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REMOTE ONLINE PROCTORING SYSTEM

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Abstract:

The project's aim is to create a secure and user-friendly environment for students who don't have access to a campus to take tests online from a variety of places. The research uses a variety of machine learning models to relieve the administrative load of detecting student misconduct on a wide scale. The model verifies and authenticates the applicants taking the test, and it checks for any irregularities on a regular basis. This is achieved by identifying video and audio that the model analyses in order to verify the student's honesty. The system's continuous analysis of the inputs allows it to verify the candidate's honesty, guaranteeing academic integrity in e-learning. From the viewpoint of the test taker, the system is both economical and simple to use, as it simply involves the usage of inexpensive web cameras and a microphone. User verification, audio processing, gaze detection, number of person detection, item and phone detection are the five main components that continually evaluate the essential behaviour clues. We create higher-level features to classify if the test taker is cheating at any point throughout the exam by merging the continuous estimate components and using a temporal sliding window.

Index Terms - Remote Proctoring, Face Detection, Object Detection, Audio Conversion

I.INTRODUCTION

The use of e-learning or other remote education continues to increase due to its ability to reach people who don't have access to campus. Exams are important components of educational programs as well as on an online learning program. Conducting exams gives the institution a very brief perspective about the delivery of knowledge to their students irrespective of the medium of interaction, be it offline or online mode. In an exam, a proctoring method is employed to detect and reduce the malpractices involved. It turns out to be very important so that the examiner can ensure that the students have learned the material given and try to grasp the knowledge delivered to them to their potential. Various methods had been proposed to provide an efficient, effective and comfortable online exam proctoring. A visual verification for the whole exam session is needed in an online exam, therefore a face verification is needed. This is to ensure that the examinee is a legit candidate who has enrolled himself/herself for the process of examination with the organisation. The visual verification part will have to deal with detecting the person who has enrolled for taking the examination. For implementing this part we utilize image capturing techniques to capture the image of the candidate. Secondly, the system employs fragments of alternative algorithms which work on the audio which is being captured using the microphone of the connected device(s). The audio feed will serve as an input for voice processing algorithms which constantly monitor the examination environment. This constant monitoring allows us to use the input data to process accordingly with the help of various algorithms to detect and notify if any kind of verbal malpractice methods are being employed. The system uses specific input references to cross check within its permissible limits to classify any act as indictable. Moreover, there are some other methods which are employed within the system framework that can detect any anomalies in the examination environment. The visual verification module constantly looks out for multiple persons' presence and/or electronic gadgets within the candidates' vicinity. The system is also designed to notify the examiner about the working nodes in the environment which may or may not be a part of a suspicious act. Unlike generic systems which require the presence of an examiner for the whole process, this system employs

automated algorithms which process input information and produce a detailed analytical output which can be inspected even after the commencement of the examination. This allows the organisation to be in full control of the entire operation with the help of the automated processing taking place within modules of the system to run a smooth, effective and efficient examination process in which the candidates can be examined thoroughly.

II. EXISTING SYSTEM

Online remote proctoring is the act of invigilating an online exam from any location to eliminate aberrant behavior. It is administered by experienced human proctors, by an AI Algorithm, or both, to maintain the examination process's integrity. The ability to efficiently proctor remote online examinations is an important limiting factor to the scalability of this next stage in education. Presently, human proctoring is the most common approach of evaluation, by either requiring the test taker to visit an examination center, or by monitoring them visually and acoustically during exams via a webcam. However, such methods are labor-intensive and costly. So, a multimedia analytics system that performs automatic online exam proctoring was presented. The system comprises various modules which may include hardware components such as a webcam, and a microphone, for the purpose of monitoring the visual and acoustic environment of the testing location. The system also employs software modules which continuously estimate the key behavior cues. These modules employ user verification, active window detection, gaze estimation and phone detection to process the examination process and prevent malpractices. By combining the continuous estimation components, and applying a temporal sliding window, and higher level features to classify whether the test taker is cheating at any moment during the exam can be easily determined.

2.1 USER VERIFICATION

An OEP system continuously verifies whether the test taker is who he claims to be throughout the entire exam session. The test taker is also expected to take the exam alone without the aid of another person in the room. While there are various options for continuous user authentication, such as keystroke dynamics, commonly face verification is used due to its robustness.

2.2 ACTIVE WINDOW DETECTION

The Internet and computers are an open gateway to valuable information answering exam questions. Commonly Blackboard's Respondus Lockdown Browser (RLB) is used to access the online exam. RLB is a special browser where the test taker is locked into the exam and has no way to exit/return, cut/paste, or electronically manipulate the system. However, some exams might require Internet access to some specific websites, or perhaps the use of e-mail or chat functions. Moreover, some test takers might have saved files and documents on the computer containing answers to the exam. Therefore, it is critical to keep track of how many windows the test taker is opening. So, the user is granted full Internet and computer access during the exam. Periodic estimation of the number of active windows running in the system is obtained from the operational system API. Most of the time, there should be only one active window, which is the online exam itself. If there are more than one window open at a specific time t during the exam, the system assumes that the test taker is cheating, and a warning will be displayed on the monitor requesting an immediate shutdown of the opened window. The probability of cheating increases as the test taker keeps the unexpected window opened longer. Since this component relies on the operational system API, the accuracy of active window detection is 100%.

2.3 GAZE ESTIMATION

In traditional classroom-based proctoring, the abnormal head gaze direction and its dynamics over time can be a strong indicator of potential cheating. An abnormal gaze is when the test taker's eyes are off the screen for an extended period of time, or if the head quickly gazes around a few times. Although abnormal gaze does not directly constitute cheating behavior, it is an important cue to suggest the potential subsequent cheating actions. As a classic computer vision problem, head gaze estimation is a particularly challenging problem in any application due to the spontaneous head motion of the test taker as well as the partial occlusion by the cameras. To address this issue, algorithms that use various visual sensors to enhance head gaze estimation are

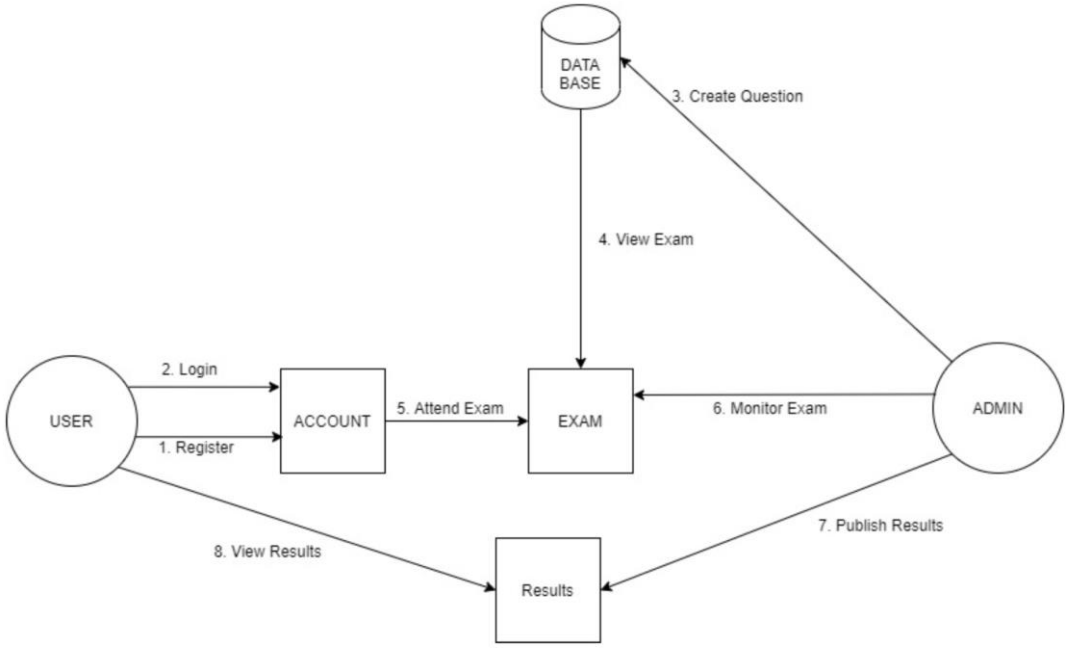
implemented. From the webcam, we may estimate the gaze from the face in the video frame. By combining the information from the cameras, accurate estimates of the head gaze of the test taker in a wide range of yaw and pitch angles are obtained.

2.4 PHONE DETECTION

Most online exam rules prohibit the use of any type of mobile phones. Therefore, the presence of a mobile phone in the examination environment can be an indication of potential cheating. With advancements in mobile phone technology, there are many ways to cheat from them, such as reading saved notes, text messaging friends, browsing the Internet, and taking a snapshot of the exam to share with other test takers. Phone detection is challenging due to the various sizes, models and shapes of phones (a tablet could also be considered a type of phone). Some test takers might have large touch screens while others might use button-based flip phones. Moreover, cheating from a phone is usually accompanied with various occlusions, such as holding the phone under the desk, or covering part of the phone with their hand. To enable this capability, the video captured from the wearcam is utilized, since it sees what the test taker is seeing. The phone detection is based on a simple approach, i.e., searching for pixels that are brighter than the background pixels. The motivation of using the screen's brightness over detecting the phone object, is that the system shouldn't claim there is phone-based cheating behavior unless the phone is switched on. So, the estimated phone screen is represented by using the area of the local region.

III. PROPOSED SYSTEM

This system presents a multimedia analytics system for remote online exam proctoring, which aims to maintain academic integrity in e-learning. The system is affordable and convenient to use from the test taker's perspective, since it only requires having inexpensive web cameras and a microphone. These features are then processed in a temporal window to acquire high-level features, and then are used for cheat detection. The main contribution of this work is to present a comprehensive framework for remote online exam proctoring. While we have achieved good performance in our evaluation, our framework can certainly be improved in a number of ways. For the basic components, we can either apply more advanced algorithms for each component, such as the deep learning-based feature representation, typing-based continuous authentication, face alignment-based pose estimation, upper body alignment, and model personalization. We may also expand the array of basic components, to include additional components such as pen detection. For cheat classification, we can explore temporal-spatial dynamic features, similar to the work in video-based activity recognition. Moreover, the system efficiency can also be improved while maintaining a high accuracy in recognizing cheat events, by selecting more suitable features and classifiers, as well as selecting a smaller number of frames instead of utilizing all frames. Apart from the basic components and the inherited components from different use cases this system implements novel modules such as: user verification, audio processing, gaze detection, number of person detection, object and phone detection.



3.1 USER VERIFICATION

In this module, the system continuously verifies whether the test taker is who he claims to be throughout the entire exam session. It is implemented by the use of face_recognition algorithm from opencv which uses feed from the web camera to process the data and determine whether the candidate enrolled is the same as the one taking the examination at any given point of time. The test taker is also expected to take the exam alone without the aid of another person in the room. Implementation for the same, is explained in the next module.

3.2 NUMBER OF PERSON DETECTION

In any kind of examination, the test taker is expected to take the exam alone without the aid of another person in the room. So, the system uses the input video feed from the web camera to verify whether there is any other persons' presence in the examination environment. Most probably, the candidates' environment will be any confined spot in a room. So, the frame for reference of verification of any other persons' persence will have to be set within a specific spot. The module makes sure that this processing of input data follows the specified algorithms. YoloV3 from Keras TensorFlow is an algorithm implemented in this module.

3.3 OBJECT AND PHONE DETECTION

The presence of any kind of mobile phones in the examination environment can be an indication of potential cheating. With advancements in mobile phone technology, there are many ways to cheat from them, such as reading saved notes, text messaging friends, browsing the Internet, and taking a snapshot of the exam to share with other test takers. This is to be prevented effectively because most of the malpractice techniques involve mobile phones. So, by implementing YoloV3 from Keras TensorFlow algorithm the system achieves at most robustness for this use case.

3.4 GAZE DETECTION

Any abnormal head gaze in any inappropriate direction with context to its dynamics over time can be a strong indicator of potential cheating. An abnormal gaze is when the test taker's eyes are off the screen for an extended period of time, or if the head quickly gazes around a few times. Although abnormal gaze does not directly constitute cheating behavior, it is an important cue to suggest the potential subsequent cheating actions. Head gaze estimation is a particularly challenging problem in any application involving classic computer vision due to the spontaneity in the head motion of the test taker as well as the partial occlusion by the cameras. This issue is addressed by implementing algorithms which will be imported from Keras TensorFlow and Computer vision.

From the webcam, we may estimate the gaze from the face in the video frame by combining the information from the cameras, accurate estimates of the head gaze of the test taker in a wide range of yaw and pitch angles are obtained.

3.5 AUDIO PROCESSING

One of the most likely fraudulent behaviors in online exams is to seek verbal assistance from another person in the same room, or remotely via a phone call. This is the most frequent cheating behavior. By requiring the test taker to take the exam in a quiet room with no one around, any human speech being detected could be considered a potential cheating instance. Therefore, the module uses Natural Language Processing Toolkits in this component to detect speech from acoustic signals. This module predominantly employs keywords based identification to detect potential instances of fraudulent behaviour.

IV. APPLICATIONS

4.1 E-Learning:

eLearning, or electronic learning, is the delivery of learning and training through digital resources. Although eLearning is based on formalized learning, it is provided through electronic devices such as computers, tablets and even cellular phones that are connected to the internet. This makes it easy for users to learn anytime, anywhere, with few, if any, restrictions. Basically, eLearning is training, learning, or education delivered online through a computer or any other digital device.

4.2 Distance Education:

Distance education, also called distance learning, is the education of students who may not always be physically present at a school. Traditionally, this usually involved correspondence courses wherein the student corresponded with the school via mail. Today, it involves online education.

4.3 Assessment:

Educational assessment is the systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programs and improve student learning. Assessment data can be obtained from directly examining student work to assess the achievement of learning outcomes or can be based on data from which one can make inferences about learning. Assessment can focus on the individual learner, the learning community, a course, an academic program, the institution, or the educational system as a whole. It uses real time remote proctoring methods to effectively conduct examinations for candidates.

IV. FUTURE ENHANCEMENTS

Working in non-ideal conditions:

Any non-ideal conditions such as low quality web cameras or microphones being used can be negated by using advanced processing algorithms.

Bad Network Connections:

If the candidates' network quality is poor, any method to employ offline assessments has to be automatically run so that the transition is smooth so that the assessee does not face any hindrances.

Ui/Ux Enhancements:

Enhancements can be made to the front-end UI so that the candidates can have a more pleasant experience.

Scalability:

Further advancements to accommodate even more number of candidates to assess simultaneously can be implemented.

V. CONCLUSION

Thus, the aim is to provide a safe and user-friendly environment to take exams from a remote location with a better machine learning model to proctor the examination and to prevent students from malpractices. By combining the continuous estimation components, and applying a temporal sliding window, we design higher-level features to classify whether the test taker is cheating at any moment during the exam.

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