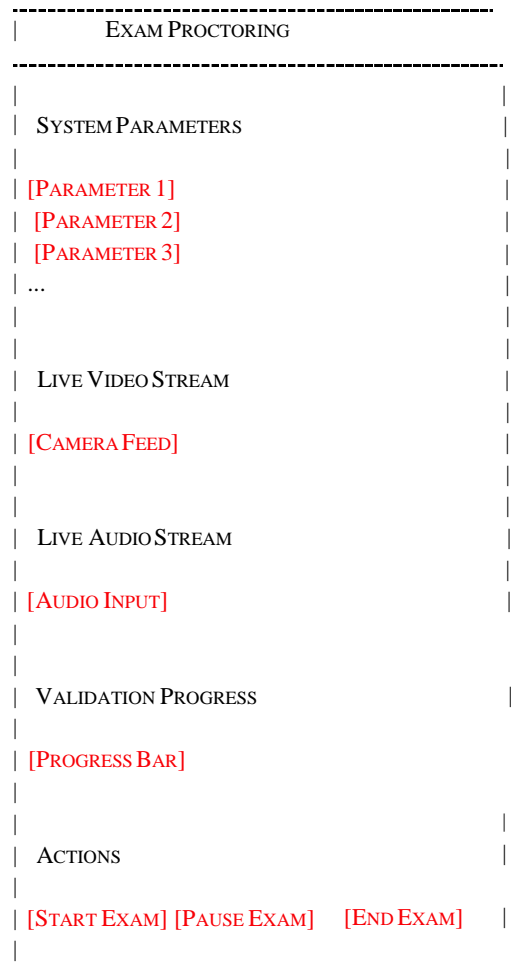
Fig 1. Online Proctoring System Architecture

II. LITERATURE SURVEY

Due to the rising popularity of remote learning and online exams, online proctoring solutions have recently received a lot of attention and implementation. The following are some important advances and trends in online proctoring systems.

Increased Accessibility and Integration: Online proctoring services have been more resolutely integrated into learning management systems (LMS) and assessment platforms, simplifying the implementation and administration of proctored tests for institutions. Both teachers and test-takers benefit from the streamlined experience this integration offers. **Data security and privacy measures:** Online proctoring solutions have put strong privacy and data security protections in place in response to growing privacy concerns. To protect test-takers' personal information, these measures include data encryption, secure storage, and strict adherence to privacy laws.

III. ALGORITHM



IV. DISCUSSIONS AND RESULTS

The use of ML in education is a paradigm change that will make it more creative, interactive, and personalized for group learning, as is abundantly obvious from the research presented here. In outcome-based education for students' professional or career views, ML has proven to be useful in both online and offline learning modes. The academic curriculum has been revised based on the goals of the programmers and courses, and the teaching approach has changed to one of outcome-based education. The prediction serves as the foundation for developing the curriculum for preparing students for and evaluating their performance on student assessments in this outcome-based model. A continual eye on students' progress is required, as is regular assessment.

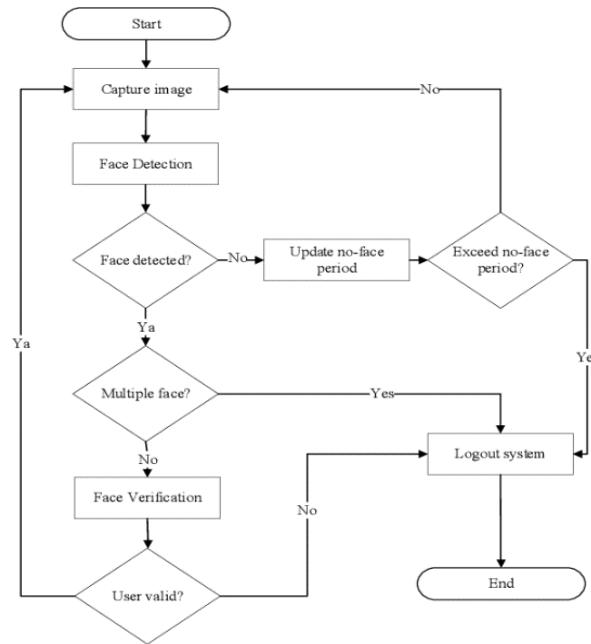


Fig 2. Methodology Flowchart

A. Matplot Graph

If the user is looking right or left, then the value of x-axis changes. If the user is looking left, then it goes to the negative side of zero and if the user looks right then the value goes to the positive side of zero. And similarly, if the user looks up or down then the y-axis value changes. The values of x-axis and y-axis are then passed through an algorithm which checks whether it goes above the threshold then it changes the flag.

Previous Cheat	X axis	Y axis	Audio cheat	Final Cheat Percentage
0	0	0	0	0
0	0	0	1	0.2
0	0	1	0	0.2
0	0	1	1	0.4
0	1	0	0	0.1
0	1	0	1	0.4
0	1	1	0	0.15
0	1	1	1	0.25
1	0	0	0	0
1	0	0	1	0.55
1	0	1	0	0.55
1	0	1	1	0.85
1	1	0	0	0.6
1	1	0	1	0.85
1	1	1	0	0.5
1	1	1	1	0.85

Fig 3. Weightages for conditional algorithm

B. Head Pose

The best technique for supervisors to detect anomalous behavior is to look where the examinee is looking; in this project, we apply the same principle to detect the direction/angle of the examinee's head. The main problem is the computer vision algorithm used to detect the face using picture data as well as head direction; such algorithms typically require significant quantities of training data as well as discrete graphic hardware to function well. We address this issue by utilizing third- party open-source algorithms from Google's MediaPipe library, which is designed to work on low-end devices with comparable precision. The MediaPipe library gives precise face landmarks, which are then processed by the Perspective-n-Points method, which is built with the help of an open computer vision library, to provide the user's head's 3D orientation.

C. Audio Detection

Speech is one of the communication methods that can be used to get exam help. We suppose that the examinee is sitting alone in a quiet environment. The major issue in speech detection is false identification; because there is bound to be some form of sound in the surroundings, determining whether it is aid or not-support is difficult. We addressed this issue with our in-house audio processing algorithm. It detects amplitude variations in background noise. It detects the frequency of amplitude changes relative to the idle noise value to determine whether the examinee or his accomplice is speaking.

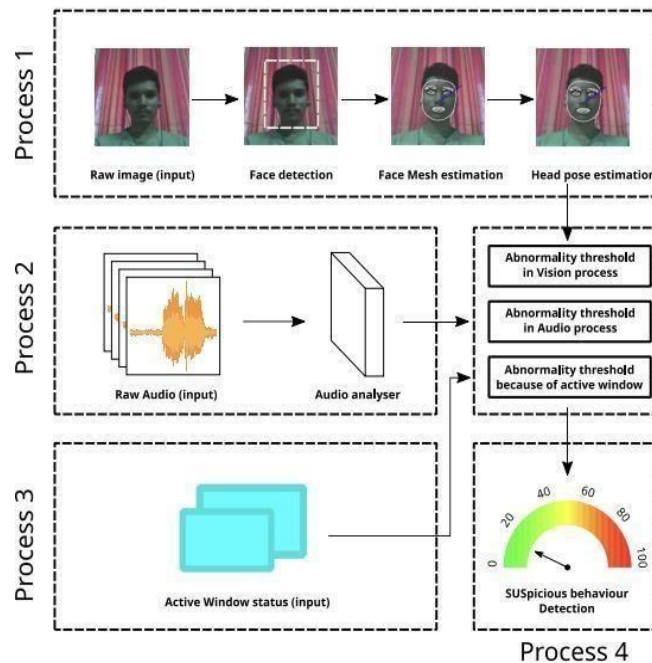
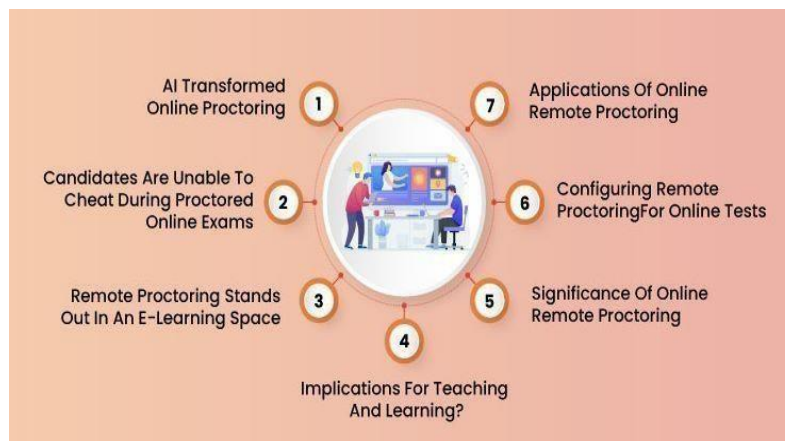


Fig 4. Process Diagram

D. Benefits of Online Proctoring

- a. **Improved Test Integrity:** Online proctoring solutions inhibit cheating attempts by providing robust monitoring and detection capabilities, ensuring exam integrity.
- b. **Flexibility for Remote Learning:** With online proctoring, students can take examinations from anywhere, reducing the need for physical presence and providing greater scheduling flexibility.
- c. **Cost and Time Efficiency:** Online proctoring eliminates the need for physical exam centers, lowering costs related to logistics, infrastructure, and travel. It also saves time for both students and institutions.
- d. **Scalability:** Because online proctoring systems can manage multiple test takers at the same time, they are ideal for institutions with a high volume of tests.



E. Challenges and Considerations

- a. **Privacy Concerns:** The use of webcams and microphones for continuous monitoring raises privacy concerns, requiring institutions to ensure data protection and comply with privacy regulations.

- b.* Technical Issues: Students may encounter technical difficulties during exams, such as internet connectivity problems or software compatibility issues. Institutions must provide adequate support to address these challenges.
- c.* False Positives: Automated behavior analysis algorithms may produce false positives, flagging innocent behavior as suspicious. A human proctor should review such cases to avoid unfair penalization.
- d.* System Requirements and Compatibility: Students must often meet hardware and software requirements when using online proctoring systems. These prerequisites can be difficult for students who do not have access to the appropriate equipment or who have device compatibility concerns.

F. Result

The student first logs in to the proctor application/platform, enters the Examination ID, then is redirected to the exam portal.

The proctor API then checks all the hardware and software pre-requisites on the student's device. The student verifies their identity using ID proof. Once verified, the proctor API asks permission to take over the student's device. After the access is granted the proctor API now has access to the student's screen, browser, camera feed and audio feed. When the examination begins, the proctor API enables a browser lockdown, which restricts the student from accessing any other applications. It also applies a script lock, where the address bar is locked, and no other tabs can be opened. The proctor has access to the webcam.

Here it analyzes the head position of the student. It also detects audio disturbances and speech. The valuation is done based on Cheat Probability v/s Time Graph, where student suspicious activity is compared against time and if the limit exceeds 8.0, the student is then flagged. The invigilator will then personally check for suspicious activity and then will take the necessary actions.

V. CONCLUSION AND FUTURE SCOPE

Because of the epidemic and the requirement for people to perform online examinations, this system is one of the most frequently addressed topics. Using video and audio output, this system attempted to detect whether the user was displaying questionable paper. We used multiple machine learning techniques for head posture detections while developing the system, and we successfully performed headpose estimation using computer vision as well as voice detection utilizing a microphone. We successfully designed a system that can detect suspicious behavior and is lightweight and resource efficient.

Over the last decade, educational institutions and corporate organizations throughout the world have increasingly begun to employ online proctoring software to conduct distant tests in a fair manner and to ensure that applicants took the exam in a known environment. Because of the COVID-19 Pandemic, it has become critical to use remote proctoring services to administer flawless tests while also guaranteeing that candidates do not commit malpractice during these online exams. 2020 (Remote Proctoring). There are various advantages for any organization that conducts any examination using remote proctoring rather than the traditional pen-and-paper method.

Exam scheduling becomes easy because no specific testing centers are required to administer examinations. Communication between the examiner and the examinee is more efficient, painless, and quick. Examination results can be generated more quickly and, in some situations, nearly instantly. Online examinations also allow the organization to conduct the exam on a large scale without worrying about filling up the testing centers. (Arora, 2021). However, a concerted effort must be made to develop proctoring technologies that ensure the level of online examinations is on par with offline examinations in all respects, including the integrity of marks scored, ensuring applicants do not engage in wrongdoing.

The public's social opinion of online exams must also be modified, and they must be made aware of the benefits of doing so. The difficulties raised above must be addressed using existing technology while creating an AI-based proctoring system. Technology advancement will undoubtedly benefit the construction of more robust and secure systems, but in order to meet the growing demand for this software, a concerted effort must be made to help existing technologies in minimizing the challenges that present. (Pimple, 2021). Any proctoring software must correctly identify the individual administering the examination.

Impersonation is a major danger to the integrity of online exams; hence several approaches are being used to ensure that the designated person is the one administering the exam. Every candidate is asked to give some personal information or proof of identity, which is then validated before the candidate is allowed to advance. Certain systems have begun to use biometric identification by fingerprints via the fingerprint scanner, which is now widely available on mobile phones and PCs.

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