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Smart-Artificial Intelligence Based Online Proctoring System

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***Abstract*:**

Since COVID 19, there have been significant advancements in the field of teaching and learning. Academic institutions are going digital to provide their students more resources. Due to technology, students now have more alternatives to study and improve skills at their own pace. In terms of assessments, there has been a shift toward online tests. The absence of a physical invigilator is perhaps the most significant impediment in online mode. Henceforth, online proctoring services are becoming more popular, and AI-powered proctoring solutions are becoming demanding. In this project, we describe a strategy for avoiding the physical presence of a proctor during the test by developing a multi-modal system. We captured video using a webcam along active window capture. The face of the test taker is identified and analyzed to forecast his emotions. To identify his head pose, his feature points are identified. Furthermore, aspects including a phone, a book, or the presence of another person are detected. This combination of models creates an intelligent rule-based inference system which is capable of determining if any malpractice took place during the examination.

Keywords—deep learning, convolutional neural network, facial expression, inter personal communication

I. INTRODUCTION

Nowadays most educational institutions have been compelled to convert to an online education format, due to the pandemic crisis. Colleges began offering online lessons and assessments for a variety of courses. The COVID-19Pandemic also had an impact on entrance examinations and the recruitment processes, which uses a written test to select candidates. In this context, academic misconduct is on the rise, whether in the form of plagiarism or cheating during the examination. A proctoring system is required to monitor all students, as therearemoremethodsand possibilities for a student to cheat when tests are conducted online.

Even with numerous checks in place, such as the unique way proposed to electronically invigilate students during tests held in remote places, the possibility of a high incidence of fraud in online examinations makes monitoring more difficult. As E-Learning courses become popular, so does the likelihood of a student cheating in tests in a number of ways, such as multi-window surfing, asking peers for answers, and even bringing unethical materials into the examination. There are various proctoring software available to assist instructors in Even with numerous checks inplace, such as the unique way proposed to electronically invigilate students during tests held in remote places, the possibility of a highhanded of fraud in online examinations makes monitoring more difficult. As E-Learning courses become popular, so does the likelihood of a student cheating in tests in a number of ways, such as multi-window surfing, asking peers for answers, and even bringing unethical materials into the examination. There are various proctoring software available to assist instructors in conducting tests online. The usual criteria for taking tests from anywhere is indeed a computer with a camera and an active internet connection. However, they only ensure integrity through the accreditation of professional proctors. But they still continue to bank on the human exam monitoring procedure. As a result, automating the monitoring process while maintaining reliability and low cost is a difficult task that is tackled in this work. Keeping all this in view, we developed a model that:

• Detects face of the examinee.

• Detects the presence Webcam has become a de facto device thanks to the popularity of interactive social networking applications. A human can oftentimes deduce the emotion of a person sitting in front of a webcam to

a certain degree of accuracy. Recent research (in last decade) in video processing and machine learning has demonstrated that human affects can be recognized via webcam video, noticeably via human facial features and eye gaze behaviours .In the publication we will point out our designed and implemented solution, which with the help of a webcam can identify the subject's emotions in real time. When designing and building our system, we encountered many issues that will be described in detail. Of a cell phone, book or any other person that can be used for malpractice.

• Detects head pose, eye-ball and mouth movement of the examinee. Apart from that, the speech from the microphone will be recorded, converted totext, and will also be compared to the text of the question paper to report the number of common words spoken by the test-taker.

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1.1 Objective

Since COVID 19, there have been significant advancements in the field of teaching and learning. Academic institutions are going digital to provide their students more resources. Due to technology, students now have more alternatives to study and improve skills at their own pace. In terms of assessments, there has been a shift toward online tests. The absence of a physical invigilator is perhaps the most significant impediment in online mode. Henceforth, online proctoring services are becoming more popular, and AI-powered proctoring solutions are becoming demanding. In this project, we describe a strategy for avoiding the physical presence of a proctor during the test by developing a multi-modalDue to the current covid situation, it is not possible to conduct paper-based examination. Online examination requires a proctoring system to maintain credibility. An alternative to this is to conduct AI based exam proctoring.

- Physical proctoring of the exam involves invigilator being physically present at the examination center.

- For each batch of 50 students one person is needed to monitor the activities of the exam. This is traditional approach followed by many entities while managing examination process.As a result, the system makes a decision on the users' actions. Fig.1 depicts the block diagram of the mentioned system. The remainder of this section elaborates the following topics: 1) Face Detection 2) Person and Phone Detection 3) Facial Landmarks Detection a) Eye-ball Tracking b) Mouth Movement Tracking c) Head Pose Estimation. As a result, the system makes a decision on the users' actions. Fig.1 depicts the block diagram of the mentioned system. The remainder of this section elaborates the following topics: 1) Face Detection 2) Person and Phone Detection 3) Facial Landmarks Detection a) Eye-ball Tracking b) Mouth Movement Tracking c) Head Pose Estimation

1.2. Machine Learning

Machine Learning is a field of Artificial Intelligence which enables PC frameworks to learn and improve in execution with the assistance of information. It is used to study the construction of algorithms that make predictions on data. Machine learning is used to perform a lot of computing tasks. It is also used to make predictions with the use of computers. Machine learning is sometimes also used to devise complex models. The principle point of machine learning is to permit the PCs to learn things naturally without the assistance of people. Machine learning is very useful and is widely used around the whole world. The process of machine learning involves providing data and then training the computers by building machine learning models with the help of various algorithms. Machine learning can be used to make various applications such as face detection application, etc. Machine Learning is a field in software engineering that has changed the way of examining information colossally.

1.3. Python

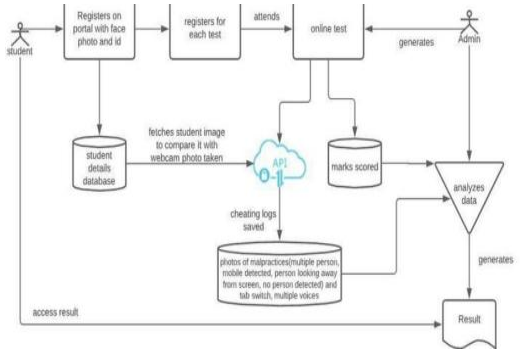
Python is an elevated level programming language for broadly useful programming. It was created by Guido Van Rossum and released in 1991. It enables clear programming on both small and large scales. Python bolsters various programming standards including object arranged, useful and procedural. Python is an easily readable language. It uses english keywords whereas other programming languages use punctuations. Python utilizes whitespace space as opposed to wavy sections to delimit squares. Python was mainly developed to read codes easily. Python supports various libraries such as Pandas, NumPy, SciPy, Matplotlib etc. It supports various packages such as Xlsx Writer and Xl Rd. Python is an exceptionally helpful language for web improvement and programming advancement. It tends to be utilized to make web applications. It very well may be utilized to peruse and alter documents. It very well may be used to perform complex science. Python has gotten a very well-known language since it can chip away at various stages. Python code can be executed when it is composed. Python is a very significant language since the program is updated without investing additional exertion and energy. Python bolsters many working frameworks.

II. LITERATURE REVIEW

Navya Thampan et al. (2024): This paper presents a smart online exam invigilation system that uses AI-based facial detection and recognition algorithms. The system is designed to monitor online exams and ensure the integrity of the assessment process by identifying and preventing potential cheating behaviors.[1]Jadidinejad & Mahmoudi (2023): The authors propose an unsupervised short answer grading approach using spreading activation over an associative network of concepts. This method aims to automate the grading process for short-answer questions, enhancing efficiency and consistency in assessment.[3] Design and implementation of an online self- training system (2023): This study presents the development and implementation of an online self-training system for a computer system platform course. The system aims to enhance students' learning experience and performance through interactive and adaptive online training modules.[4] Aditya Nigam et al. (2021): This systematic review examines AI-based proctoring systems, analyzing their evolution, current state, and future prospects. The authors provide insights into the benefits, challenges, and potential applications of AI-driven proctoring technologies in online education.[5] Vats et al. (2022): This paper introduces a voice- operated examination portal designed for blind individuals. The system leverages voice recognition technology to enable visually impaired students to interact with online exams effectively, promoting inclusivity in educational assessments.[6] Smith et al. (2023): The authors discuss adaptive technologies that enhance accessibility in online education. The paper highlights various tools and strategies that support diverse learners, ensuring equitable access to digital learning resources and assessments.[7]

III. METHODOLOGY

The system design mainly consists of:
1. Image Collection
2. Image Preprocessing
3. Image Segmentation
4. Feature Extraction
5. Training
6. Classification



3.1. Data Collection

Data collection is a crucial phase in this research. The dataset used for training and testing the model should be diverse, representative, and of high quality. The dataset should include a variety of facial expressions, poses, lighting conditions, and individuals to ensure the model's generalizability.

1. Image Collection

Input to proposed system is the real time video. The real time video is captured from theweb cam of the user’s pc or laptop.

2. Image Preprocessing

Goal of pre-processing is an improvement of image data that reduces unwanted distortionsand enhances some image features important for further image processing. Image preprocessing involves three main things

a) Gray scale conversion

b) Noise removal

c) Imageenhancement.

a. Grayscale conversion

Grayscale image contains only brightness information. Each pixel value in grayscaleimage corresponds to an amount or quantity of light. The brightness graduation can bedifferentiated in grayscale image. Grayscale image measures only light intensity 8-bitimage will have brightness variation from 0 to 255 where '0' represents black and '255'represents white. In grayscale conversion color image is converted into grayscale image.Grayscale images are easier and faster to process than coloured images. All imageprocessing technique are applied on grayscale image. In our proposed system coloured orRGB image is converted into grayscale image.

b. Noise Removal

The objective of noise removal is to detect and remove unwanted noise from digital image.The difficulty is in deciding which features of an image are real and which are caused bynoise. Noise is random variations in pixel values. In our proposed system we are usingmedian filter to remove unwanted noise. Median filter is nonlinear filter, it leaves edgesinvariant. Median filter is implemented by sliding window of odd length. Each sample valueis sorted by magnitude, the center most value is median of sample within the window, is afilter output.

c. Image Enhancement

The next step after image pre-processing was to segment the object from the surroundingimage. Since a clear colour distinction existed between the object and the face,thresholding was very suitable for the task. A black and white image was produced with itscontrast adjusted to provide better segmentation.

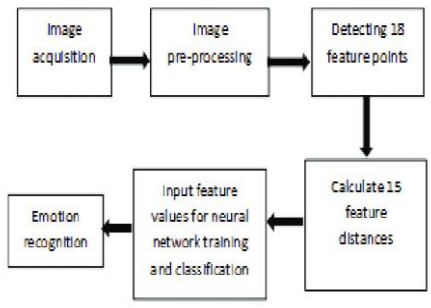
3. Image Segmentation

The next step after image pre-processing was to segment the object from the surroundingimage. Since a clear colour distinction existed between the object and the face,thresholding was very suitable for the task. A black an

3.2 Data Pre-Processing

The collected data needs to be preprocessed before being used for training. This typically involves the following steps:

- **Facial detection:** Identifying the location of the face in each image.
- **Facial landmark detection:** Localizing key points on the face, such as the eyes, nose, mouth, and eyebrows.
- **Normalization:** Aligning and resizing the faces to a standard size and orientation
- **Augmentation:** Creating additional training data by applying random transformations to the images, such as rotation, scaling, and flipping.



3.3 Feature Extraction

Feature extraction involves extracting relevant information from the preprocessed images. This can be achieved using various techniques, such as:

Histogram of Oriented Gradients (HOG): A feature descriptor that captures the distribution of edge orientations in an image.

Local Binary Patterns (LBP): A texture descriptor that compares the intensity of a pixel with its neighbors.

Gabor Wavelets: A set of filters that can capture different spatial frequencies and orientations.

Deep Learning Features: Convolutional Neural Networks (CNNs) can automatically learn discriminative features from the images.

3.4. Model Training

The extracted features are used to train a machine learning or deep learning model. The model learns to map the extracted features to corresponding facial expression labels. Various models can be used, including:

Support Vector Machines (SVM): A supervised learning algorithm that finds a hyperplane to separate different classes.

Random Forest: An ensemble learning method that combines multiple decision trees.

Convolutional Neural Networks (CNN): A deep learning architecture that is well-suited for image classification tasks.

3.5. Model Evaluation

The trained model is evaluated on a separate validation dataset to assess its performance. Metrics such as accuracy, precision, recall, and F1-score can be used to evaluate the model's ability to correctly classify facial expressions.

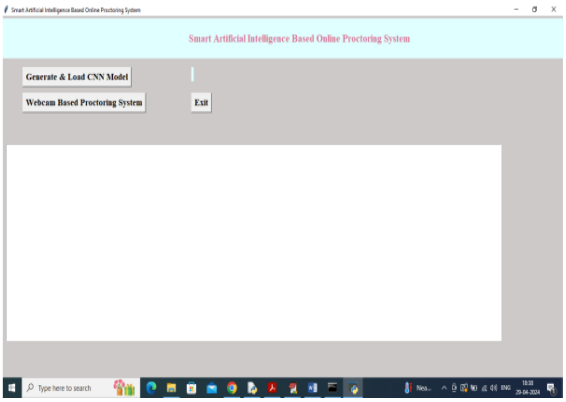
3.6. Real-time Implementation

Once a satisfactory model is obtained, it can be integrated into a real-time system. This involves:

- **Webcam capture:** Capturing frames from a webcam in real time.
- **Preprocessing:** Applying the same preprocessing steps as in training.
- **Feature extraction:** Extracting features from the captured frames.
- **Model prediction:** Using the trained model to predict the facial expression.
- **Visualization:** Displaying the predicted facial expression or other relevant information.

IV .RESULT

To run project double click on 'run.bat' file to get below screen



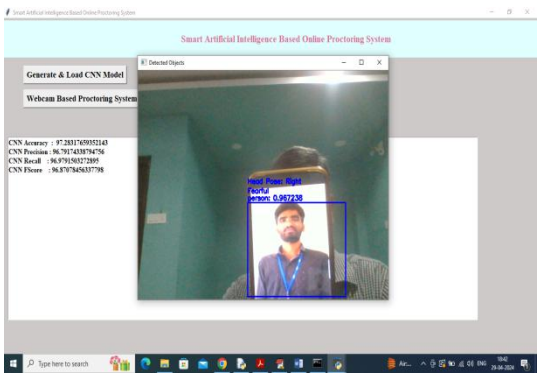
In above screen click on "Generate & Load CNN Model" button to load CNN and get below output

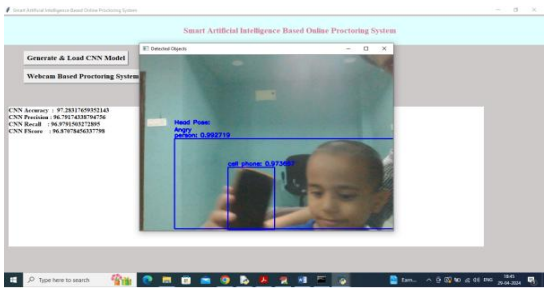
In above screen CNN model loaded and got accuracy as 97% and now click on 'Webcam Based Proctoring System' button to get below page

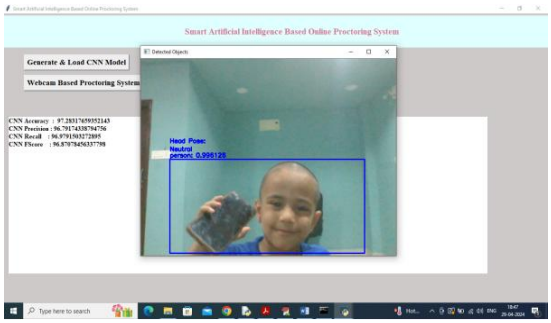
Any proctoring software needs to accurately establish the identity of the person giving the examination. Impersonation is a big threat to the sanctity of the online exams and hence, various methods are being employed to ensure that the designated person is the one giving the examination.

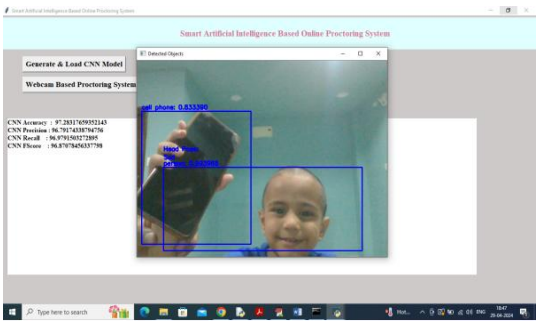
Here these are the results obtaining all smart ai based online proctoring system and these detects

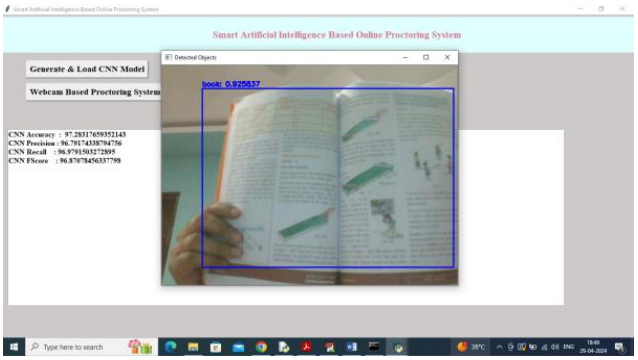
- Detects phone
- Detects keyboard
- Detects books











V.CONCLUSION

We have developed a visual model of a proctoring system to prevent harmful behavior during online exams. The functionalities of the system include:Emotion detection: Recognizing an examinee's emotions throughout an exam is one of the most important features in determining whether or not he is cheating. Fear expressed by the candidate could indicate that he or she is involved in criminal behavior.Estimation of Head Movement: Here, movement of the examinee's head can be an indication to engagement in cheating activities.Cell phone, book, and multiple person detection (Malicious object detection): Detecting theaforementioned items in the examinee's exam surroundings can also provide us with information on cheating techniques.This system can be used in conjunction with a secure exam browser to prevent cheating in online exams. However, because the system will not be completely successful in eliminating all forms of cheating, human intervention may be required in such cases.In conclusion, the rise of online education and remote exams has created a demand for secure and

trustworthy online exam proctoring systems. Our project proposes the development of an image/video examination proctoring system that utilizes AI algorithms, such as YOLO and face detection, to detect and prevent cheating during online exams. The system is designed to be flexible, scalable, and easy to use, allowing educators to conduct secure online exams with minimal setup and configuration. With the help of this system, institutions can provide online exams without worrying about the possibility of cheating or fraudulent activities.privacy and ethical concerns, such as data privacy and bias mitigation, is crucial for responsible deployment. Additionally, integrating facial expression recognition with other modalities, like speech analysis, body language, and physiological signals, can provide a more comprehensive understanding of human emotions and behavior. By addressing these areas, future research can significantly advance the capabilities and applications of real-time facial expression recognition via webcam, leading to more accurate, robust, and beneficial sys

VI . Reference

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