Online Examination Proctoring System Using Artificial Intelligence

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Abstract*—The scalability of the next level of education is significantly constrained by the capacity to effectively proctor distant online exams. The most popular method of evaluation at the moment is human proctoring, which involves either requiring test-takers to go to a testing facility or watching them on a webcam visually and audibly while they complete the exam. Monitoring student attendance is crucial in online learning because student presence contributes to effective teaching and learning assessments. However, these techniques are expensive and labor-intensive. Additionally, there is a growing movement towards Online Courses, which allow students to enrol in courses that will broaden their knowledge and creative potential. *Instead of traditional classroom teaching a student can take a course from anywhere in the world using a computer. The certificates for Online Courses should be provided after the student gives a proctored examination. Hence some kind of online portals are needed for a trustworthy proctoring of online examination Our portal will help in automating the proctoring the online examinations. This portal will track the exam givers – eye ball movement, lip movement, audio tracking, phone detection, person counting.

Keywords—Proctoring System, Convolutional Neural Network(CNN), Online Examination System, Remote Proctoring

I. INTRODUCTION

Any program of studies must have exams, and online learning programmes are no different. Every exam has a tendency for cheating, hence its recognition and avoidance are crucial. For educational qualifications to remain valuable to the community, they must demonstrate true learning..To protect the integrity of the assessment process, traditional exams and tests must still be taken in supervised settings, within designated exam hall, with physical examiner present. As a result, both the institution and the candidate are forced to choose an expensive model. While some students may find this to be less of an issue because they are physically present in class, an increasing portion of the industry is focused on the remote offering of every course. In many cases, even if their professors may be thousands of miles away, students still must make their way to testing facilities to take their tests.

In accordance to a report by UNESCO Instructional Distortion and Reaction to the pandemic of COVID-19, a large number of governing bodies globally are shutting down educational organisations and considerably moving their activities to online and mobile modality, which will effect more than 89% of the global population of students.The models that are used for proctoring are still very important, as is the level of evaluation done to stop mistakes in remote settings. This study contains high-level similarities of flagging, removing, and detecting anomalous activity in addition to strengthening false positives till notable accuracy is attained. While this kind of system supports the use of numerous recognition processes, including those for facial detection, Sound detection, Eyeball movements recognition, Change of tabs detection, Device finding, and others, it is frequently the case that any or all of these mechanisms, when combined, can improve the equality of an investigation, give it greater trust and honesty, and assist in avoiding not being repudiated.

What does Remote Proctoring mean?

This refers to the procedure utilised to proctor, or watch over, applicants while they take an online test. Those who are in charge of this process can monitor the applicants from anywhere in the world thanks to technologies.

This procedure is meant to deter candidates from using fraud or other unethical tactics when taking an online exam.Remote proctoring is one of the methods that might be utilised to prevent cheating or any other malpractice when giving assessments online.

Fig.1. Online Proctoring System

II. LITERATURE SURVEY

There is an additional proctoring check in [1] by Yousef Atoum that uses a mechanism for analysing multimedia content that speech, phone, and gaze detection. To make gaze recognition easier, wear cam has also been utilised in conjunction with webcam. The employment of a webcam and a gaze cam in sync allows for a real-time checking what the user sees twice. As a consequence of eliminating incorrect results and instances of cheating that have been proven, the cheat recognition mechanism in this situation integrates a number of variables and flags used by the user in the event of entropy across multiple utilised processes, such as sound detection, missing legitimate gaze detection, and various other characteristics. Using a binary SVM classifier, the audio wavelength is divided into 16 separate pathways, and voice is considered an optimistic sample.

The Face Settlement problem for a single image in [2] by Vahid Kazemi and Josephine Sullivan is the main topic of the theory. It shows how an ensemble of trees of regression can be utilised to execute with great projections to determine the facial milestone positions or milestones from a poor portion of pixel powers. They offer a basic framework for learning a set of relapse trees based on inclination boosting that minimises square damages and efficiently manages lost or ambiguous data. They use visual data to show how applying fitting priors facilitates making wise component decisions.

A practical concept for enabling mobile and digital proctoring while student examination is presented in the paper [3] by N.L. Clarke and P. Dowland. Throughout the course of the exam, the approach employs transparency identification to give a constant, unobtrusive identification of the student's existence. An examination of the platform's innovation is used to create a model, which shows how successful this strategy is.

A novel strategy is used in [6] by AsepHadian S. G and Yoanes Bandung, in which user identification is given significant priority on a constant scale. The CNNs are trained to recognise the user in situations with low light and in general using a big collection of user photos. By using classifiers that highlight characteristics that have to undergo not linear mapping, the CNN has been able to learn the values. The system accuracy rate is determined at the last assessment stage using the false acceptance rate and false rejection rate from the confirmation procedure.

The focus of [7] by Aiman Kiun is on the use of Convolutional Neural Networks for identifying fraudulent activity in video clips of exams. The image filtering employed models depended upon utilisation of Rectified activation units , which in turn displayed outstanding outcomes for large scale data sets. A user interface, video manipulation, and image categorization made up their framework.Unavoidably, the interface will upload the students' exam-taking video into a pipeline that includes a number of steps. The enormous recorded would be condensed into a small number of minimalism images, and several duplicate or similar-looking frames would be deleted since the applicant images were already included in the examining collection. This would lessen the workload of the proctoring setup.

III. METHODOLOGY

This part contains the methodology, which explains how the study was conducted in order to perform comparative analysis. The objective of this effort is to develop an electronic multimedia assessment system that can spot various forms of exam-taking fraud..Our recommended online exam method consists of two steps: the preparatory phase and the actual test phase. Before beginning the exam, the test-taker must verify himself using a password and face recognition during the preparatory stage. To make sure that all of the sensors are connected and operating correctly, this phase also includes calibration procedures.Also, the test taker is taught and verbally agrees to the Online Exam Proctoringsystem's regulations, which include things like not letting anybody else use the room while the exam is still in progress.The person taking the test completes the assessment during the examination phase while being continuously "monitored" by our online examination proctoring system, which allows in the identification of fraudulent activity in immediately.

A. Flow Chart of Proposed Methodology

Below is a brief summary of the suggested methodology. The online examination process is started first by the exam proctoring system. To begin the test, the student or test-taker logs into the system using their login and password. At student registration, the test-face taker's is already stored in the database. Facial recognition technology is used by the system to confirm each student's identification. If the student's face matches, they are allowed to take the exam; otherwise, they are not. When our proctored system begins functioning, if a student commits an error, the system warns them; however, if they receive more than four warnings, the student is removed from the exam

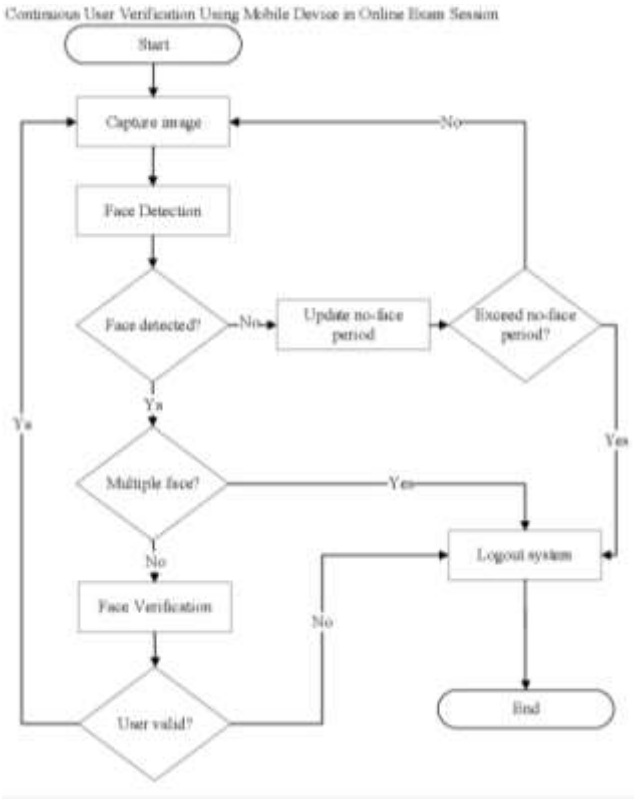

Fig. 2. Flowchart for Proposed Methodology

B. Algorithm

A type of neural network having convolutional layers is a convolutional neural network. Convolutional layers and pooling layers are the two main types of hidden layers found in CNNs, and they are typically stacked alternately in neural networks. In a manner similar to neural networks in biological systems, convolutional neural network capacity to spread connection weights over the whole neural network not only enables a reduction of link costs on the whole, but also lessens the complexity of the network model. As a result, convolutional neural network training period can typically be drastically reduced. In particular, a picture can be simply fed into a CNN rather than having to go through the laborious processes of feature extraction and data reconstruction.

1) Activation Function:The effectiveness of a neural network is also closely correlated with the accepted activation function, that is often selected as a nonlinear function in order to handle some complicated situations. Three frequently utilised activation functions in CNN are the sigmoid, hyperbolic tangent (tanh), and rectified linear units (ReLU), and they may be described as follows.

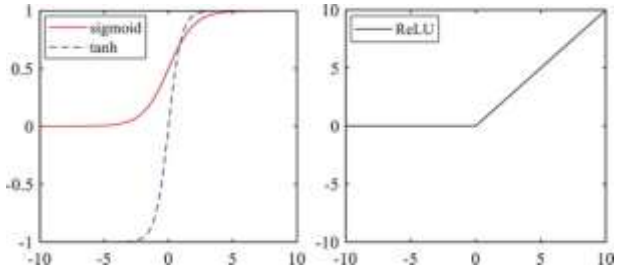

Fig. 3. Activation Functions

2) Back Propagation Algorithm: The back propagation (BP) method is one of the many widely used techniques for training neural networks. A nonlinear optimising problem of linking values underlies the transformation of both the input and the output data. The gradient descent of BP technique may be used to iteratively modify the weights for connection of a neural network by lowering the mean square error in the actual and predicted values of the output.

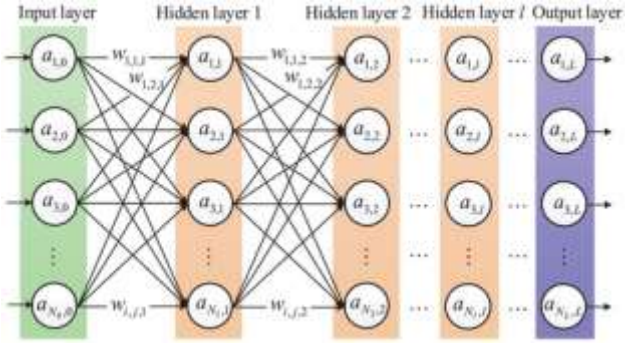

Fig. 4. Structure of Neural Network

3) Convolution Operation: In image processing is a type of computation operation that is frequently applied. Three modes—Full, Same, and Valid—that can be used in various contexts—can be created from the convolutional result. For instance, Valid mode is typically utilised in forward propagation to facilitate the extraction of image features, while Full mode is usually utilised in back propagation algorithm to obtain the optimal values. The quantity of the edge layer is determined by the measurement of the convolution kernel in the convolution process known as "edge zeroing," which is applied to the input picture. Edge zeroing is used to ensure that the results are logical, meaning that the convolution kernel and the image's input components may be gradually weighted and combined. As shown in Fig. 5, the convolution kernel's shape should be flipped up and down while it is really rotating around 180 degrees about the centre.

It's crucial to remember that convolutional processes have the ability to do sparse multiplication and parameter sharing, that can minimise the dimension of the input data. CNN doesn't require the link values be given separately for

every neuron in its input data, in contrast to DNN. In fact, because it is a widely used extraction of features method, CNN is equivalent to the majority of neural networks used for feature extraction.

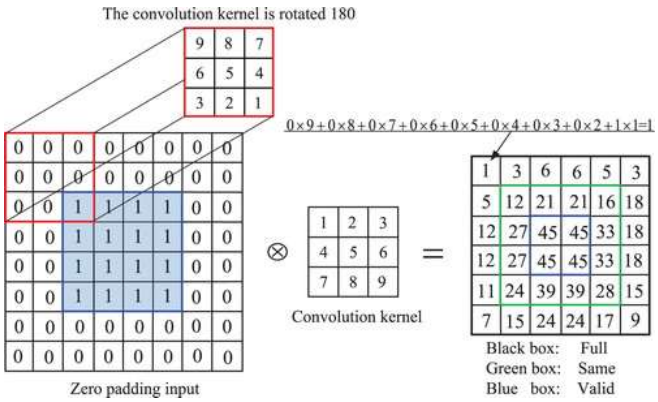

Fig. 5. Convolution Operation

4) Pooling: The pooling layers, that are frequently positioned after the convolutional layers, are largely used to compress the resultant information regarding features that results from the convolutional layers. The pooling layer's superior outputs can reduce the likelihood of excessive fitting in the neural network's model.Moreover, a pooling technique can be used to further extract an image's feature without affecting how the image's information was acquired.

Additionally, there are several forms of pooling, including mean pooling, maximum pooling, overlapping pooling, stochastic pooling, and global average pooling. In essence, pooling is a minimised procedure of the picture. Mean-pooling may obtain the median amount of the points of feature with the effect of keeping a comparable background, in opposition to max-pooling, which could capture the highest possible number of the characteristic points and provide greater textured extraction. The output of the mean-pooling is a characteristic mapped with a value of $2\times22\times2$ when a characteristic mapped had a value of $4\times44\times4$is obtained by sampling using a kernel that corresponds to that size.

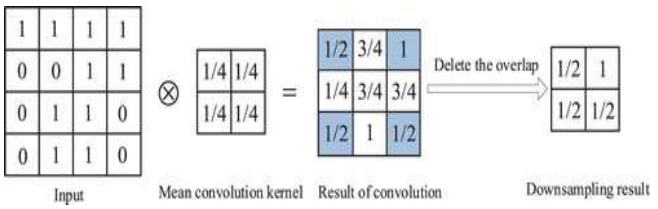

Fig.6. Pooling Operation

IV. Conclusion and Discussions

Systems for proctoring online tests have the potential to completely change how exams are given and tracked. The system can validate the identity of the test-taker and track their behaviour during the examination with the use of artificial intelligence. It can also identify and prevent cheating. In addition to ensuring that the results correctly represent the test-takers' skills and understanding, this can improve the exam's reputation and integrity. The privacy, fairness, and reliability issues with AI-based proctoring systems must be addressed, though.

AI-based online exam proctoring solutions have grown in acceptance in the past few years as remote education and online assessments become more prevalent. These systems watch the test subjects and look for any unusual behaviour using a number of AI technologies, including facial recognition, voice recognition, eye tracking, and keystroke analysis. Speedy evaluation, decreased cheating, and increased test security are all advantages of AI-based proctoring systems.

The impartiality, dependability, and privacy of these systems, nevertheless, are also issues. For instance, because of technological problems like a slow internet connection or mismatched technology, certain learners may receive unjust punishment. The correctness of the AI algorithms, which may be biassed or prone to mistakes, might also have an impact on the dependability of Intelligence-based proctoring systems.

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