IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

"Automated Exam Proctoring Using AI & GUI"

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Abstract:

Online examinations have turned out to be the new norm. However, it is not that easy to proctor the students as rigorously as in in-center examinations. It is essential to find an approach to proctor the online examinations too as rigorously as possible. There are already several webcam proctoring systems that are used in the real world, but these systems are not very accurate and miss out on detecting all possible malpractices and in certain cases due to defect in the system it detects a malpractice for someone who never even attempted any.This project focuses mainly on building features that can make the existing webcam proctoring system more advanced and rigorous. The project is aimed at building the following features namely head pose estimation, mouth opening detection, eye ball monitoring, number of persons detection, mobile phone detection and face spoofing detection. For each of these features, machine learning models are built using Python. All these features make use of the live webcam feed which is obtained using OpenCV and an output is obtained which gives information about the direction of the head and eyes, presence of more than one person and presence of mobile phone, opening of mouth, occurrence of face spoofing. All these outputs are recorded as a log file which can be used to identify any possible malpractices based on these features.

Key words: Automated Exam PROCTORING USING AI & GUI, Open CV, Cheating detector

I. Introduction

Online examination systems are still at a very early stage and have a lot of improve with respect to its user interface as well as its proctoring abilities. Most of the online examination systems have all kinds of proctoring features but the accuracy ofthese features is still under scrutiny.

Webcam, microphone and screen sharing are the three major data that are collected during online examinations. Of these, the data collected from webcam is still not used to its full potential. In the present day online proctoring systems, only facedetection process is implemented

II. Literature Review

Interest in the affordances of technology for learning and teaching is on the rise. This is leading toa growing interest in online learning and teaching. When used effectively, online learning is able to provide higher education institutions with flexible options to expand their offerings into the global market (Casey, 2008). However, as institutions continue to grow their online education, there is a commensurate rise in concerns about how best to ensure academic integrity (Barnes & Paris, 2013).The *distance* or *flexibility* between students and instructors in an online learning environment may, in fact, contribute to the challenges of maintaining the integrity of online assessment. This wasalso highlighted by Hollister and Berenson (2009) that, "the most commonly reported challengein online assessment is how to maintain academic integrity". While proctored exams remain a common tool for assessing student learning, ways of facilitating them continue to evolve fromonline exams facilitated via learning management systems (LMS) to other online testing platforms (Prisacari & Danielson, 2017). This has raised both academic and non-academic issues, suchas the designing and administering of online exams, and monitoring students' behaviour during exams (Cramp et al., 2019). These behaviours include dishonest and unethical practices by the students such as cheating and fraud.

In their study, King et al. (2009) reported that the majority of students surveyed felt that cheating was easier in an online environment compared to a traditional face-to-face classroom. Similarly, Berkey and Halfond (2015) reported that 84% of the students surveyed in their study agreed that student dishonesty in online test-taking was a significant issue. In a study of 635 students, Watson and Sottile (2010) also noted that students indicated that they would be more than four times more likely to cheat in an online class. Several other studies also found higher rates of cheating online (Lanier, 2006; Harmon & Lambrinos, 2008; Grijalva et al., 2006) and prevalence of cheating online compared to in a face-to-face environment (Etteret al., 2006; Watson & Sottile, 2010).

Ensuring and maintaining academic honesty and integrity in any learning environment is vital andsignificant. When putting this in the context of an online learning environment, Moten et al. (2013) explained that students in these learning environments work independently with relative autonomy and anonymity, and instructors may be uncertain who is taking exams or how best to validate studentlearning. Therefore, online learning must address issues and challenges of honesty and integrity in student assessment and evaluation. Online proctoring is one way to address this challenge. With technology- based aides, such as computer/system lockdowns, keystroke monitoring, the ability to stop/start a test, and many other assistive proctoring processes (Foster & Layman, 2013) now easilyintegrated into the monitoring process, online proctoringhas now become a viable solution.

Moreover, online proctoring offers both instructors and students other significant advantages. Kinney (2001) noted that online proctoring is a valuable option for students who are geographically dispersed with time differences. Several studies (such as Bedford et al., 2009; Harmon et al.,2010; Rose, 2009; Watson & Sottile, 2010) found that when compared with traditional face-to-face settings, the technologies associated with monitoring of the online examination can provide better exam security and integrity. Karim et al. (2014) in their study found that the use of remote online proctoring decreases instances of student cheating. Similarly, Kolski and Weible (2019) posited thatthe importance of academic integrity could be reinforced when students are aware of the instructorsreviewing their recorded exam sessions. Likewise, Tao and Li (2012) highlighted that online proctoringreduces instructional time dedicated to testing allowing instructors and students to engage more withthe course content.

However, there are mixed findings in terms of student performance in online-proctored exams. Schultz et al. (2007) in their study reported that students who took the non-proctored online exams performed significantly higher than did those in the proctored settings. Similarly, Alessio et al. (2017),Richardson and North (2013), Wellman and Marcinkiewicz (2004) and Carstairs and Myors (2009) reported the same findings with non-proctored test scores being significantly better than proctored test scores in their respective studies. But, other studies (such as Ladyshewsky (2015), Yates and Beaudrie (2009) and Beck (2014) found no significant difference between the test scores in proctoredversus non-proctored online tests.

For institutions, selecting the fit-for-purpose online exam proctoring technology can be challenging.While there are not many studies on how institutions selected and integrated online proctoring systems, Brown (2018) describes three factors that can impact the selection of an online exam proctoring solution: cost, security and, instructor and student comfortability with the use of technologyhighlighting that involving the faculty in the selection of the online proctoring technology would be beneficial. She further identifies technology support staff, teaching staff and students as the three most important stakeholders in the selection process of the fit-for-purpose online exam proctoring technology of an institution (Brown, 2018).

Moreover, Foster and Layman (2013) developed a comparison matrix that describes online proctoring functionality, and compares that functionality across various online proctoring services/ products such as proctoring features (human-proctor availability, data transfer encryption, proctor management, recorded review, automated proctoring, incident logs, etc.), lockdown features (browser lockdown, computer operations lockdown, keystroke alerts, etc.), authentication options (facial recognition, photo comparison, keystroke analytics, biometrics, etc.) and webcam features (camera view angles, panning, etc.). This matrix could be useful for institutions in the process of identifying and selecting the right online exam proctoringsystem.

III. Proposed System

The proposed system brings out a lot more features and more accuracy to the existing system.

Firstly, using OpenCV, live webcam feed is captured and processed, which means, several frames are captured per second. Next, in addition to just detecting number of faces, several other features such as monitoring eye movement, identifying the presence of objects such as mobile phone and other electrical gadgets, face spoofing detection, estimating position and direction of the head and measuring the distance between lips to identify if the person is talking.

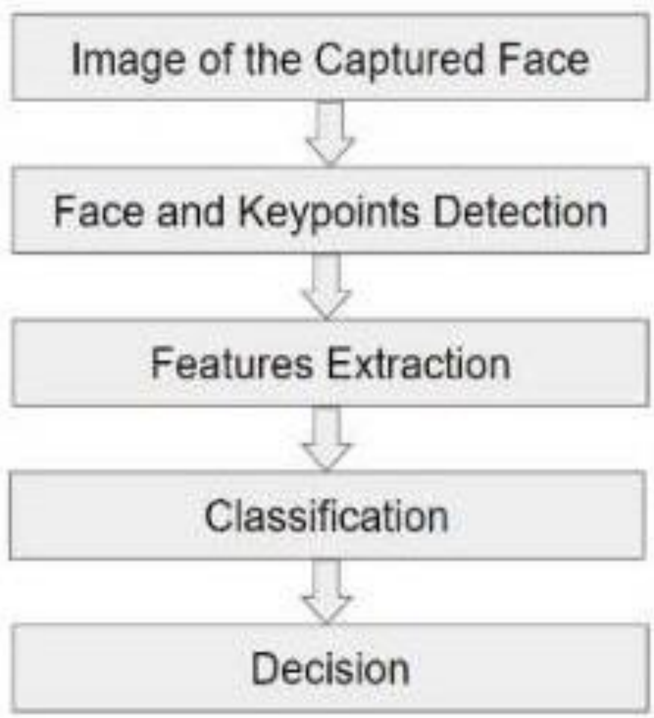


Fig a. system Architecture

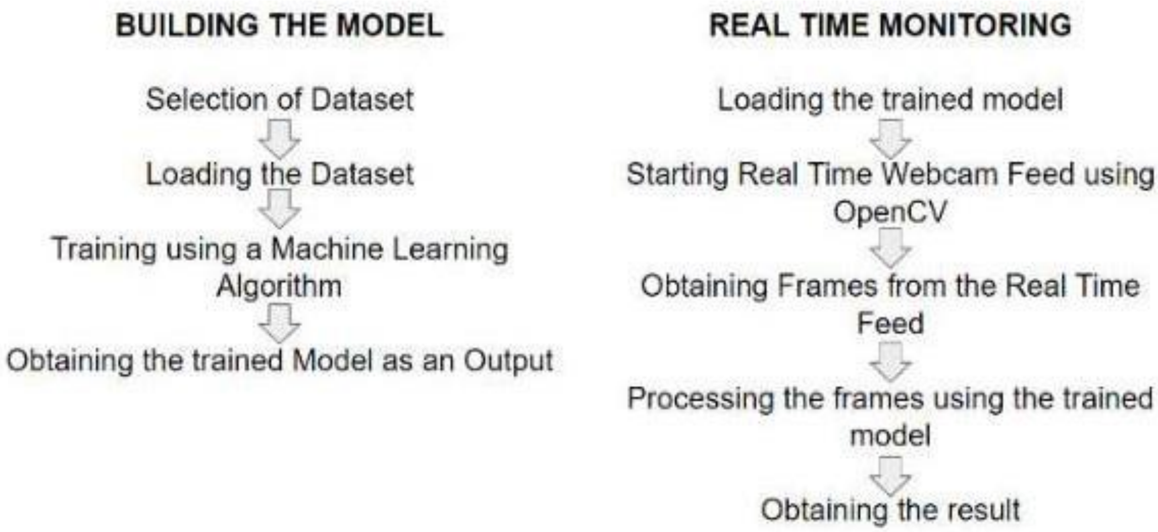


Fig b. Flow of the system.

IV. System Requirements

Dataset Requirements

Dataset : Shape Predictor Dataset, Face net weight set, Anti spoofing model.h5

Software Requirements (Platform Choice)

Operating System : Windows

Programming Language : Python

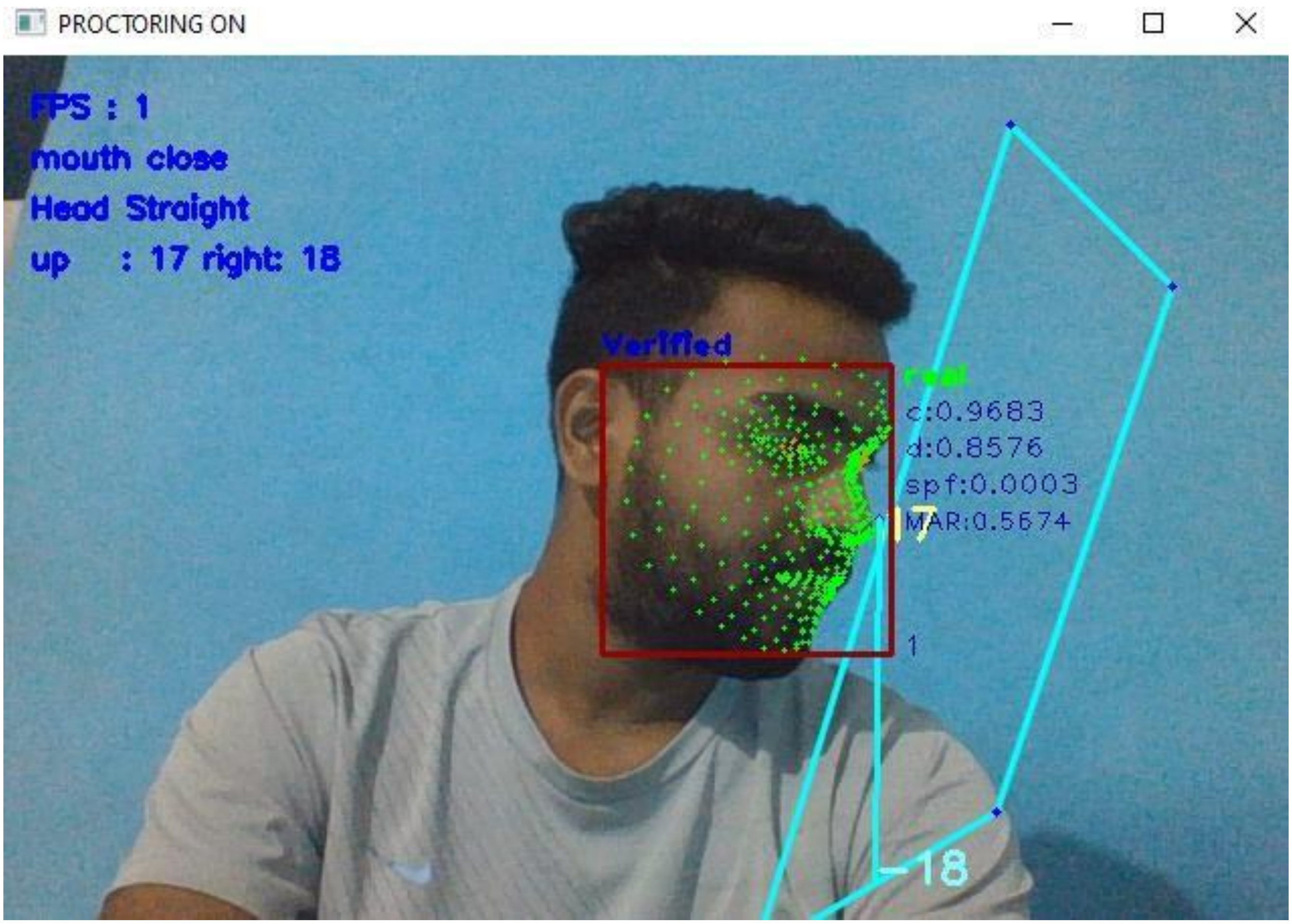
IDE : PyCharm, Conda, or any ide which supports python library

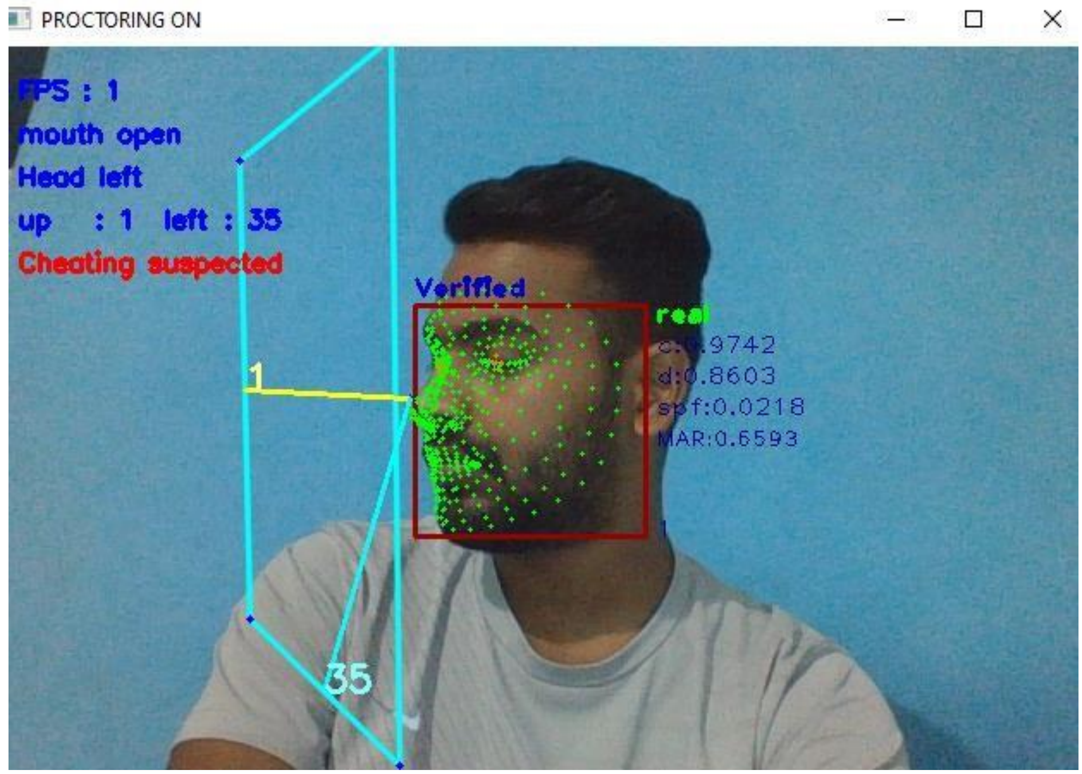
Hardware Requirements

- Processor : I5 (Recommended) / I3 (min)
- Speed : 2.1 GHz
- RAM : 8 Gb (Recommended) / 4 GB(min)
- Hard Disk : 10 GB
- Webcam : 5 MP

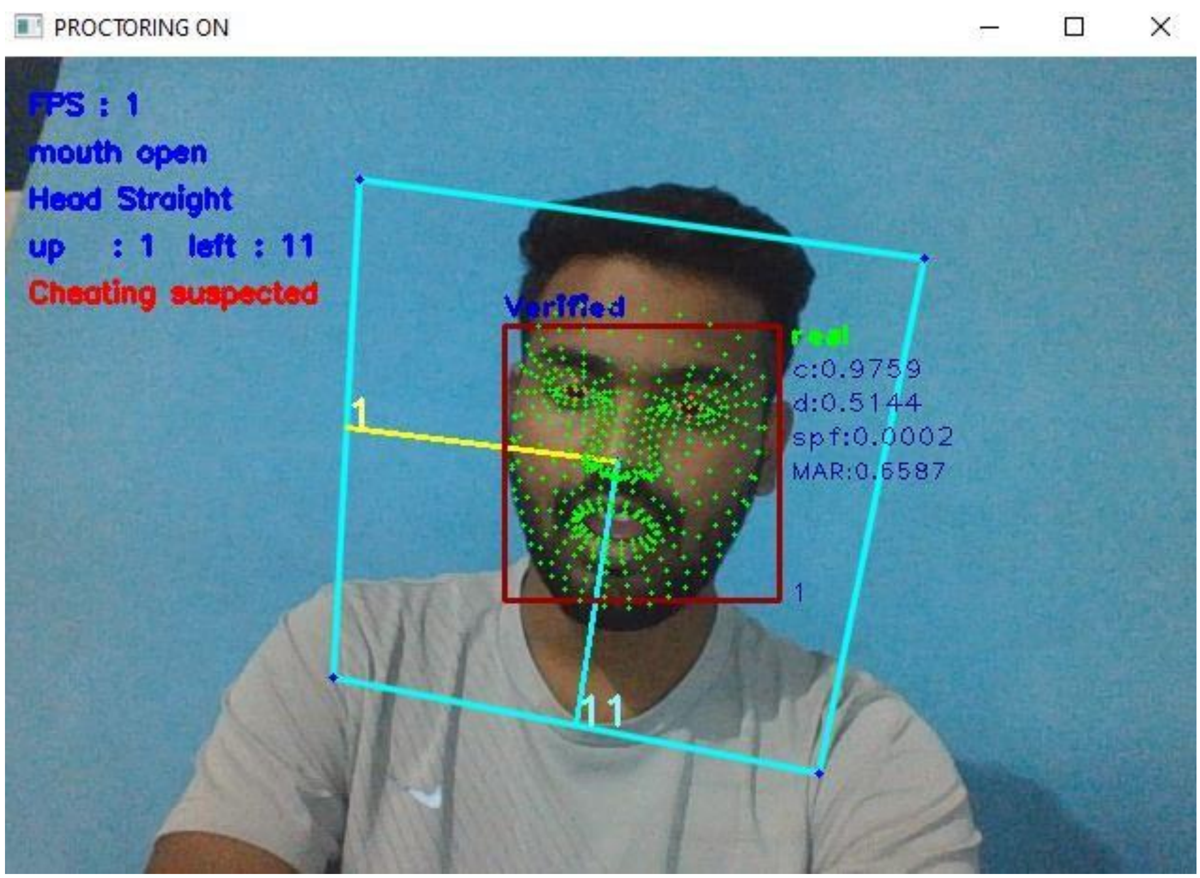
V. Implementation

1. Head Pose Estimation

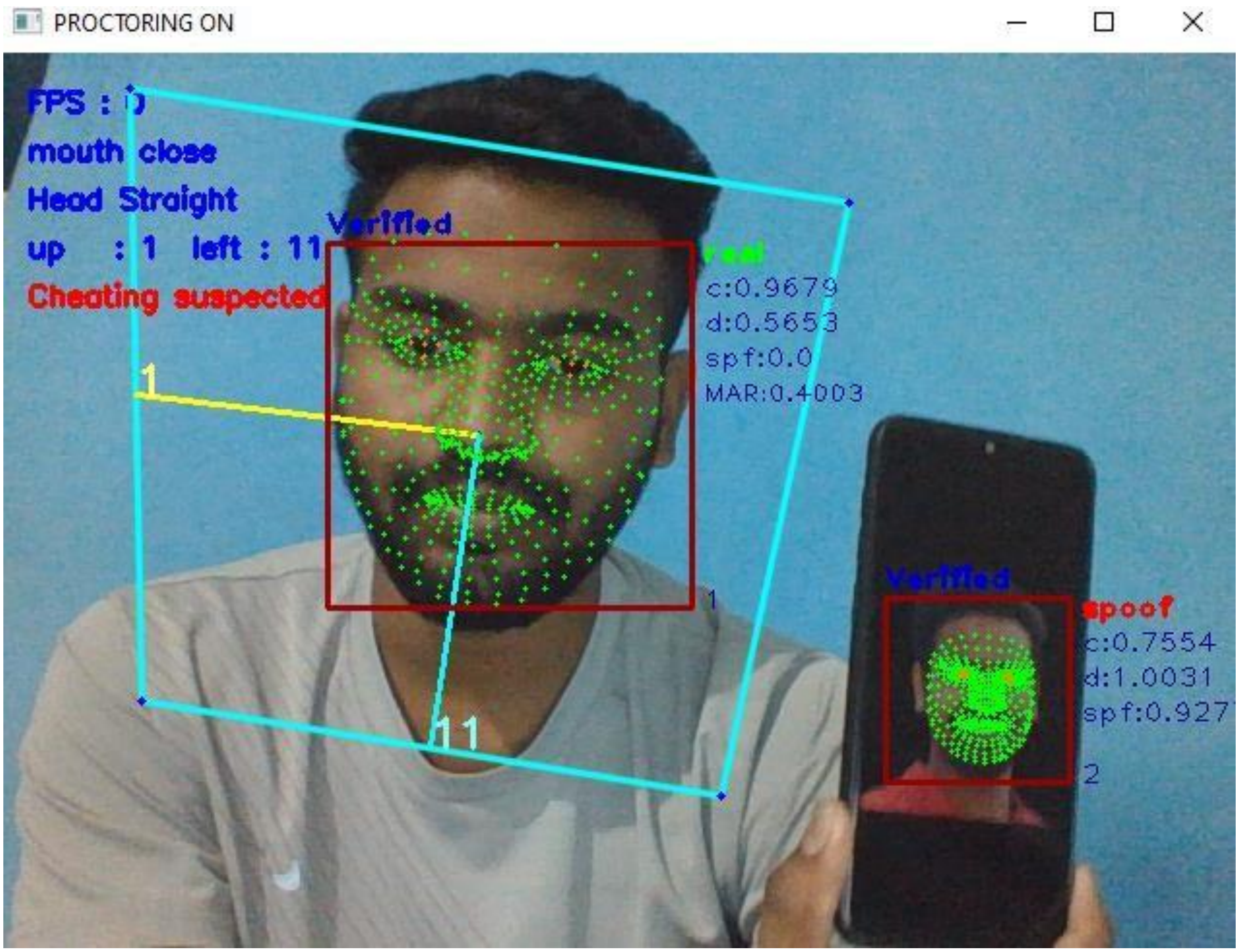




2. Mouth Opening Detection



3. Spoof Detection



VI. Conclusion

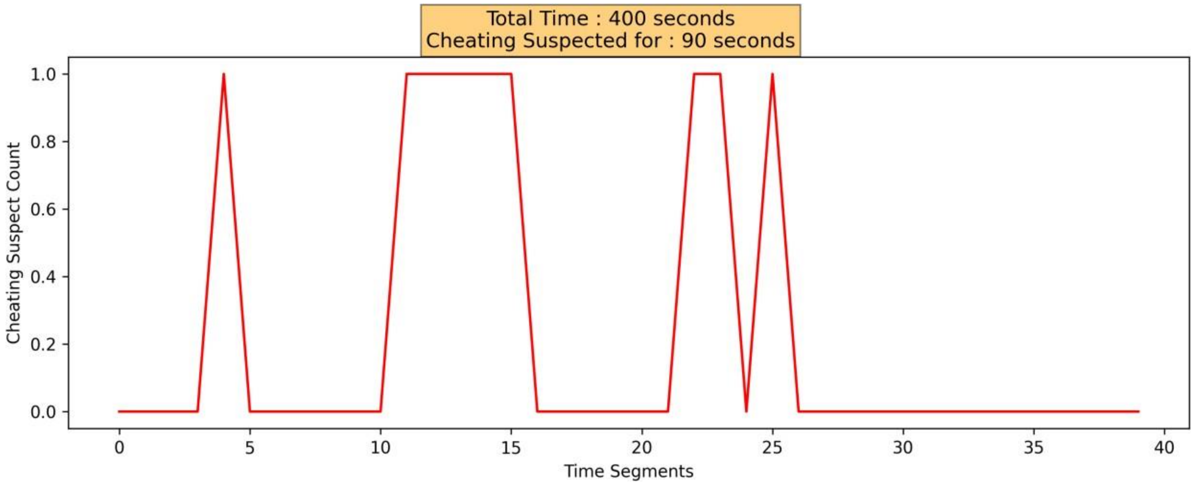
In this project, several features for webcam proctoring were developed. Initially, a model based on Extra Trees Classifier was built for Face Spoofing Detection and model based on Convolutional Neural Networks was built for Face Landmarks Detection. Using the Face Landmarks Detection model along with OpenCV, various features such as Head Pose Estimation, Mouth Opening Detector and Eye Tracker for live webcam feed were implemented.

Using Face Spoofing Detection model along with OpenCV, face spoofing detection for webcam feed was implemented. A YOLOv3 model was built using YOLOv3 weights and this model was used along with OpenCV to find the number of people in the live webcam feed and also to detect the presence of mobile phone.

All the outputs obtained was also automatically recorded into a log file

VII. Result

Final Result (Cheating Detection On Graph)



VIII. Future work

Educational institutions and corporate organizations across the world had gradually begun the process of adopting online proctoring software over the past decade to conduct remote examinations in a fair manner and ensuring that the candidates gave the exam in a known environment. Due to the COVID-19 Pandemic, it has become the need of the hour to leverage remote proctoring platforms to conduct seamless tests while also ensuring that the candidates do not indulge in malpractices during these online exams .

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