1.INTRODUCTION

The current ongoing health crisis has forced everyone to move their academics, talent assessments, and certifications online. Since we don't know how long our studies, training, and examinations for everyone will keep happening online, corporate organizations, schools, colleges, and universities are taking the help of online proctoring software to make online exams easier to conduct. For those who don't know what proctoring means, it is merely a process of invigilating an examination.

A 'proctor' is a person who acts as a supervisor during an exam, and 'proctoring' means supervising an examination or test of students, candidates, employees, etc. Proctoring is just a fancy word for an invigilator who keeps an eye on the students giving an exam – and the exam could be physical or even online. But the methods of invigilating AKA proctoring are different. During a physical examination, a teacher/supervisor is physically present around the students/candidates while they give an exam.

Online exams are conducted with students located remotely, which means there is no way of knowing whether they are maintaining the integrity of the test. This is where online proctoring software comes into the picture to make supervision more efficient, standardized, and straightforward.

After the conclusion of any online exam, there is a comprehensive review document, which elaborates, dissects, and explains the student's performance in the test. But with the implementation of an online invigilation service such as online proctoring services, the entire process is not only automated but it is more efficient, standardized, and simple.

Digital Education has not only made learning engaging and interactive but also supports taking exams remotely. The exam is taken online by academic establishments starting from colleges to high schools to universities to ensure that learning doesn't come back to a standstill.

Additionally, academic establishments are utilizing the power of digital education to acknowledge the various benefits of administering tests online. Now we are all aware that conducting examinations needs preparation such as invigilation, programming, and scheduling plus the cost of labor employed. But digital education has made this process, much simpler and cost-effective.

1.1 Online proctoring platform:

Online proctoring software helps organizations monitor test takers remotely during online exams. Proctoring solutions enable administrators of online assessments to create a more secure testing environment by deterring and preventing instances of academic dishonesty. It allows students to take their tests online in a remote location while managing the integrity of the examination. One of the most critical things in a web proctored exam is that students undergo an identity verification process for exam integrity purposes. A proctoring software confirms a student's identity and monitors him/her through a webcam. The video recorded during a remote proctored exam helps to flag any suspicious activity or behaviour.

Online Proctoring in education is not a new area of research. Even before the Pandemic, many universities/institutions were using proctoring systems for online courses. The competitive and adaptive exams like GRE, GMAT, CAT are purely proctor-based exams. Online proctoring makes use of virtual tools for monitoring activities (such as tab change, timestamp, background noise etc.) for assessing the students appearing for exams. Such exams are generally happening online and remote location so that any student from any location can give exams to ensure the integrity. Online proctoring system focusses on two major components viz. Web camera for recording the video of the student appearing for the exam which can be later on viewed by examiner/proctor. Examiner/proctor can potentially look at any mischievous things, cheating happening during exam or not. The second component is locking which prevent students from opening other tabs in the web browsers. This is also known as Computer or Browser Lockdown.

While you take the exam, the proctoring software monitors your computer, including any software that is running, and streams the exam data to the proctoring software via the cloud. The software also records video and audio from your webcam.

1.1.1 Definition and Meaning:

A proctored test is a test that is supervised by someone, referred to as a proctor, who verifies the identity of the test taker and maintains academic integrity. Proctored tests may be administered in-person or remotely. For in-person tests, school officials are responsible for overseeing students during the testing period. With remote proctoring, students' identities are confirmed through a webcam. Remote proctored tests may also require students to be monitored and suspicious activity may be flagged.

A proctored test refers to a school official or software program that supervises students as they write a test. The school invigilator or software will ensure that students follow academic integrity standards for the duration of their test.

Proctored testing, often referred to as online proctoring or remote proctoring, is monitoring students taking online exams with software and services to: Protect academic integrity. Prevent and deter cheating. Help and support students complete their online exams.

Proctored exams are timed exams that you take while proctoring software monitors your computer's desktop, webcam video and audio. The data recorded by the proctoring software is transferred to a proctoring service for review. Proctored exams may or may not be required for your course and enrollment track. When it comes to online exams, it is not possible for a proctor to be present physically at every candidate's location. This is where online remote proctoring comes into play. Online remote proctoring refers to remote invigilation or supervision of an exam by using online monitoring software and video streaming. This is done to increase accountability and ensure the integrity, credibility, and authenticity of the online exam.

1.1.2 Types of Online Exam Proctoring:

Live Online Proctoring: An invigilator monitors the candidates' videos, audios, and screen usage feed in real-time from a remote location. It is not very different from offline proctoring except for the availability of the remote location.

Recorded Proctoring: In this type of proctoring, candidates' webcam, audio, and screen usage feed are recorded in real-time. And the invigilator reviews the recording at a later time. This removes the time constraint to monitor candidates actively but retains the limitation of the active involvement of human invigilators.

AI-based Proctoring: The most advanced form of proctoring is AI-based proctoring. And it almost removes the need for human proctoring. With the use of face recognition, eye tracking, and object tracking ability through the webcam, AI-based proctoring systems can monitor and detect any suspicious behaviour of the candidates in real-time.

1.1.3 Face Detection:

Facial recognition software reads the geometry of your face. Key factors include the distance between your eyes and the distance from forehead to chin. The software identifies facial landmark one system identifies 68 of them that are key to distinguishing your face. Face detection is used in biometrics, often as a part of (or together with) a facial recognition system. It is also used in video surveillance, human computer interface and image database

management. Face recognition is one of the most significant applications of face detection. It's able to capture someone's image and know exactly who that person is. The technology isn't 100% perfected yet, but if your image is already in a database, there's a good chance that the owner of the database will be able to identify you.

This is the very first step in headpose estimation technique.We will detect face of users using opencv library. We will be using a Caffe model of Opencv DNN module.We will first captures the users face and then send it to the Opencv caffe model of DNN module for Facial Landmark detection. In our proposed methodology, we snap a picture of a student as input and use HOG techniques to recognize faces in the image. Then, for the identified picture, estimate the 68 landmarks. Faces that are oriented differently and seem differently to a computer may all belong to the same person, and these signs can be used to easily identify them. Finally, the identified photos are directly compared to previously learnt and saved faces in our database. The pseudo code for facial recognition is shown in the Algorithm 2.

Fig.1.1.Face Detection in an online proctored exam

We match a known face from our database to unknown faces using a deep neural network. We train a classifier to determine which known student is the closest match based on measures from a new test image. The classifier's output would be the name of a student. The number of faces in the photograph is also counted.

1.1.4 Object Detection:

Object detection is a computer vision technique that works to identify and locate objects within an image or video. Object classification can be divided into three tasks: object localization, image classification, and object detection. Specifically, object detection draws bounding boxes around these detected objects, which allow us to locate where said objects are in (or how they move through) a given scene. Object detection is completely inter-linked with other similar computer vision techniques such as image segmentation and image recognition that assist us to understand and analyze the scenes in videos and images. Object

detection consists of two separate tasks that are classification and localization. R-CNN stands for Region-based Convolutional Neural Network. The key concept behind the R-CNN series is region proposals. Region proposals are used to localize objects within an image. The improved versions of the R-CNN model are Faster RCNN, and Fast R-CNN, which are demonstrated and for object recognition, and object localization. The acronym YOLO stands for 'You Only Look Once'. YOLO model versions are YOLOv2 and YOLOv3.

Fig.1.2.Object Detection in an online proctored exam

The R-CNN family of models delivers excellent object identification accuracy, but its processing speed is a key drawback. The processing speed is just 5 frames per second on a GPU, but the YOLO model is significantly quic;2ker than R-CNN since a single-layer neural network is applied to the entire image. For training, the YOLO model is linked to a single neural network. It takes pictures and divides them into a grid of cells, with the cells anticipating bounding boxes and class labels. The predicted accuracy rate for this model is lower. YOLOv3 is better than YOLOv2 in terms of speed and strength. It implements the darknet-53 proprietary deep architecture, which includes a 53 network and additional layers for object identification trained on ImageNet. As a result, it has a fully convolutional underlying architecture with 106 layers.

1.1.5 Multiple persons 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. YoloV3 from Keras TensorFlow is an algorithm implemented in this module. The remote proctoring allows a large number of students to appear in an exam

from anywhere around the corner. Such convenience has made remote proctoring a good choice for the institutions as well for students.

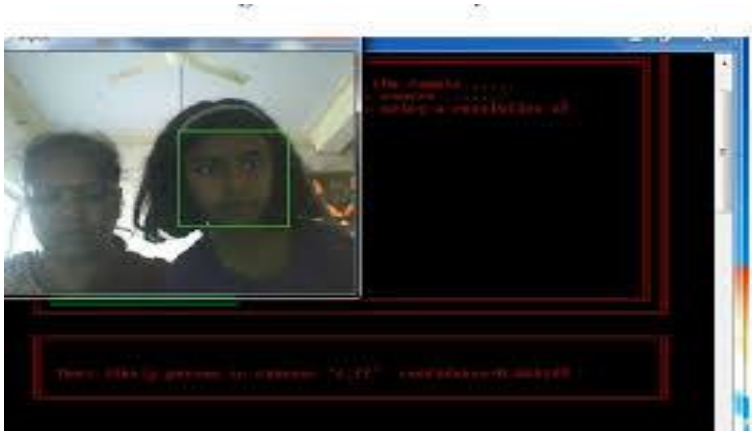

Fig.1.3.Multiple persons detecting during exam

1.2 IMPORTANCE OF ONLINE PROCTORED EXAM:

One of the biggest benefits of online proctoring is that it removes many of the scheduling hassles associated with online exams. With proctoring services that combine automated proctoring and live proctoring, students can schedule their online exam at a time that works for their busy schedules, 24/7/365. It allows students to take their tests online in a remote location while managing the integrity of the examination. One of the most critical things in a web proctored exam is that students undergo an identity verification process for exam integrity purposes. An online exam provides flexibility and security to the examination process. Once all the questions are uploaded in the system, the system can shuffle and give questions in different orders to different students. This minimizes the chance of cheating. The advantages include better turnaround time, a hassle-free process, automation of manual processes, economical for institutions, highly secure, etc. Meanwhile, the disadvantages of an online examination system are shifting to an online platform, grading of long answer-type questions, cheating, etc.

The online exam is totally proctored on the basis of facial recognition technique. It is the main technique used in the online proctored exam to minimize the chances of cheating. The facial recognition in online proctoring software restricts the use of other websites on a candidate's computer/device. During an online proctored exam, the activities of the candidate are monitored throughout. The software alarms, pause or stop the exam in case any sign of cheating is observed. Thus, the facial recognition is so helpful in online proctoring exam.

2.LITERATURE SURVEY

SL.NO	TITLE	AUTHOR NAME	YEAR	TECHNIQUES	DISADVANTAGES
1	Face Description With Local Binary Patterns: Application To Face Recognition	Timo Ahonen and Matti Pietikainen	**2006**	LBP, Texton Histogram	Object detection, Head pose estimation
2	"Design of Online Examination System Based on Web Service	Li Jun	**2009**	Client/Server and Browser/Server model.	Eye ball tracking and Head pose detection, Multiple person detection
3	Outlier detection and influential point observation using clustering techniques	Ilango V., Subramanian R., Vasudevan V	**2013**	Clustering, Segmentation	Voice detection and Eye ball tracking
4	"A General Review of Human Face Detection Including a Study of Neural Networks and Haar Feature-based Cascade Classifier	Ali Sharifara , Mohd Shafry Mohd Rahim	**2014**	Haar cascade, Neural Network	Voice detection
5	"A Novel Web-Based Online Examination System For Computer Science Education,	Yuan Zhenming, Zhang Liang and Zhan Guohua	**2016**	Test-taker, web locks, tabbed web browsing	Resume analysis, eye ball tracking
6	Face Recognition Method for Online Exams	Arief Agus Sukmandhani and Indrajani Sutedja	**2019**	Thresholding, Clustering, Open CV	Head pose estimation
7	Face Recognition Based on LBP Algorithm	Yang Tao ,Yuanzi He	**2020**	LBP, Preprocessing, Feature Extraction	Eye ball tracking and head pose estimation
8	An Incremental Training on Deep Learning Face Recognition for M-Learning Online Exam Proctoring	Hadian S. G. Asep and Yoanes Bandung	**2021**	Test-taker, web locks.	Voice to text conversion, head pose estimation

Table.2.1 Authors and their proposed systems

The research papers listed below will assist us in better understanding the deployment of modules for online proctoring.

2.1 BASE PAPERS:

The following are the base papers considered for the proposed system. The base papers are as follows:

1. AI-based proctoring System

2. Face Recognition based Automated Remote Proctoring Platform

2.1.1 AI-based proctoring System:

The improvement of e-learning and online evaluation frameworks is increasing rapidly. The Main Goal is to develop a model which is intended to distinguish the ordinary examples for activities of concern, for example, conversations during a test or the pivoting, processes more exactness and computes more accuracy. Certain presumptions about normal behaviour with regards to delegating tests are made. In the existing system, it takes more computational power and speed is less. Thus, it is important to develop a framework which is high precision and less the manual force. Identification depends on highlights registered utilizing the textural features followed by a Haar Cascade classifier and ADA Boosting calculation and search through explained examples of pre-recorded clips to prepare the framework for train the system for behaviour, the framework is planned as a choice emotionally supportive network to work with programmed administering of tests and distinguishes misbehaviour or malpractice.

2.1.2 Face Recognition based Automated Remote Proctoring Platform:

Samuel S. Chua Garcia et al proposed a theoretical approach for the tab locking mechanism of the user window while taking up the exam. Methods like tabbed web browsing and web locks can be used to prevent the student from switching tabs during the exam. In addition to this, the authors have also explained how to provide unique ways to conduct exams online using a randomizer which helps in generating unique formats of exam questions and assessing the same targeted learning outcomes. For this, they have considered two components namely a test bank and a randomizer which work hand in hand to generate different sets of papers for the students. The paper also explains the different stages of developing a system using the Royce model. Royce is a water flow model which is an essential tool to be followed from the start to the end of developing a software or a product. Finally, the project was able to output a good efficiency in terms of generating quick questions as well as evaluating the same.

Arief Agus Sukmandhani et al have developed an efficient software solution to record student attendance using face recognition. The Eigenface method was used for the recognition of students' faces. Eigenface is nothing but a set of standardized values from the face points of several samples' datasets of faces. They have used a crossplatform image processing library called Egmu CV which is closely related to Open CV. The proposed prototype for finding Eigenvectors from face images follows nearly 6-8 steps starting from arranging the image matrix in flat vector form, finding the difference in values of training images with expected values after which, the covariance matrix is calculated, and finally arrive at calculating the Eigenvalue, Eigenvector and Eigenface value. The SQLite relational database system has been used as a storage medium to record the student's attendance.

Kirti Dang et al have shown their research in the domain of face detection. They have worked on reviewing and comparing the multiple face detection algorithms. They have considered four main face detection algorithms for comparison which are V-J face detector, SMQT, and SNOW classifier, face detection using neural networks, and SVM. For comparison of face detection algorithms, precision and recall were the two parameters which were calculated to find out their accuracy using DetEval software. The paper also mentions about few APIs to calculate the true value of face image samples to get accurate values of dimensions of the face bounding boxes. After the estimation of precision and recall values of the different algorithms, they arrived at a conclusion stating that Viola-Jones was the efficient algorithm to detect faces from facial images.

2.2 SUMMARY OF RELATED WORK:

Over the years, the demand for online learning has increased significantly. Researchers have proposed various methods to proctor online exams in the most efficient and convenient way possible, yet still preserve academic integrity. These methods can be categorized into three categories: (a) no proctoring, (b) online human monitoring, and (c) semi-automated machine proctoring,. No proctoring does not mean that test takers have the freedom of cheating. Instead, cheating is minimized in various ways. The authors believe they can prompt academic honesty by proposing eight control procedures that enable faculty to increase the difficulty and thus reduce the likelihood of cheating. The authors offer a secure web-based exam system along with network design which is expected to prevent cheating.

Online human monitoring is one common approach for proctoring online exams. The main downside is that it's very costly in terms of requiring many employees to monitor the test takers. Researchers have also prop;2osed different strategies in full monitoring, such as

in, where they use snapshots to reduce the bandwidth cost of transmitting large video files. Authors in attempt to do semi-automated machine proctoring, by building a desktop robot that contains a 360◦ camera and motion sensors. The main problem is that a single camera cannot see what the subject sees, and as a result even humans may have a hard time detecting many cheating strategies. For example, a partner who is outside the camera view, but who can see the test questions (e.g., on a second monitor), could supply answers to the test taker using silent signals, or writing on a piece of paper which is visible to the test taker.

Among all prior work, the most relevant work to ours is the Massive Open Online Proctoring framework, which combines both automatic and collaborative approaches to detect cheating behaviours in online exams. Their hardware includes four components: two webcams, a gaze tracker, and an EEG sensor. One camera is mounted above the monitor capturing the face, and the other is placed on the righthand side of the subject capturing the profile of the subject. Motion is used for classification by extracting dense trajectory features. However, this work is limited to only one type of cheating, with evaluation on a small set of 9 subjects with 84 cheat instances. Since many types of cheating do not contain high-level motion, it is not clear how this method can be extended to handle them. To the best of our knowledge, there is no prior work on a fully automated online proctoring system that detects a wide variety of cheating behaviours.

Beyond educational applications, in the multimedia community, there is prior work on audio-visual-based behaviour recognition. Authors study audio-visual recordings of head motion in human interaction, to analyze socio-communicative and affective behavioural characteristics of interacting partners. Automatically predicts the hire ability in real job interviews, using applicant and interviewer nonverbal cues extracted from the audio-visual data. One of our novel ideas is to use a second wearcam for capturing the full field of the view of the subject. This is similar to the research in first person vision where visual analysis is performed on the wearcam. For example, temporally segments human motion into actions and performs activity classification in the context of cooking. A wearcam to detect the iris and estimate the visual field in front of the subject, which helps to identify where exactly the subject is looking. In contrast to the single wearcam in the first person vision, our OEP system utilizes two cameras to capture both what the subject sees and his/her own behavior, which enables comprehensive behaviour profiling.

3.SYSTEM ANALYSIS

3.1 PROBLEM STATEMENT:

For the smart proctoring in online exams the previous systems were good at reducing the malpractices but only by the methods of face detection, object detection and tab locking mechanisms cannot reduce cheating in the exam. Even that methods are included the candidate appearing for the online exam has some chances of performing some malpractices this will be main problem using the previous systems.

3.2 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 laborintensive 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.

The previous systems to proctor the online exams are as follows:

1. Face Recognition based Automated Remote Proctoring Platform
2. AI Based Proctoring
3. Remote Online Proctoring System

3.2.1 FACE RECOGNITION BASED AUTOMATED REMOTE PROCTORING PLATFORM:

Automated online proctoring can be termed as a cross-over that ties up both sides of the ends of education for students and the examiners. Online proctoring has evolved a long way from the time it was developed. Online proctoring is a software tool that assists in

helping examiners to conduct exams for students in a free and fair manner to assess them. In the present situation, there has been a tremendous increase in the use of online proctoring platforms not just in the educational domain but also in fields like hiring, company certification exams, competitive exams, etc.

Since the trend of online exams has been increasing recently, there are very few software's which can be relied on for real-time use. Thus, there is a need to develop one such software which can handle all the work effortlessly. Use case testing of any application that is being developed is a very important task to be performed to better understand the product outcome. Online proctoring usually involves a webcam to get the live feed of the student taking up the exam. This is to constantly monitor the student activities and if in case of any misconduct the software usually warns the user a certain number of times after which the software saves the state of the exam and logs out the student from the exam portal. In the initial stage, a face detection algorithm is executed to detect any face objects in the cam feed.

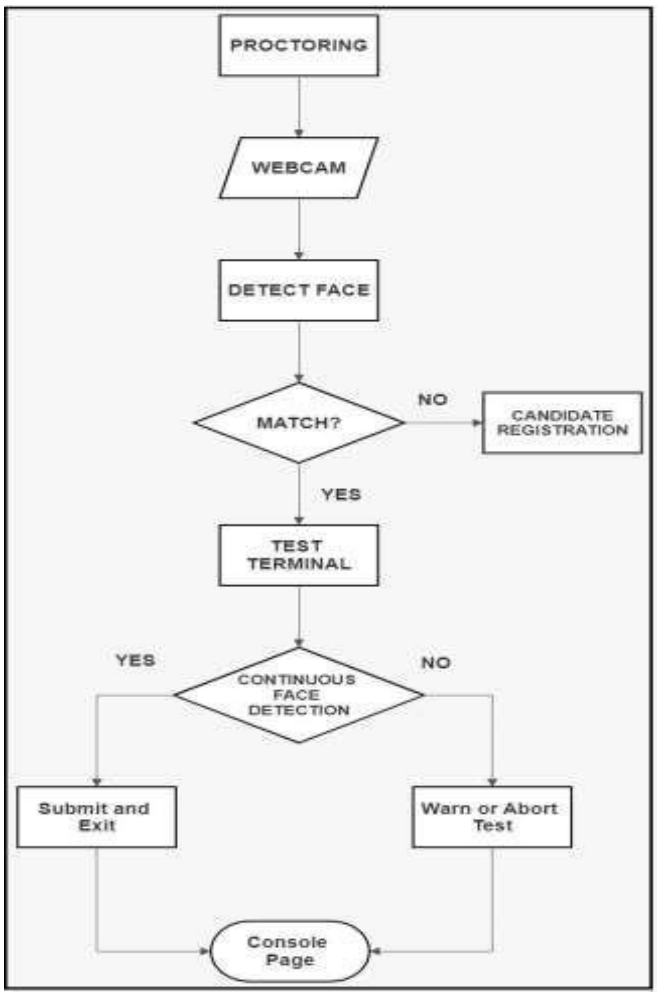

Fig.3.1 Proctoring Activity Diagram

The most important concept involved in deep learning is the use of the deep neural network to train the nodes for extracting complex features from the available information with a limited contribution. When the test-takers face is detected by the algorithm, it stores the features extracted from the face and stores it in the database against a unique Id which will be used for further validation. During this process of face feature extraction, there can be errors that have to be backpropagated and corrected by an algorithm like CNN.

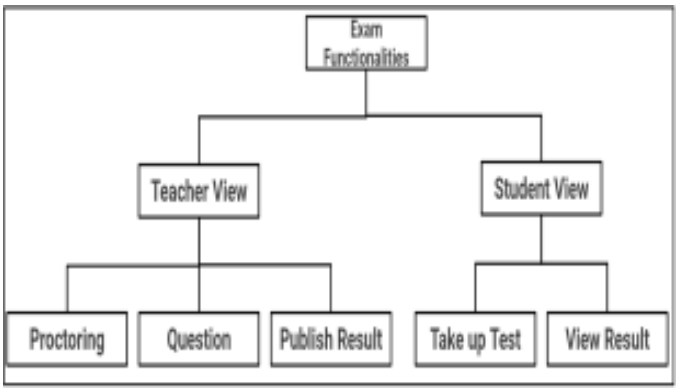

Fig.3.2 Examination Functionalities

One of the major implementations to check for misconduct is, if the student tries to switch tabs, it is detected by the software and is notified to the student. On performing the same action thrice, the student will be logged out without any warning and may lose access to the test. On the other hand, a CNN-based face recognition algorithm is simultaneously executed to detect if any invalid student is taking up the test. This is done by capturing the face of the test-taker for every interval (say 40-50 seconds) and then comparing it with the signature of the face saved in the database which would be recorded during student registration.

3.2.2 AI- BASED PROCTORING:

From the past year, Online Examination has become popular in all the educational fields due to covid19 and its flexibility. However, the institutions and community confront a big difficulty in terms of proctoring methods, as it is extremely difficult to administer cheating-free online exams. Here we present techniques and tools through which the proctor need not to be present throughout the exam. This is based on neural networks and machine learning. Our AI-based model will be able to detect any unfair means in an examination. Our experiments proved that the proposed system is better than the existing ones.

ProctorU is an example of an OPS that uses a microphone and webcam. It is a live proctoring system in which the proctor guides students through the entire process of an online

exam, and also monitors them using the webcam. Proctors are required to ensure that no unauthorized materials are present before the start of the exam. They are also required to verify the student's identity by asking them to present their ID cards. Students are required to maintain an uninterrupted audio-visual connection to the proctor throughout the session.

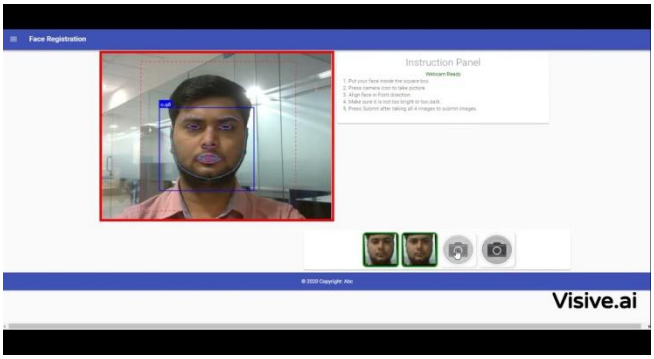

Fig.3.3 Proctored Exam based on AI

The concept map shows us the key points that need to be considered while designing the AIPS. All of these points have been covered in greater detail in their respective sections as per the related research question. This allows us to give a clearer and detailed analysis of the work done. Topics such as Requirements and Necessity cover the points related to the existing architectures of such systems.

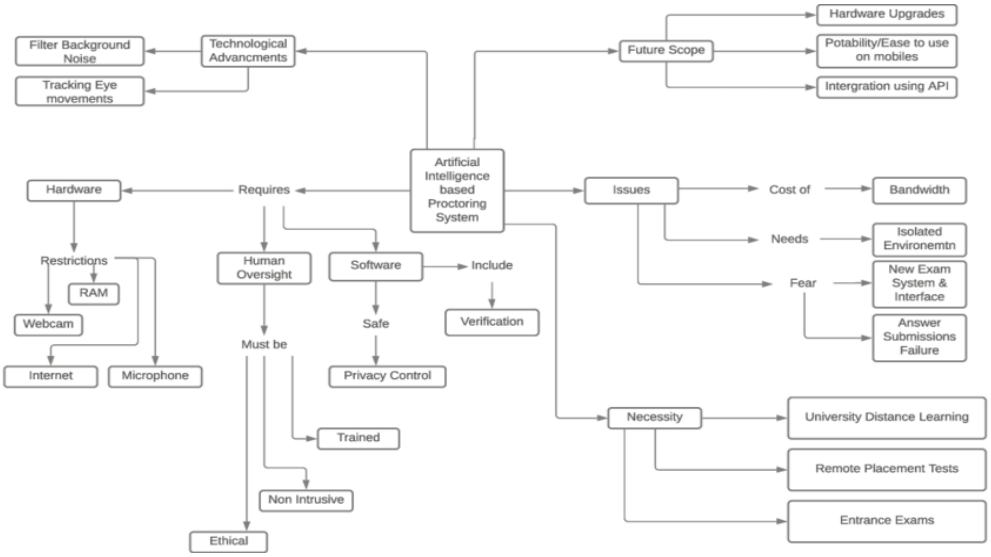

Fig.3.4. Concept map of AIPS

Hardware, Software and Human Oversight are related with the discussion over the parameters that are considered when designing the proctoring systems. Issues in itself is covers a large focus of our literature review, and is related to the Technological

Advancements that are discussed. Technological Advancements and Future Scope deal with the trends and advancements of the proctoring system.

3.2.3 REMOTE ONLINE PROCTORING SYSTEM:

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;2 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.

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 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.

Fig.3.5. Online Exam based on Remote proctoring

3.3 DRAWBACKS OF EXISTING SYSTEM:

By using above mentioned methods in the existing system we get several drawbacks inthose methods. Some important drawbacks are mentioned below:

1. There is no lip movements and eye ball tracking methods
2. It only shows alert when the system identifies any suspicious behavior of candidate
3. The system did not have the head pose detection method to identify the anomalous behavior of the candidate.

3.4 PROPOSED SYSTEM:

In this project, a computational tool used for eye ball tracking and lip movement detection. We report improvements for better proctored online exam in comparison with other works on the literature, a machine learning based method to proctor the candidate thoroughly throughout the exam.

In this we have used openCV for facial recognition and object recognition. Then we have used machine learning based methods to track the eye ball and lip movements. To recognize the object and image CNN and YOLO algorithms has been included in this project. The YOLO algorithm is very useful in fast recognition of objects and also useful in multiple person detection during the proctored exam. The main thing that introduced in this system is that the voice which is detected is converted to text using speech recognition library in python. According to the count of the eye movement, lip movement and head position it shows an alert message if system finds such movements again after giving the alert message then the exam is closed and candidate will be out of the exam.

3.5 BLOCK DIAGRAMS:

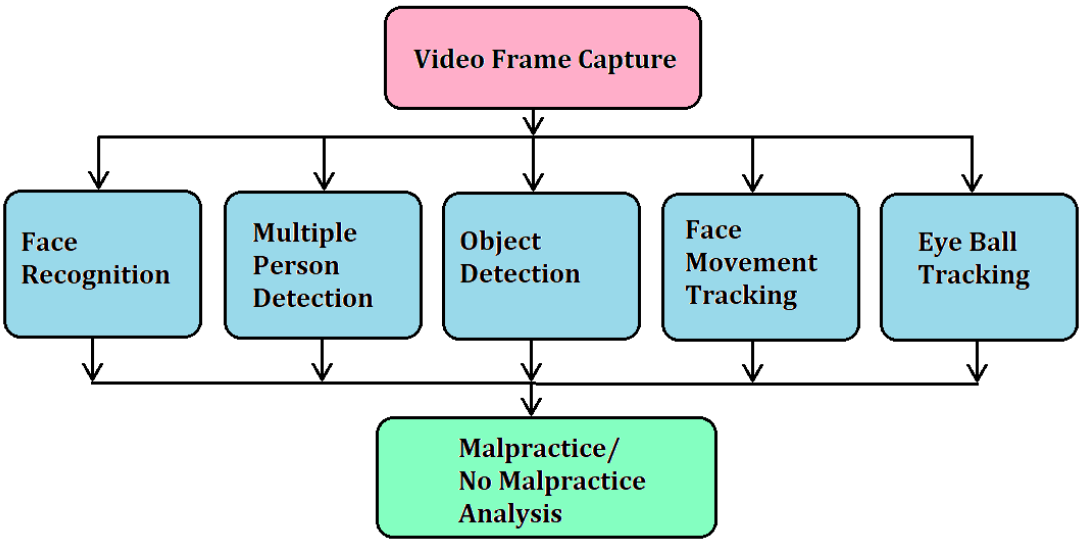

Fig.3.6(a).Block Diagram of Proposed System

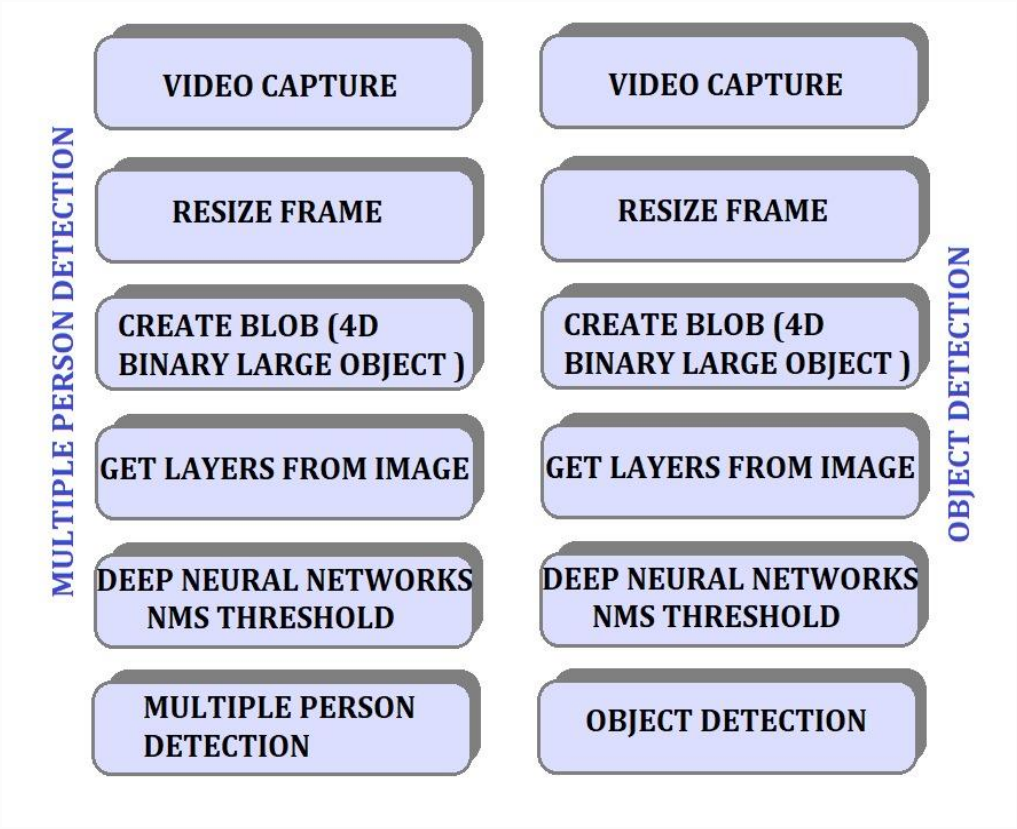

Fig.3.6(b). Block Diagram of working principle of system

As we can see from the above block diagram 3.6(a) how the online exam can be proctored from start to end. At first it extract the frames from real time video stream then if it finds any objects, multiple faces and also the person face is not detected then the exam will abort immediately. If there is no such activities are detected then it will move to further step

which is from face it will track the eye ball and detect head position. If these activities are found then it will give alert and if that happens frequently then the exam will abort. It also recognise the voice and converts to the text using the speech recognition library in python. Finally if there is no such anomalous behaviour as mentioned above then exam will be completed successfully.

3.6 METODOLOGIES:

3.6.1 FACE DETECTION and RECOGNITION:

Face detection is the first step in the pipeline. It is the process of finding a face in an image. This step only focuses on finding a face and does not concern identity determination. Ultralight detector is set as the default face detection model, as it gives excellent performance in detecting faces from different angles (i.e., it is not restricted by detecting front face only).

Face recognition technology is not new – you are probably already using it in your daily life. Most of us use smart phones nowadays, which often employ face recognition technology to unlock the device. This technology provides a powerful way to protect personal data and ensure that even if the phone is stolen, sensitive data remains inaccessible by the perpetrator. The use of face recognition technology is being applied to an ever-expanding set of domains, including safety, security, and payments.

So, what exactly does face recognition do? Face recognition is a broad problem of identifying or verifying a person in digital images or video frames through the facial biometric pattern and data. The technology collects a set of unique biometric data of each person associated with their face and facial expression to authenticate a person. Face recognition technology is mostly used for two types of tasks:

• Face Verification: given a face image, match it with known images in secure database, give a yes/no decision (for example, is this the person who claims he/she is?). Does the person exist in the database?

• Face Identification: given a face image, match it with known images in secure database, detect whose image it is (for example, who is this person?). Identifying the person such as the image is John Doe’s or Mark Twain’s, and so on.

3.6.2 FACE LANDMARK RECOGNITION:

Face landmark detection is a computer vision task where we want to detect and track keypoints from a human face. This task applies to many problems. For example, we can use the keypoints for detecting a human's head pose position and rotation. With that, we can track whether a driver is paying attention or not. Facial landmark detection is the task of detecting

key landmarks on the face and tracking them (being robust to rigid and non-rigid facial deformations due to head movements and facial expressions).

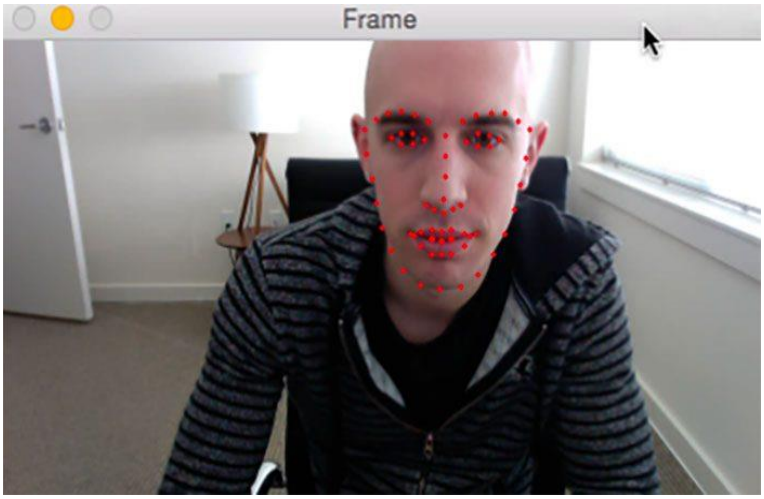

Fig.3.7.Face landmark detection

Generally the common landmarks which are mostly recognized are eyebrows, eyes, mouth, nose and jawline. These are the common landmarks recognized in the face and this is the main technique to detect the faces and find the difference between faces.

3.6.2.1 Image processing:

The face detection and face landmark recognition uses this image processing technique to extract the particles which are helpful in detecting the different faces. Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Image processing is any form of processing for which the input is an image or a series of images or videos, such as photographs or frames of video. The output of image processing can be either an image or a set of characteristics or parameters related to the image. It also means. Analyzing and manipulating images with a computer. There are some examples which are processed on image processing. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Digital image processing is the use of a digital computer to process digital images through an algorithm. As a subcategory or field of digital signal processing, digital image processing has many advantages over analogy image processing.

3.6.2.2 Image Segmentation:

Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or

change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image, ora set of contours extracted from the image (see edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s)when applied to a stack of images, typical in medical imaging, the resulting contours after image segmentation can be used to create 3D reconstructions with the help of interpolation algorithms like Marching cubes.

3.6.2.3 Image Enhancement:

Image enhancement is the procedure of improving the quality and information content of original data before processing. Common practices include contrast enhancement, spatial filtering, density slicing, and FCC. Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features. The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide `better' input for other automated image processing techniques. Principle objective of Image enhancement is to process an image so that result is more suitable than original image for specific application. Digital image enhancement techniques provide a multitude of choices for improving the visual quality of images.

3.6.2.4 Gray Scaling:

Gray scaling is the process of converting an image from other color spaces e.g. RGB, CMYK, HSV, etc. to shades of gray. It varies between complete black and complete white a series of regularly spaced tones ranging from black to white through intermediate shades of gray also an image composed solely of gray scale tones. The main reason why grayscale representations are often used for extracting descriptors instead of operating on color images directly is that grayscale simplifies the algorithm and reduces computational requirements. Grayscale images are distinct from one-bit bi-tonal black-and-white images, which, in the context of computer imaging, are images with only two colors: black and white (also called bilevel or binary images). Grayscale images have many shades of gray in between. Grayscale

images can be the result of measuring the intensity of light at each pixel according to a particular weighted combination of frequencies (or wavelengths), and in such cases they are monochromatic proper when only a single frequency (in practice, a narrow band of frequencies) is captured. The frequencies can in principle be from anywhere in the electromagnetic spectrum.

3.6.2.5 Image Resolution:

The term resolution is often used as a pixel count in digital imaging. When the pixel counts are referred to as resolution, the convention is to describe the pixel resolution with the set of two numbers. The first number is the number of pixel columns (width) and the second is the number of pixel rows (height), for example as 640 by 480. Another popular convention is to cite resolution as the total number of pixels in the image, typically given as number of megapixels, which can be calculated by multiplying pixel columns by pixel rows and dividing by one million. An image that is 2048 pixels in width and 1536 pixels in height has a total of 2048×1536 = 3,145,728 pixels or 3.1 megapixels. One could refer to it as 2048 by 1536 or a 3.1-megapixel image. Other conventions include describing pixels per length unit or pixels per area unit, such as pixels per inch or per square inch.

Below is an illustration of how the same image might appear at different pixel resolutions:

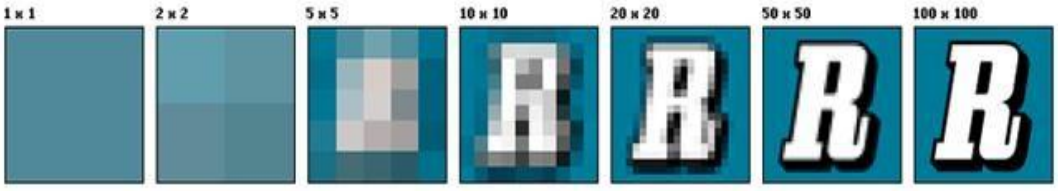

Fig.3.8 Different forms of Image Resolution

As the megapixels of a camera increase so does the ability of a camera to produce a larger image; a 5-megapixel camera is capable of capturing a larger image than a 3-megapixel camera. Larger monitor screens usually have higher screen resolution, measured in pixels.

3.6.2.6 Gray Scale:

Gray scaling is the process of converting an image from other colour spaces e.g. RGB, CMYK, HSV, etc. to shades of grey. It varies between complete black and complete white a series of regularly spaced tones ranging from black to white through intermediate shades of grey also an image composed solely of grey scale tones. The main reason why grayscale representations are often used for extracting descriptors instead of operating on colour images directly is that grayscale simplifies the algorithm and reduces computational requirements. Grayscale images are distinct from one-bit bi-tonal black-and-white images,

which, in the context of computer imaging, are images with only two colours: black and white (also called bilevel or binary images). Grayscale images have many shades of grey in between. Grayscale images can be the result of measuring the intensity of light at each pixel according to a particular weighted combination of frequencies (or wavelengths), and in such cases they are monochromatic proper when only a single frequency (in practice, a narrow band of frequencies) is captured. The frequencies can in principle be from anywhere in the electromagnetic spectrum.

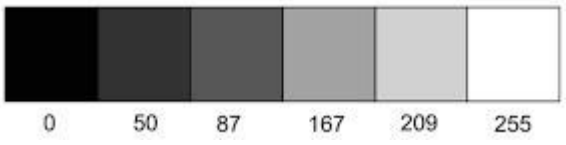

Fig.3.9 Gray Scale

The grey level or grey value indicates the brightness of a pixel. … In a binary image a pixel can only take on either the value 0 or the value 255. In contrast, in a greyscale or colour image a pixel can take on any value between 0 and 255. Mean grey value – Average grey value within the selection. This is the sum of the grey values of all the pixels in the selection divided by the number of pixels. Because a byte is composed of 8 bits, such images are known as 8-bit grayscale images. Some high-end scanners can scan with a finer intensity scale. They use 12 or 16 bits to represent the intensity values of the image, making it possible to register 4096 or 65,536 different grey levels. Gray level slicing is a technique used to highlight a specific. Range of grey levels in a given image. – Similar to thresholding. – Other levels can be suppressed or maintained. – Useful for highlighting features in an image.

Gray-level slicing is being done by two approach One approach is to give all grey level of a specific range high value and a low value to all other grey levels. Second approach is to brighten the pixels gray-value of interest and preserve the background. Both iOS and Android offer the option to set your phone to grey scale, something that can help those who are colourblind as well as let developers more easily work with an awareness of what their visually impaired users are seeing. For people with full colour vision, though, it just makes your phone drab.

3.6.2.7 Face Encoding:

The third step is face encoding. This process identifies key parts of a face through the “eyes of a computer.” As computers can only recognize numbers, a reliable way of converting face images to numbers/measurements was needed to represent each face. Finding a good method of face encoding was a challenging task. Quite often deep learning models, such as the “Convolutional Neural Network (CNN)” model, are trained by using a large

database of face images to calculate the best face representation of each face. The goal of this training is to generate nearly the same encodings when looking at two different pictures of the same person, whilst generating quite different measurements when looking at pictures of different people.

After exploring many different models, a pre-trained Resnet model provided in Dlib was chosen for the face encoding model of the pipeline. This model was essentially a ResNet34 model, which was modified by dropping some layers and re-building with 29 convolution layers. This Resnet model takes an image inputs with size 150 x 150 x 3 and represents/encodes each face image as 128-dim measurements. Once the model network was designed, the pretrained model was trained on a dataset of about 3 million faces. The face dataset was mainly derived from the two open-source face databases, the face scrub dataset and the VGG dataset.

3.6.2.8 Pixel:

In digital imaging, a pixel(or picture element) is the smallest item of information in an image. Pixels are arranged in a 2-dimensional grid, represented using squares. Each pixel is a sample of an original image, where more samples typically provide more-accurate representations of the original. The intensity of each pixel is variable; in colour systems, each pixel has typically three or four components such as red, green, and blue, or cyan, magenta, yellow, and black. The word pixel is based on a contraction of pix ("pictures") and el (for "element").

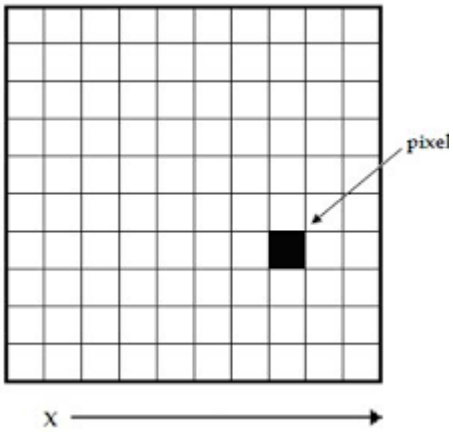

Fig.3.10 Example of Pixel

3.6.3 HEAD POSE DETECTION AND ESTIMATION:

The head pose detection is based on the above two methods to estimate the pose of the candidate face during exam. Firstly, we need to locate the face in the frame and then the various facial landmarks. Now, recognizing the face seems a trivial task in this day and that is true with faces facing the camera. The problem arises when the face is at an angle. Add to that

some facial landmarks are not visible due to the movement of the head. After this, we need to convert the points to 3D coordinates to find the inclination. Based the facial landmark detection and 3D coordinates the head pose is estimated.

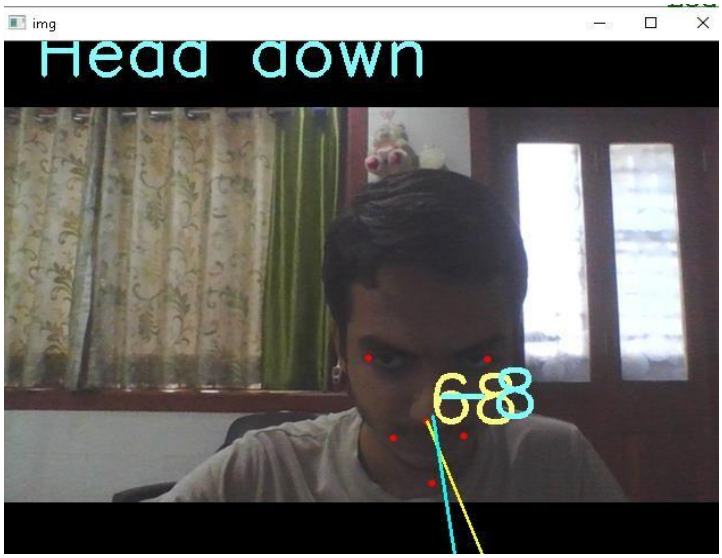

Fig.3.11 Head pose estimation

3.6.4 OBJECT DETECTION:

Object detection can be done by a machine learning approach and a deep learning approach. The machine learning approach requires the features to be defined by using various methods and then using any technique such as Support Vector Machines (SVMs) to do the classification. Methods for object detection generally fall into either neural network-based or non-neural approaches. For non-neural approaches, it becomes necessary to first define features using one of the methods below, then using a technique such as support vector machine (SVM) to do the classification.

Object recognition refers to identifying objects from digital images. Object classification can be divided into three tasks: object localization, image classification, and object detection. Object segmentation is the final task for object recognition. R-CNN, YOLO, SSD are popular deep learning-based object recognition models. The acronym YOLO stands for 'You Only Look Once'. YOLO model versions are YOLOv2 and YOLOv3. The pre-trained weights of YOLOv3 trained on the COCO dataset to detect people and mobile phones in the webcam feed. For an in-depth explanation on how to use YOLOv3 in TensorFlow2 and to perform people counting If the count is not equal to an alarm can be raised. The index of mobile phones in the COCO dataset is 67 so we need to check if any class index is equal to

that then we can report a mobile phone as well.

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.

Fig.3.12 Object Detection

YOLOv3 is better than YOLOv2 in terms of speed and strength. It implements the darknet-53 proprietary deep architecture, which includes a 53 network and additional layers for object identification trained on ImageNet. As a result, it has a fully convolutional underlying architecture with 106 layers. The YOLOv3 model was employed in our suggested approach.

3.6.4.1 CONVOLUTIONAL NEURAL NETWORK:

Convolutional neural networks. Sounds like a weird combination of biology and math with a little CS sprinkled in, but these networks have been some of the most influential innovations in the field of computer vision. 2012 was the first year that neural nets grew to prominence as Alex Krizhevsky used them to win that year's ImageNet competition (basically, the annual Olympics of computer vision), dropping the classification error record from 26% to 15%, an astounding improvement at the time.Ever since then, a host of companies have been using deep learning at the core of their services. Facebook uses neural nets for their automatic tagging algorithms, Google for their photo search, Amazon for their product recommendations, Pinterest for their home feed personalization, and Instagram for

their search infrastructure.

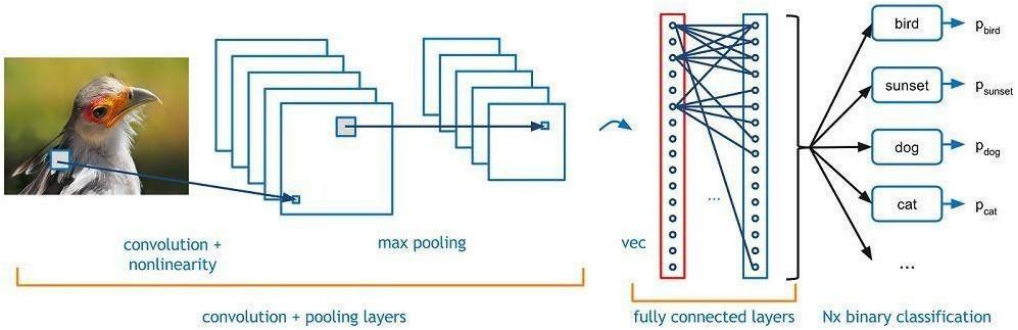

Fig.3.13 Convolutional Neural Network

3.6.4.2 How Convolutional Neural Network Works:

Generally, A Convolutional neural network has three layers. And we understand each layer one by one with the help of an example of the classifier. With it can classify an image of an X and O. So, with the case, we will understand all four layers.

Convolutional Neural Networks have the following layers:

- Convolutional
- ReLU Layer
- Pooling
- Fully Connected Layer

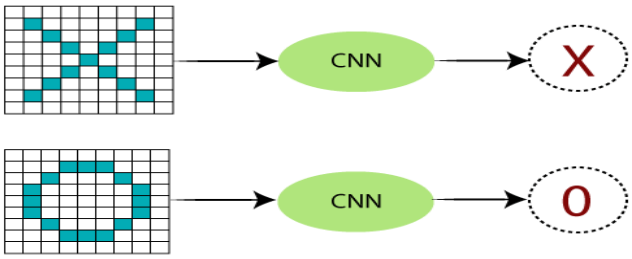

Fig.3.14 Working of CNN

3.6.4.3 YOLOv3:

YOLOv3 (You Only Look Once, Version 3) is a real-time object detection algorithm that identifies specific objects in videos, live feeds, or images. YOLO uses features learned by a deep convolutional neural network to detect an object. Versions 1-3 of YOLO were created by Joseph Redmon and Ali Farhadi.The first version of YOLO was created in 2016, and version 3, which is discussed extensively in 2 this article, was made two years later in 2018. YOLOv3 is an improved version of YOLO and YOLOv2. YOLO is implemented using the Keras or OpenCV deep learning libraries.

YOLO is a Convolutional Neural Network (CNN) for performing object detection in real-time. CNNs are classifier-based systems that can process input images as structured arrays of data and identify patterns between them (view image below). YOLO has the advantage of being much faster than other networks and still maintains accuracy.It allows the model to look at the whole image at test time, so its predictions are informed by the global context in the image. YOLO and other convolutional neural network algorithms “score” regions based on their similarities to predefined classes.

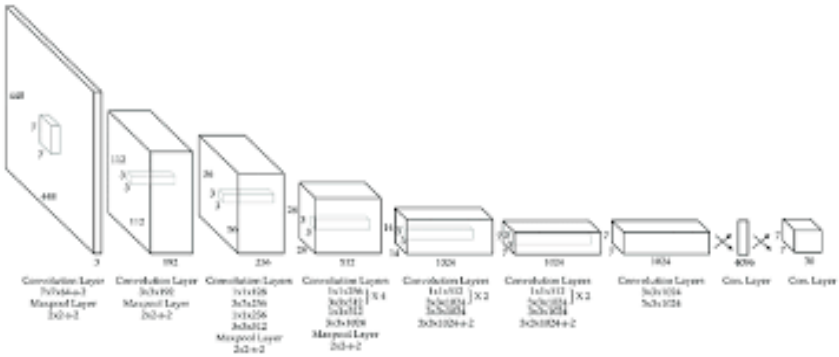

Fig.3.15 Architecture of YOLO

High-scoring regions are noted as positive detections of whatever class they most closely identify with. For example, in a live feed of traffic, YOLO can be used to detect different kinds of vehicles depending on which regions of the video score highly in comparison to predefined classes of vehicles.

3.6.5 MULTIPLE 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 ca;8ndidates’ 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.

With the technique of image processing which means the facial recognition method is useful in the multiple person detection including some of the algos like YOLO and tensor flow for fast recognition of faces and count the person in frame of that proctored exam.

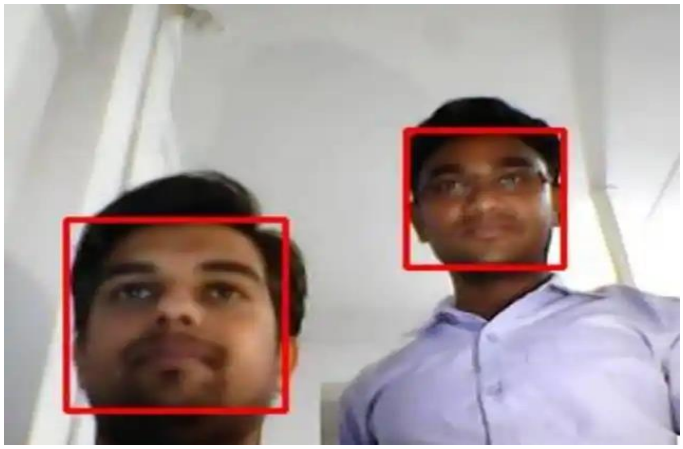

Fig.3.16 Multiple person detection

3.6.6 EYE BALL TRACKING:

Eye tracking is the process of measuring either the point of gaze where one is looking or the motion of an eye relative to the head. An eye tracker is a technique for detecting the position where the eye is looking. Eye tracking is a sensor technology that can detect a person's presence and follow what they are looking at in real-time. The technology converts eye movements into a data stream that contains information such as pupil position, the gaze vector for each eye, and gaze point. Eye-tracking systems measure eye position, eye movement, and pupil size to detect zones in which the user has a particular interest at a specific time. There are a number of methods for measuring eye movement.

Eye tracking is a technology that finds out the eye gaze point of a user as he or she looks around. The eye gaze coordinates are calculated with respect to a screen the person is looking at, and are represented by a pair of (x, y) coordinates given on the screen coordinate system.

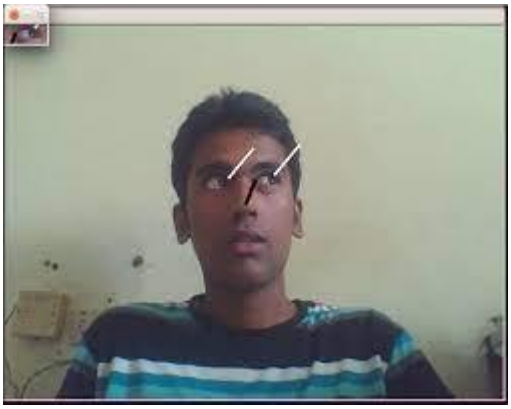

Fig.3.17 Eye ball Tracking

3.6.6.1 Eye Tracking Features:

Eye Position: When the eye is presented with a stimulus, the eye follows a specific pattern unique to an individual.

Eye Velocity: The underlining principle used in eye-;2position can be extended to the time-domain by taking the change of eye position with respect to the time leading to the eye velocity.

Eye Movement Direction: The direction in which the eye moves is unique.

Signal: The eye velocity coupled with the eye movement gives it a high potential feature.

3.6.6.2. Methods of Eye ball Tracking:

A method of recording eye position and movements is called oculography. There are three different methods to track the motion of the eyes:

Electro-Oculography:

In this method, sensors are attached at the skin around the eyes to measure an electric field exists when eyes rotate. By recording small differences in the skin potential around the eye, the position of the eye can be estimated, as is shown in Figure 3.14.

Fig.3.18. Electro-Oculography of Eye Tracking

Infrared Oculography:

The infrared (IR) oculography measures intensity of reflected infrared light. In this eye tracking method, eye is illuminated by infrared light which is reflected by the sclera. The difference between the amounts of IR light reflected back from the eye surface carries the information about the eye position changes. The light source and sensors can be placed on spherical glasses.

Video Oculography:

A video-based eye tracker is to estimate the direction of gaze from the picture delivered by a video camera. A possible way is to detect the iris using the high contrast of the white of the scelra and the dark iris. The most video-based eye trackers work with the

detection of the pupil. There are two methods to detect the pupil – the dark and the bright pupil method. With the dark pupil method an image processing technique locates the position of a black pupil in the camera image. The bright pupil method uses infrared light reflected from the retina and this makes the pupil to appear white in the camera image. Video-based eye tracking is the most widely used method in commercial eye trackers. Video oculography make use of single or multiple cameras to determine the movement of eye using the information obtained from the images captured.

3.6.7. VOICE RECOGNITION:

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 th;2e 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.

3.6.7.1 Automatic Voice Signal Detection (AVSD):

In the well-known Fourier analysis, signal is broken down into constituent sinusoids of different frequencies. Another way to think of Fourier analysis is as a mathematical technique for transforming our view of the signal from time-based to frequency-based. A simple Fourier transform is illustrated in Fig. 3.19(a). Taking the Fourier transform of a signal can be viewed as a rotation in the function space of the signal from the time domain to the frequency domain.

Fig.3.19(a). Fourier Transform from Time Domain to Frequency

Similarly, the wavelet transforms can be viewed as transforming signal from the time domain to wavelet domain. This new domain contains more complicated basis functions called wavelets, mother wavelets or analyzing wavelets. A simple Fourier transform is illustrated in Fig. 3.19(b).

Fig.3.19(b). Wavelet Transform from Time Domain to Wavelet Domain.

3.7 ADVANTAGES OF PROPOSED SYSTEM:

1. Eye ball tracking, lip movement detection, voice recognition, person counting or multiple persons detection are the main advantages of proposed system.
2. The voice which is recognized is converted into the text and that text is stored in the database.
3. This system is very efficient in reducing malpractices in the exams.

4.SOFTWARE TOOLS REQUIRED

4.1 PYTHON 3.8:

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Python supports modules and packages, which encourages program modularity and code reuse. Besides web and software development, Python is used for data analytics, machine learning, and even design. We take a closer look at some of the uses of Python, as well as why it's such a popular and versatile programming language. The programming language is used globally to design and build 2D imaging software like Inkscape, GIMP, Paint Shop Pro, and Scribus.

4.1.1 PYTHON FEATURES:

Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and has a large and comprehensive library. Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of its features support functional programming and aspect -oriented programming (including by meta programming and meta objects (magic methods)). Many other paradigms are supported via extensions, including design by contract and logic programming.

4.1.1.1 PYTHON IN IMAGE PROCESSING:

PIL (Python Imaging Library) is an open-source library for image processing tasks that requires python programming language. PIL can perform tasks on an image such as reading, rescaling, saving in different image formats. PIL can be used for Image archives, Image processing, Image display.

Numpy it is an open-source python library that is used for numerical analysis. It contains a matrix and multi-dimensional arrays as data structures. But NumPy can also use for image processing tasks such as image cropping, manipulating pixels, and masking of pixel values.

4.1.2 OPENCV:

OpenCV-Python is a library of Python bindings designed to solve computer vision problems. OpenCV is a great tool for image processing and performing computer vision tasks. It is an open-source library that can be used to perform tasks like face detection, objection tracking, landmark detection, and much more.

It supports multiple languages including python, java C++. OpenCV is used as an image processing library in many computer vision real-time applications. As we know an image is a combination of pixels, for a color image we have three channels with pixels ranging from 0 to 225, and for black & white-colored images has only one change ranging from 0 to 1. OpenCV is a video and image processing library and it is used for image and video analysis, like facial detection, license plate reading, photo editing, advanced robotic vision, and many more. This project utilizes OpenCV Library to make a Real-Time Face Detection using your webcam as a primary camera. Approach/Algorithms used: This project uses HAAR Cascade Algorithm to detect faces.

4.1.3 Dlib:

Dlib is a modern python toolkit containing machine learning algorithms and tools for creating complex software in python to solve real w;8orld problems. It is used in both industry and academia in a wide range of domains including robotics, embedded devices, mobile phones, and large high performance computing environments.

It's a landmark's facial detector with pre-trained models, the dlib is used to estimate the location of 68 coordinates (x, y) that map the facial points on a person's face like image below. These points are identified from the pre-trained model where the iBUG300-W dataset was used. Both OpenCV and dlib extensively for face detection and face recognition and dlib is much accurate as compared to OpenCV Haar based face detector. Note that OpenCV now has a DNN module where we get Deep Learning based Face Detector and Face Recognizer models.

4.1.4 LINEAR SVM:

SVM or Support Vector Machine is a linear model for classification and regression problems. It can solve linear and non-linear problems and work well for many practical problems. The idea of SVM is simple: The algorithm creates a line or a hyperplane which separates the data into classes. SVMs are formulated to solve a classical two class pattern recognition problem. We adapt SVM to face recognition by modifying the interpretation of the output of a SVM classifier and devising a representation of facial images that is concordant with a two class problem. A SVM algorithm generates a decision surface separating the two classes. For face recognition, we re-interpret the decision surface to produce a similarity metric between two facial images. This allows us to construct face-recognition algorithms.

4.1.5 MEDIAPIPE:

Mediapipe is a cross-platform library developed by Google that provides amazing ready-to-use ML solutions for computer vision tasks. OpenCV library in python is a computer vision library that is widely used for image analysis, image processing, detection, recognition, etc. MediaPipe is Google's open-source framework, used for media processing. It is cross-platform or we can say it is platform friendly. It is run on Android, iOS, web, and YouTube servers that's what Cross-platform means, to run everywhere.

4.1.6 NUMPY:

NumPy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays. It is the fundamental package for scientific computing with Python.

4.1.7 TKINTER:

Tkinter is the standard GUI library for Python. Python when combined with Tkinter provides a fast and easy way to create GUI applications. Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit. Tkinter is the Python interface to Tk, which is the GUI toolkit for Tcl/Tk. Tcl (pronounced as tickle) is a scripting language often used in testing, prototyping, and GUI de;8velopment. Tk is an open-source, cross-platform widget toolkit used by many different programming languages to build GUI programs. Python Tkinter is the standard Graphical User Interface (GUI) that is supported in Python. When Tkinter is used alongside Python, it results in the creation of GUI very conveniently and quite fast. The main advantage of using Tkinter is that it has an object-oriented interface.

4.2 ANACONDA:

Anaconda is a distribution of the Python and R programming languages for scientific computing data science, machine learning applications, large-scale data processing, predictive analytics, etc., that aims to simplify package management and deployment. The main difference between Anaconda and Python is, Anaconda is a distribution of Python and R programming languages for data science and Machine learning tasks whereas Python is a high-level general-purpose programming language.

4.2.1 ANACONDA NAVIGATOR:

Anaconda Navigator is a desktop graphical user interface (GUI) included in Anaconda distribution that allows you to launch applications and easily manage conda packages, environments, and channels without using command-line commands. Navigator can search for packages on Anaconda.org or in a local Anaconda Repository. Navigator is an

easy, point-and-click way to work with packages and environments without needing to type conda commands in a terminal window. You can use it to find the packages you want, install them in an environment, run the package;es, and update them – all inside Navigator.

Some of the applications that are available in the navigator are as follows:

- Jupyter Lab
- Jupyter Notebook
- Pycharm
- VS code
- Anaconda prompt

4.2.2 JUPYTER NOTEBOOK:

The Jupyter Notebook is the original web application for creating and sharing computational documents. It offers a simple, streamlined, document-centric experience. The Jupyter Notebook is the original web application for creating and sharing computational documents. Jupyter is an interactive Python notebook where you can run code, visualize data and include text all in one document. It offers a simple, streamlined, document-centric experience. Jupyter notebooks have three particularly strong benefits: They're great for showcasing your work. You can see both the code and the results. The notebooks at Kaggle is a particularly great example of this.

4.3 VISUAL STUDIO CODE (VS Code):

Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. It aims to provide just the tools a developer needs for a quick code-build-debug cycle and leaves more complex workflows to fuller featured IDEs, such as Visual Studio IDE. In contrast, Visual Studio Code can be classed as an integrated development environment (IDE), meaning that developers can write and test code at the same time. With support for hundreds of languages, VS Code helps you be instantly productive with syntax highlighting, bracket-matching, auto-indentation, box-selection, snippets, and more. Intuitive keyboard shortcuts, easy customization and community-contributed keyboard shortcut mappings let you navigate your code with ease.

4.3.1 Starting VS Code:

On a Microsoft Windows platform, to start VS code, double-click the VS code shortcut icon on your Windows desktop. On a UNIX platform, to start VS code, type vs code at the operating system prompt.

After starting VS Code, the VS Code desktop opens - see VS Code Desktop. You can change the folder in which VS Code starts, define startup options including running a script upon startup, and reduce startup time in some situations. Note that when running a code which are in different files that must be in the same folder.

4.3.2 Quitting VS Code:

To quit the vs code while running a code by clicking the ctrl + c we can quit the current open file which is running. To close the file which is opened by clicking the close mark on the file it can be closed. On clicking the close tab icon on vs code desktop we quit from the vs code and come back to windows desktop.

4.3.3 VS CODE DESKTOP:

When you start VS code, the VS code desktop appears, containing tools (graphical user interfaces) for managing files, variables, and applications associated with VS code. The first time VS code starts, the desktop appears as shown in the following illustration, although your Launch Pad may contain different entries.

You can change the way your desktop looks by opening, closing, moving, and resizing the tools in it. You can also move tools outside of the desktop or return them back inside the desktop (docking). All the desktop tools provide common features such as context menus and keyboard shortcuts.

You can specify certain characteristics for the desktop tools by selecting Preferences from the File menu. For example, you can specify the font characteristics for Command Window text. For more information, click the Help button in the Preferences dialog box.

4.3.3.1 Desktop tools:

This section provides an introduction to VS code desktop tools. You can also use VS code functions to perform most of the features found in the desktop tools. The tools are:

Command window:

Use the command window to run the functions or code and also to run files in the specified folder.

Explorer window:

In the explorer window it contains all the files and folders which the user has added to run the code or function. It is like file manager tab which stores all files which have been added by the user. When user want to run the function there is no need to add the file again. If user has added lots of files in a folder the required file can be opened using the search option which is right below the explorer tab.

Extension browser:

We know that vs code is capable of running lots of code of many types of programming languages so for that any extensions needed for a specific language that can be installed from this extension browser. For example, to run java code it need some extension file so we can install from that browser.

File tab:

With the help of this tab the user can create new files and folders or open the existing files and folders to the current workspace. User can also create duplicate workspace using this tab. With this tab user can also close files and folders which have been opened on the workspace.

Help Browser:

Use the Help browser to search and view documentation for all your files. The help browser is a web browser where user can know more about the vs code.

To open the Help browser, click the help button in the toolbar. The help browser consists of all the keys by which user can know how to use vs code with ease. It consists of shortcut keys folder using this you can learn the short cut keys to do functions easier and faster.

Terminal:

To open the terminal, click on the terminal in the tool bar. The terminal is used for running the given tasks which is to run the programs and execute the programs. This terminal shows the output of the given task in the browser. To run the program there is a play button by clicking on that you can run and debug the given program or task.

4.4 NATURAL LANGUAGE PROCESSING (NLP):

Natural language processing (NLP) refers to the branch of computer science—and more specifically, the branch of artificial intelligence or AI—concerned with giving computers the ability to understand text and spoken words in much the same way human beings can. It helps machines process and understand the human language so that they can automatically perform repetitive tasks. Examples include machine translation, summarization, ticket classification, and spell check.. The five phases of NLP involve lexical (structure) analysis, parsing, semantic analysis, discourse integration, and pragmatic analysis. NLP pre-trained models are useful for NLP tasks like translating text, predicting missing parts of a sentence or even generating new sentences. NLP pre-trained models can be used in many NLP applications like such as chatbots and NLP API etc.

4.4.1 SPEECH RECOGNITION LIBRARY:

Speech recognition is a machine's ability to listen to spoken words and identify them. You can then use speech recognition in Python to convert the spoken words into text, make a query or give a reply. You can even program some devices to respond to these spoken words. The easiest way to install this is using pip install Speech Recognition. Otherwise, download the source distribution from PyPI, and extract the archive. In the folder, run python setup.py install. The algorithms used in this form of technology include PLP features, Viterbi search, deep neural networks, discrimination training, WFST framework, etc. If you are interested in Google's new inventions, keep checking their recent publications on speech. Speech recognition is an interdisciplinary subfield of NLP that develops methodologies and technologies to enable the recognition and translation of spoken language into text by computers. Speech recognition software works by breaking down the audio of a speech recording into individual sounds, analyzing each sound, using algorithms to find the most probable word fit in that language, and transcribing those sounds into text. Speech recognition technologies such as Alexa, Cortana, Google Assistant and Siri are changing the way people interact with their devices, homes, cars, and jobs. The technology allows us to talk to a computer or device that interprets what we're saying in order to respond to our question or command.

4.4.2 NATURAL LANGUAGE PROCESSING TOOLKIT (NLTK):

NLTK is the main library for building Python projects to work with human language data. It gives simple to-utilize interfaces to more than 50 corpora and lexical assets like WordNet, alongside a set-up of text preprocessing libraries for tagging, parsing, classification, stemming, tokenization and semantic reasoning wrappers for NLP libraries and an active conversation discussion. NLTK is accessible for Windows, Mac OS, and Linux. The best part is that NLTK is a free, open-source, local area-driven venture. It has some disadvantages as well. It is slow and difficult to match the demands of production usage. The learning curve is somehow steep. Some of the features provided by NLTK are;

- Entity Extraction
- Part-of-speech tagging
- Tokenization
- Parsing
- Semantic reasoning
- Stemming
- Text classification

4.4.3 Text Analysis using NLP:

NLTK is a powerful Python package that provides a set of diverse natural languages algorithms. It is free, opensource, easy to use, large community, and well documented. NLTK consists of the most common algorithms such as tokenizing, part-of-speech tagging, stemming, sentiment analysis, topic segmentation, and named entity recognition. NLTK helps the computer to analysis, preprocess, and understand the written text.

4.4.4 Text Classifiaction:

Text classification is one of the important tasks of text mining. It is a supervised approach. Identifying category or class of given text such as a blog, book, web page, news articles, and tweets. It has various application in today's computer world such as spam detection, task categorization in CRM services, categorizing products on E-retailer websites, classifying the content of websites for a search engine, sentiments of customer feedback, etc. In the next section, you will learn how you can do text classification in python.

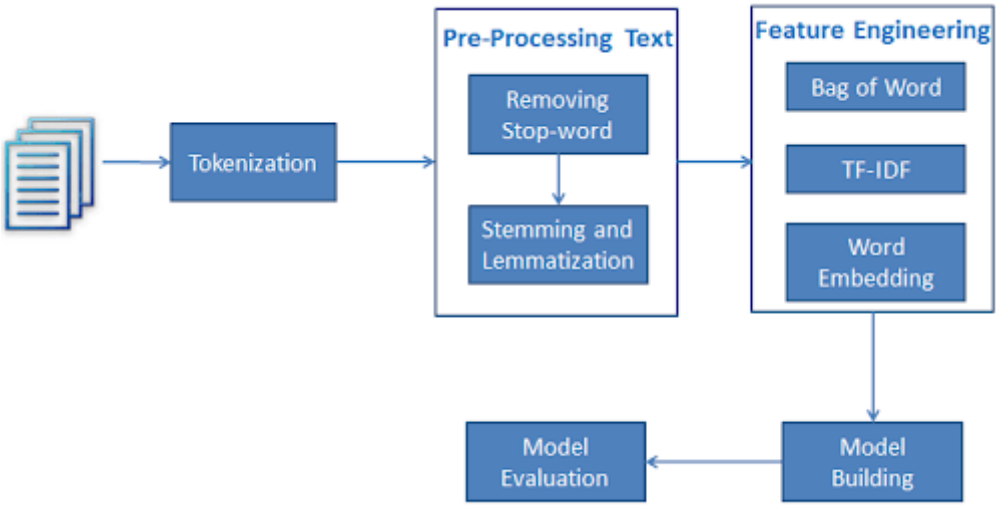

Fig 4.1 Text analysis flow diagram

4.4.5 Tokenization:

Tokenization is the first step in text analytics. The process of breaking down a text paragraph into smaller chunks such as words or sentence is called Tokenization. Token is a single entity that is building blocks for sentence or paragraph.

4.4.6 Stop Words:

Stop words considered as noise in the text. Text may contain stop words such as is, am, are, this, a, an, the, etc. In NLTK for removing stop words, you need to create a list of stop words and filter out your list of tokens from these words.

4.4.7 Stemming and Lemmatization:

Stemming is a process of linguistic normalization, which reduces words to their word root word or chops off the derivational affixes. For example, connection, connected, connecting word reduce to a common word "connect".

Lemmatization reduces words to their base word, which is linguistically correct lemmas. It transforms root word with the use of vocabulary and morphological analysis. Lemmatization is usually more sophisticated than stemming. Stemmer works on an individual word without knowledge of the context. For example, The word "better" has "good" as its lemma. This thing will miss by stemming because it requires a dictionary look-up.

4.5 NEURAL NETWORK CLASSFIER:

A neural network model which is the branch of artificial intelligence is generally referred to as artificial neural networks (ANNs). ANN teaches the system toexecute task, instead of programming computational system to do definite tasks. To perform such tasks, Artificial Intelligence System (AI) is generated. It is a pragmatic model which can quickly and precisely find the patterns buried in data that replicate useful knowledge. One case of these AI models is neural networks. AI systems should discover from data on a constant basis. In the areas of medical diagnosis relationships with dissimilar data, the most available techniques are the Artificial Intelligence techniques. An artificial neural network is made up of many artificial neurons which are correlated together in accordance with explicit network architecture. The objective of the neural network is to convert the inputs into significant outputs.The teaching mode can be supervised or unsupervised. Neural Networks learn in the presence of noise.

ANNs found their usage in many areas such as,

- Bankruptcy prediction and Speech recognition
- Product inspection
- Fault detection

4.5.1 Neural Networks as Classifiers:

A neural network consists of units (neurons), arranged in layers, which convert an input vector into some output. Each unit takes an input, applies a (often nonlinear) function to it and then passes the output on to the next layer. Generally the networks are defined to be feed-forward: a unit feeds its output to all the units on the next layer, but there is no feedback to the previous layer. Weightings are applied to the signals passing from one unit to another, and it is these weightings which are tuned in the training phase to adapt a neural network to the particular problem at hand. This is the learning

phase.Neural networks have found application in a wide variety of problems. These range from function representation to pattern recognition, which is what we will consider here.

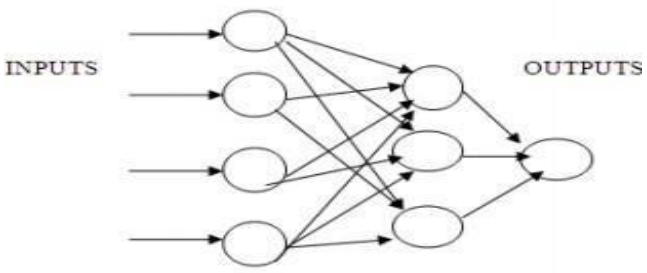

Fig.4.2 Artificial Neural Networks

4.5.2 Back Propagation Neural Network:

Artificial neural networks (ANN) consider classification as one of the most dynamic research and application areas. The major disadvantage in using ANN is to find the most appropriate grouping of training, learning and transfer function for classifying the data sets with growing number of features and classified sets. The different combinations of functions and its effect while using ANN as a classifier is studied and the correctness of these functions are analyzed for various kinds of datasets.

The real world problems which are represented by multidimensional datasets are taken from medical background. The classification and clustering of these data sets are significant. The data set is divided into training set and testing set and it has no usage in the training process. The results are produced with the help of these datasets and it is used for testing. The training set is taken from 2/3rd of the dataset and the remaining has been taken as test set. This is made through the assessmentof the accuracy achieved through testing against these data sets. Then the network is simulated with the same data.

The back propagation algorithm trains the neural network. Gradient descent method(GDM) was used to decrease the mean squared error between network output and the actual error rate.

The following parameters are considered to measure the efficiency of the network,Rate of convergence

- No of epochs taken to converge the network.
- The calculated Mean Square Error (MSE).

5.IMPLEMENTATION

5.1 FLOW DIAGRAM:

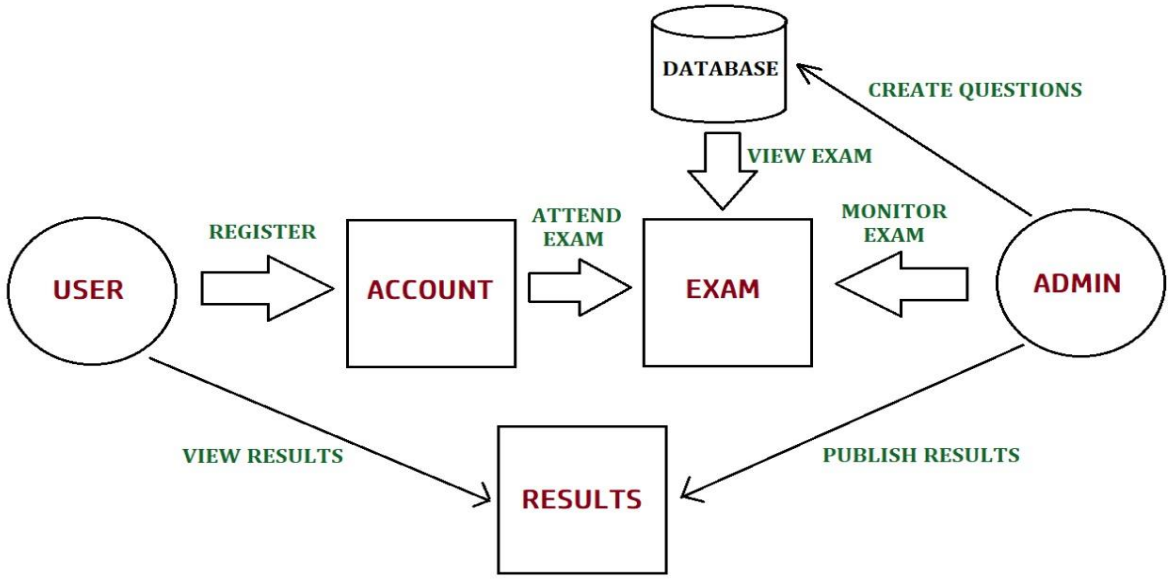

Fig.5.1 Flow Diagram of system

As we can see in the flow diagram the user need to register for the exam before he/she starts the exam. To register user must enter all the details which have been asked before starting exam. All that details which are provided by the user stored in the database and an account is created. Then the exam starts and the questions are displayed which are created by the admin and stored in the database. The questions which have been answered by the user are automatically stored in the database once the exam time completes. The results are published by admin to the registered mail of the user and thus the user can check results. The results are provided by considering all activities of user done in the camera proctored exam and if there is any suspicious activities are found then result will be disqualified.

5.2 UML DIAGRAMS:

5.2.1 INTRODUCTION TO UML:

UML (Unified Modeling Language) is a language for visualizing, specifying, constructing and documenting the artifacts of a software intensive system. UML is simply another graphical representation of a common semantic model. UML diagrams are the ultimate output of the entire discussion. All the elements, relationships are used to make a complete UML diagram and the diagram represents a system.

The visual effect of the UML diagram is the most important part of the entire process. All the other elements are used to make it a complete one. UML includes the following nine diagrams and the details are described in the following chapters.

UML defines several models for representing systems

1**. Use case diagram:** represents the functions of a system from the user's point of view.

2**. Class diagram:** represents the static structure in terms of classes and relationships.

3. **Object diagram:** represents objects and their relationships and correspond to simplified collaboration diagrams that do not represent message broadcasts.

4. **Sequence diagram:** Temporal representation of objects and their interactions.

5. **Collaboration diagram:** Spatial representation of objects, links, and interactions.

6. **State chart diagram:** represents the behavior of a class in terms of states at run time.

7. **Activity diagram:** represents the behavior of an operation as a set of actions.

8. **Component diagram:** represents the physical components of an application.

9. **Deployment diagram:** represents the deployment of components on particular pieces of hardware.

Advantages

● To represent complete systems (instead of only the software portion) using objectoriented concepts.

● To establish an explicit coupling between concepts and executable code.

● To take into account the scaling factors that are inherent to complex and critical systems.

● To create a modeling language usable by both humans and machines.

Conceptual model of UML can be mastered by learning the following three major elements:

● UML building blocks.

● Rules to connect the building blocks.

● Common mechanisms of UML.

5.2.2 USE CASE DIAGRAM:

AIM: To implement use case diagram for Smart Proctoring Online Examination Platform Using Opencv.

DESCRIPTION: Use case diagrams are central to modeling the behavior of the system or a class. Use case diagrams are important for testing executable systems through reverse engineering.

OBJECTIVE: Use case diagram organizes the behavior of the system.

THINGS: Use cases, Actors.

RELATIONSHIPS: Dependency, generalization and Association.

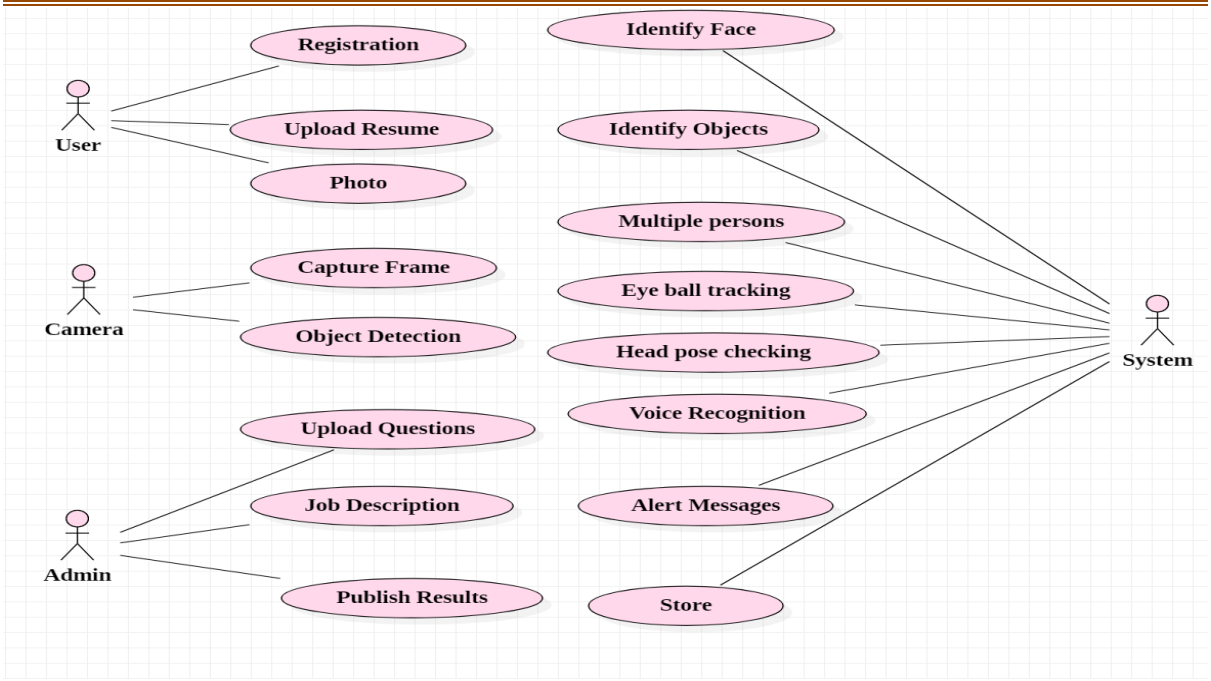

Fig.5.2 Use case diagram

5.2.3 CLASS DIAGRAM:

AIM: To implement class diagram for Smart Proctoring Online Examination Platform Using Opencv.

DESCRIPTION: A class diagram shows a set of classes, interfaces and collaborations and their relationships.

OBJECTIVE: The main objective of the class diagram to illustrate the static design of a view system. **THINGS:** class, interfaces, collaboration, active class.

RELATIONSHIPS: Dependency, generalization and association

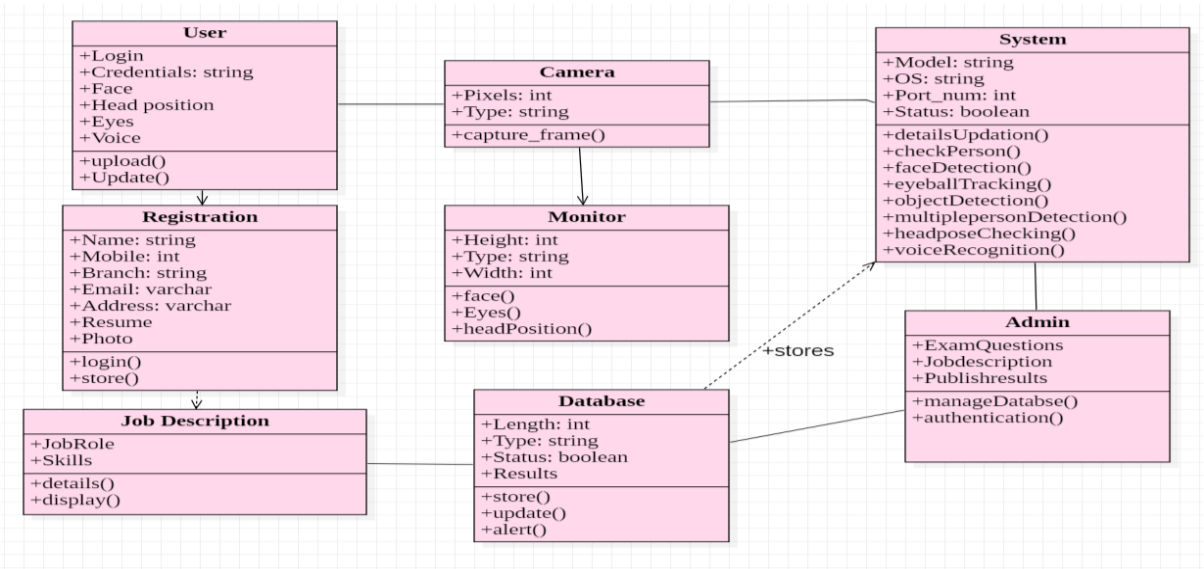

Fig.5.3 Class diagram

5.2.4 SEQUENCE DIAGRAM:

AIM: To implement sequence diagram for Smart Proctoring Online Examination Platform Using Opencv.

DESCRIPTION: A Sequence diagram is an interaction diagram that emphasizes the time ordering messages. It shows a set of objects and messages sent and received by the by those objects.

OBJECTIVE: To illustrate the dynamic view of system

THINGS: Objects and Messages

RELATIONSHIP: Time and life line, Links

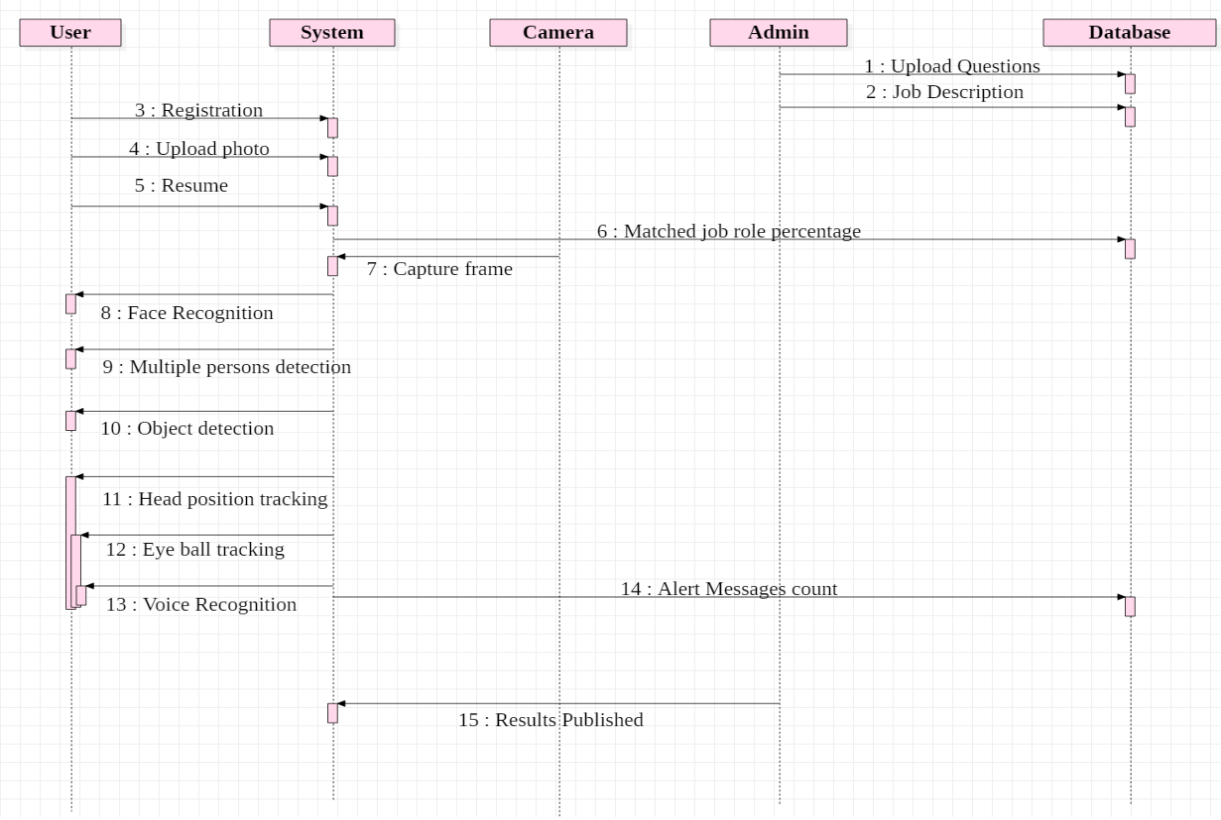

Fig.5.4 Sequence Diagram

5.2.5 ACTIVITY DIAGRAM:

AIM: To implement activity diagram for Smart Proctoting online examination platform Using Opencv.

DESCRIPTION: An activity diagram is essentially a flow chart, showing flow of control from activity to activity. It involves modeling the sequential steps in computational process. Activity diagram not only important for modeling dynamic aspects of a system, but also for constructing executable system through forward and reverse engineering.

OBJECTIVE: Focused on flow of control from activity to activity

THINGS: State and object

RELATIONSHIPS: Transitions

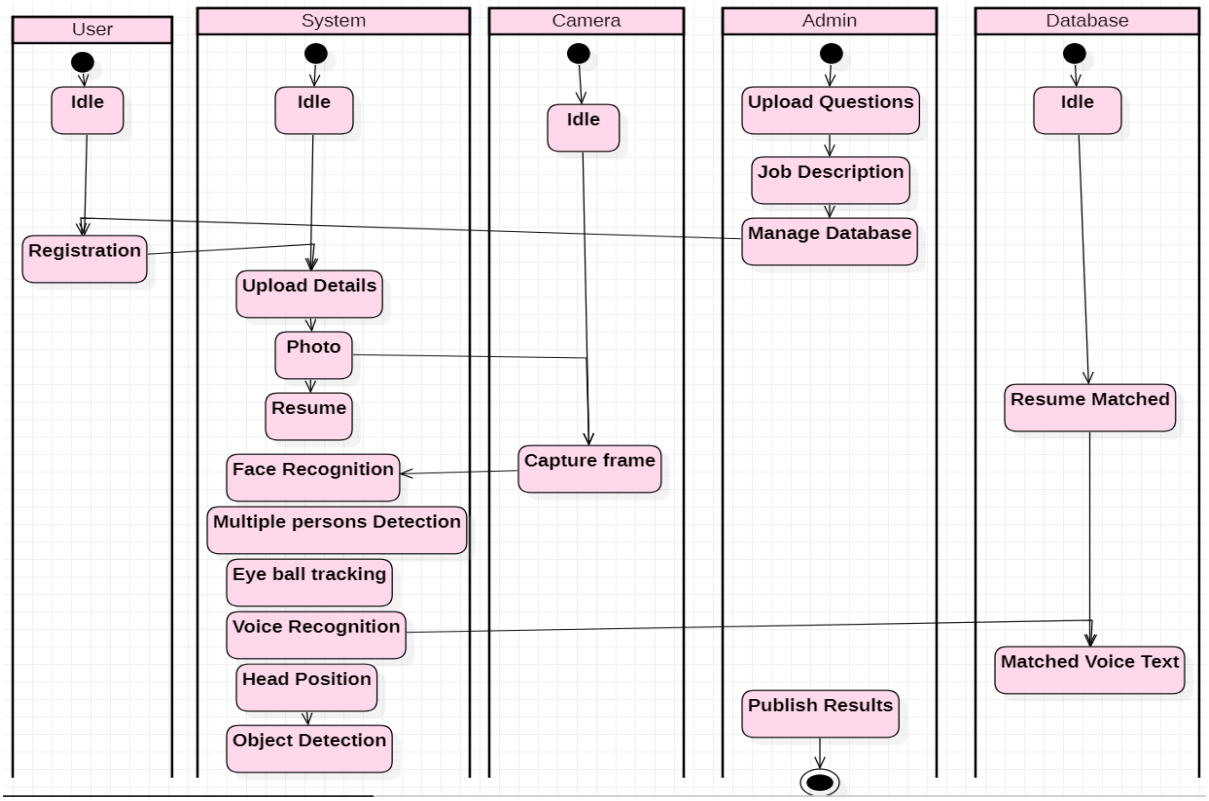

Fig.5.5 Activity diagram

5.2.6 DEPLOYMENT DIAGRAM:

AIM: To implement deployment diagram for Smart proctoring online examination platform Using Opencv.

DESCRIPTION: A deployment diagram is a type of diagram that specifies the physical hardware on which the software system will execute. The software system is manifested using various artifacts, and they are mapped to an execution environment that is going to execute software such as nodes.

OBJECTIVE: Used with the sole purpose of describing how software is deployed into the hardware system.

THINGS: Node, Component, Artifact and Interface.

RELATIONSHIP: Nodes.

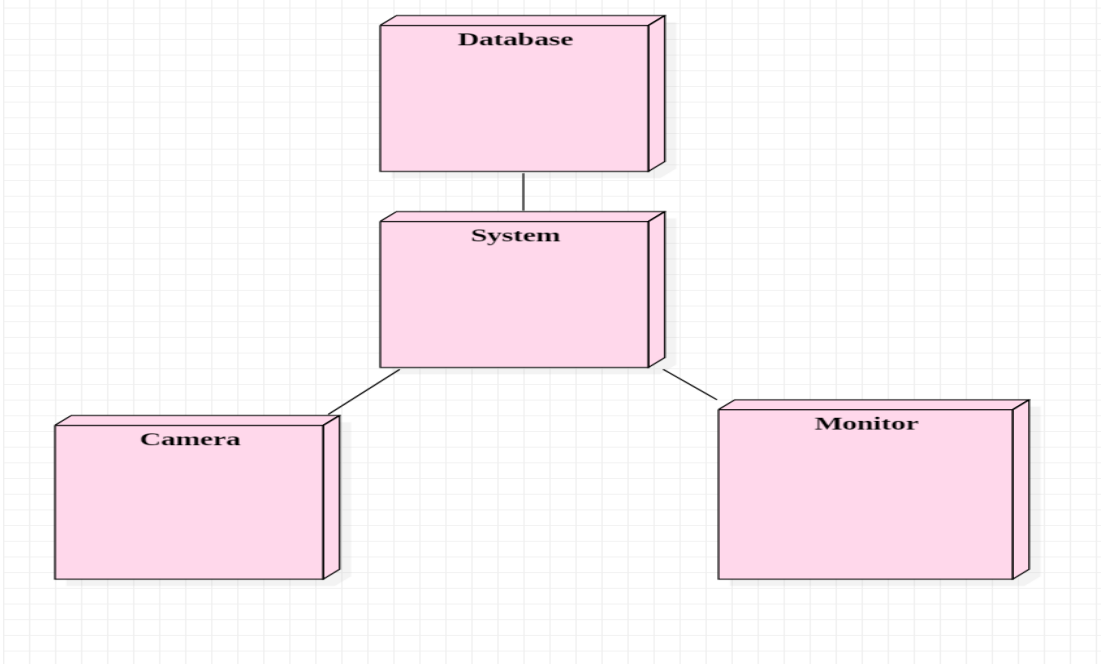

Fig.5.6 Deployment diagram

5.3 TESTING:

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

5.4 TYPES OF TESTING:

5.4.1 UNIT TESTING:

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

Test strategy and approach:

Field testing will be performed manually and functional tests will be written in detail.

Test objectives

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

Features to be tested

- Verify that the entries are of the correct format
- No duplicate entries should be allowed
- All links should take the user to the correct page

5.4.2 INTEGRATION TESTING:

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

5.4.3 ACCEPTANCE TESTING:

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

5.4.4 FUNCTIONAL TESTING:

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and

user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures : interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

5.5 FEASIBILITY STUDY:

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are:

- Economical Feasibility
- Technical Feasibility
- Social Feasibility

5.5.1 Economical Feasibility:

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus, the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

5.5.2 Technical Feasibility:

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for

implementing this system.

5.5.3 Social Feasibility:

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His/ Her level of confidence must be raised so that he/she is also able to make some constructive criticism, which is welcomed, as he/she is the final user of the system.

5.6 TEST CASES:

5.6.1 TEST CASE 1:

S.No	Test Case ID	Registration to start exam
1	**Precondition**	User register for exam
2	**Description**	Stores all the details provided by user in the database
3	**Test Steps**	1. Registration is completed 2. Exam starts and proctored through webcam
4	**Expected Output**	Details has stored in the data base and proctoring begins
5	**Actual Output**	Details has stored in the database and proctoring begins
6	**Status**	PASS
7	**Remarks**	-

Table 5.1 Test Case 1

5.6.2 TEST CASE 2:

SNO	Test case ID	Detection of malpractice
1	**Precondition**	User does any suspicious activity it is recorded and stored as malpractice
2	**Description**	Malpractices which are described in code if such activities are found it stores as malpractice found
3	**Test Steps**	1. Proctoring is done through webcam 2. Detection of person activities
4	**Expected Output**	Malpractice found
5	**Actual Output**	Malpractice found
6	**Status**	PASS
7	**Remarks**	-

Table 5.2 Test Case 2

5.6.3 TEST CASE 3:

SNO	Test case ID	No Malpractices found
1	**Precondition**	If no malpractices are found then it should give output as everything good
2	**Description**	Malpractices which are described in code if such activities are not found it stores as everything is good
3	**Test Steps**	1. Proctoring is done through webcam 2. Detection of person activities
4	**Expected Output**	Everything is good
5	**Actual Output**	Everything is good
6	**Status**	PASS
7	**Remarks**	-

Table 5.3 Test case 3

6.EXPERIMENTAL RESULTS

6.1 EXECUTION PROCEDURE:

Step 1: Initially the program is started by the admin.

Step 2: Then a tab will be displayed click on start exam which is on the tab.

Step 3: After clicking on start exam then a details box will be opened fill all the details asked in that portal. It is to register for the exam that is going to be attempted. All those details are stored in the database.

Step 4: After the registration the questions are displayed which are going to be attempted by the user. Actually these questions are present in database by the admin.

Step 5: Simultaneously at the backend the system is proctoring all the activities of the candidate.

Step 6: If any suspicious activities are done then the system will store it as malpractice and if there are no such activities it will store as everything is good.

Step 7: If the exam is submitted then at time of results the malpractices are considered which are stored in database during the exam.

6.2 SCREENSHOTS:

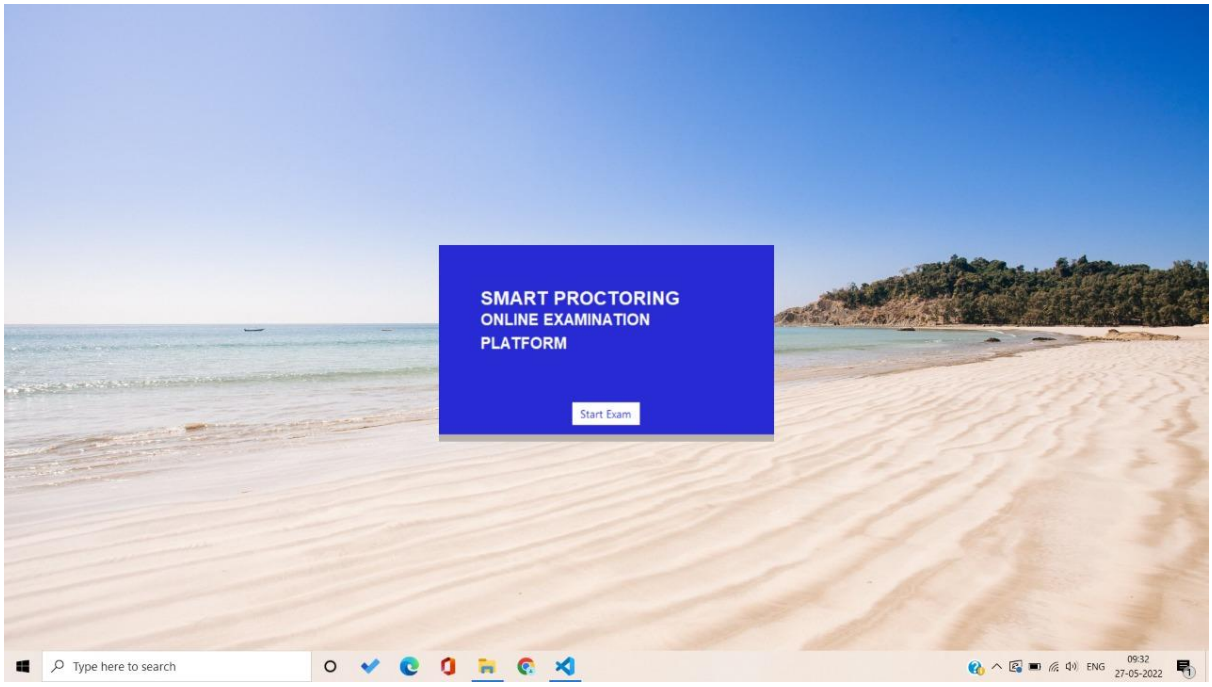

Fig.6.1 Opening tab to start the exam

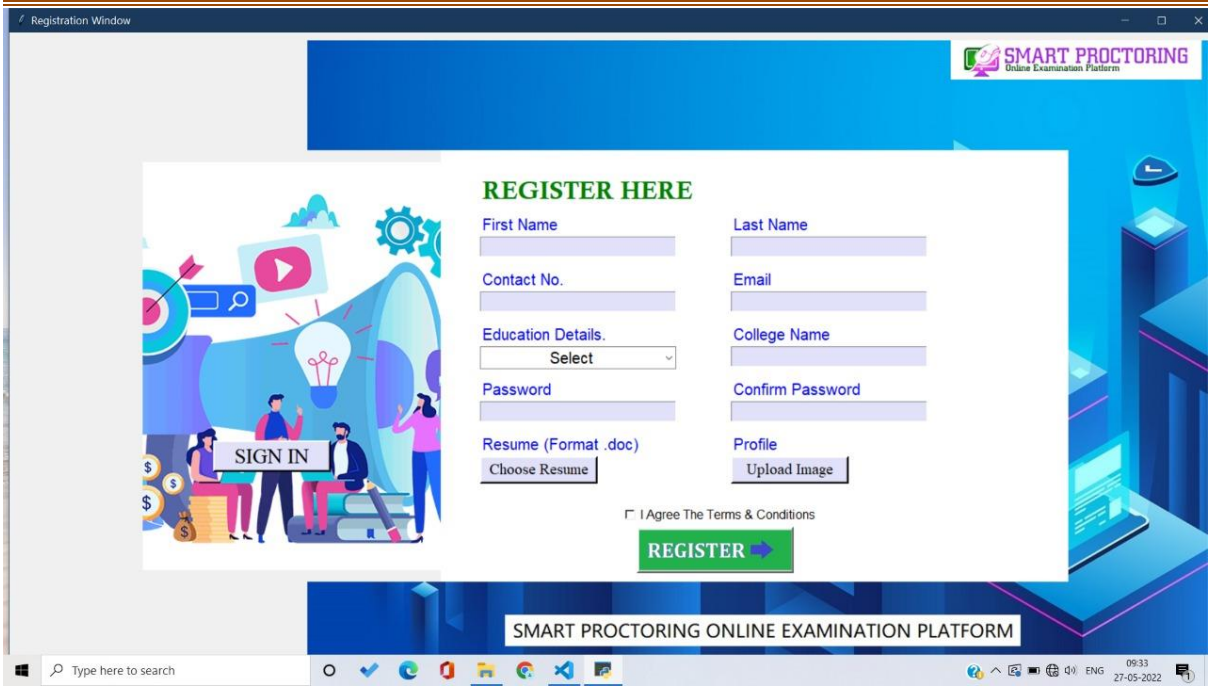

Fig.6.2 Registration tab to register for the exam

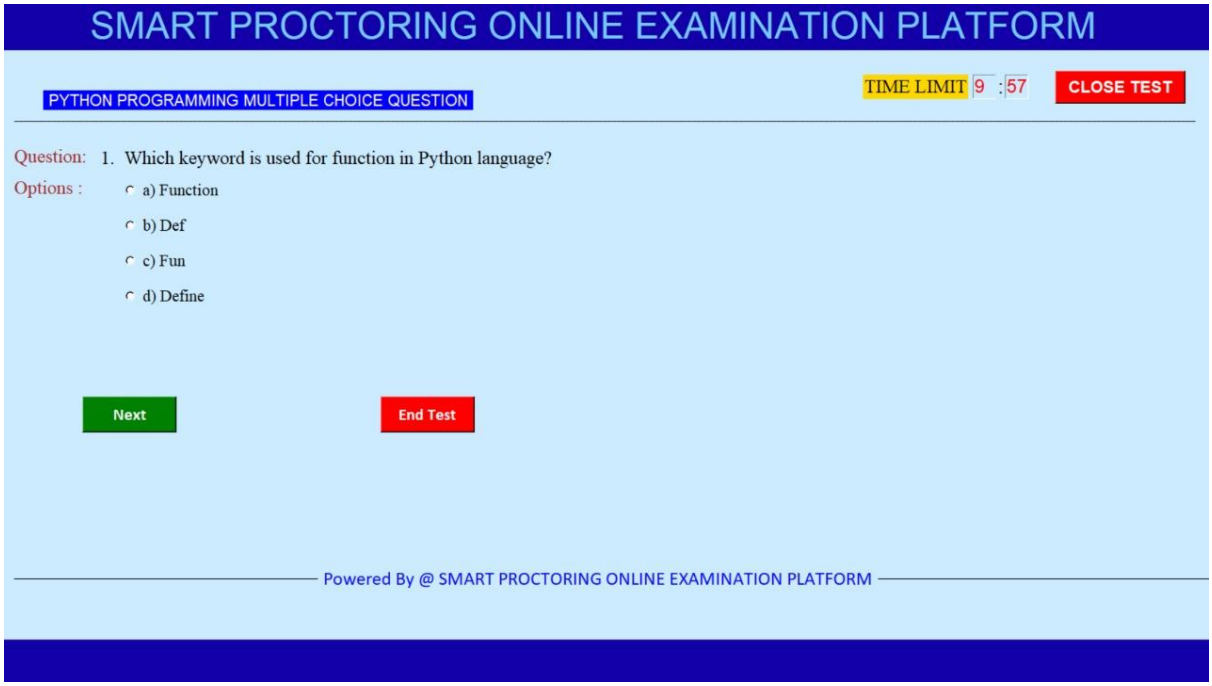

Fig.6.3 Attempting the exam by answering to the question in given time

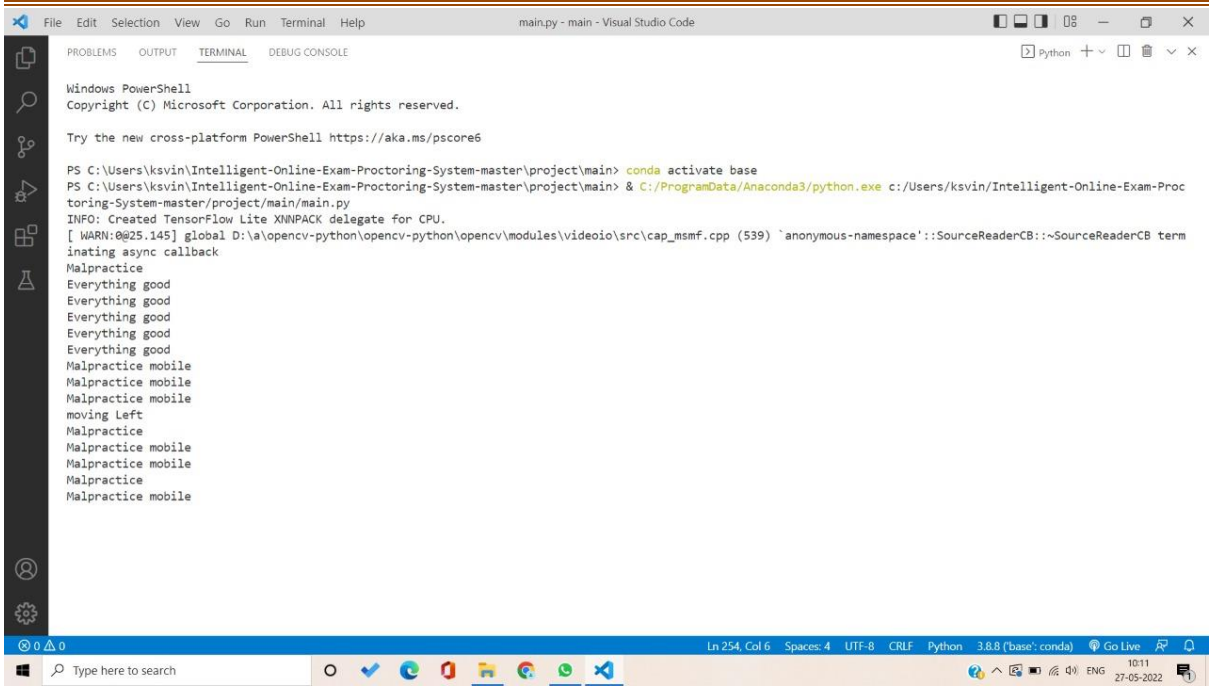

Fig.6.4 Detection of malpractice during exam saved in database

Fig.6.5 Closing tab after completion of exam

7.CONCLUSION

The smart proctoring online examination platform is more useful in reducing the malpractices during the exam whish are done by the candidate. This system is developed using the tools like openCV and machine learning which has more demand in these days. This system conducts examination by fair means and maintain its integrity.

It also uses YOLOV3 algorithm which is very fast in recognizing face and objects. It has one more advantage that it detects the voice and stores it in database for valuation purpose. So we can say that the system is robust and proctors strictly. Hence, by this system there will be reduce work to the human proctor in the exams.

FUTURE ENHANCEMENT

There are opportunities for further improvement of this project from both technical side and education point of view. Now the system is robust but by the new technologies which are developing these days very helpful to build more robust and accurate platforms or systems. Then those systems will be helpful to test the knowledge of the candidate appeared for the exam and by that future systems there will be no use of human proctors during the examinations.

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