Rajiv Gandhi University of Knowledge Technologies, Basar
RGUKT-IIIT-BASAR

A BRIEF PRESENTATION ON

AICTE SUMMER INTERNSHIP PROJECT 2020-2021

ONLINE PROCTORING SYSTEM

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INTERNSHIP CERTIFICATE

International Institute Of Information Technology, Hyderabad
A Research University

Internship Certificate

This is to certify Ms.Venkata Bhavani Amrutha Korumilli, a student of B.Tech (CSE) from RGUKT-IIIT Basar (Telangana) has successfully completed her Summer Internship Programme entitled 'Online Proctoring System' using Deep-Learning from 1st June 2020 to 31st July 2020 at International Institute Of Information Technology, Hyderabad (IIITH) under supervision of Dr.Suryakanth V.Gangashetty. As a part of her internship, she explored the concepts of Deep-Learning, Convolution Neural Networks, Detection and Recognition Algorithms and done a project on 'Online Proctoring System'. Online Proctoring enables students to write a test online in a remote a remote location while maintaining the integrity of the test. Students must confirm their identity and they are monitored through video and other cursor movements. This video can be used to flag any irregular student behavior.

During the period of her Summer Internship Programme with us, she was found to be punctual, hard-working and passionate to learn new things. Further, she has good team working skills.

We wish her every success in life.

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This is to certify Ms.Shaik Mubeen, a student of B.Tech (CSE) from RGUKT-IIIT Basar (Telangana) has successfully completed her Summer Internship Programme entitled 'Online Proctoring System' using Deep-Learning from 1st June 2020 to 31st July 2020 at International Institute Of Information Technology, Hyderabad (IIITH) under supervision of Dr.Suryakanth V.Gangashetty. As a part of her internship, she explored the concepts of Deep-Learning, Convolution Neural Networks, Detection and Recognition Algorithms and done a project on 'Online Proctoring System'. Online Proctoring enables students to write a test online in a remote a remote location while maintaining the integrity of the test. Students must confirm their identity and they are monitored through video and other cursor movements. This video can be used to flag any irregular student behavior.

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ABSTRACT

Massive open online courses (MOOCs) and other forms E-Learnings continue to increase in popularity and reach.The rapid growth of the e-learning industry has created needs for various supporting technologies.

Currently, **Human Proctoring** is the most common approach of evaluation. However, such methods are labor-intensive and costly.

Our project, is a automated analytics system which performs online exam proctoring.

The system hardware includes a webcam, for the purpose of monitoring the visual environment of the test location. The system includes basic components which continuously estimate the key behavior cues: **User Authentication**, **Active Window Detection**, **Multiple People Detection,Constant check on who is giving the test and phone detection.**

CONTENTS

Introduction

Exams are a critical component of any educational program, and online educational programs are no exception. In any exam, there is a possibility of cheating, and therefore its detection and prevention is important. Educational credentials must react actual learning in order to retain their value to society. But the academic cheating activity is on the rise.When exams are administered in a conventional and proctored classroom environment, the students are monitored by a human proctor throughout the exam. In contrast, there is no convenient way to provide human proctors in online exams.

In this project, we introduce a web based system to perform automatic and continuous **online exam proctoring (OEP)** . The overall goal of this system is to maintain academic integrity of exams, by providing real-time proctoring to detect the majority of cheating behaviors of the test taker.

Literature Review

Paper : . Object Detection Algorithm Based on Improved YOLOv3

Authors : Zhao, L.; Li, S

Summary : The real-time object detection model is discussed in is an improvement over previous YOLO detection networks. Compared to prior versions, it features multi-scale detection, stronger feature extractor network, and some changes in the loss function. As a result, this network can now detect many more targets from big to small. And, of course, just like other single-shot detectors, YOLO V3 also runs quite fast and makes real-time inference possible on GPU devices

Paper : Mask R-CNN

Authors : Kaiming He, Georgia Gkioxari, Piotr Dollár, Ross Girshic

Summary : The paper present a conceptually simple, exible, and general framework for object instance segmentation. The approach efficiently detects objects in an image while simultaneously generating a high-quality segmentation mask for each instance. The method, called Mask R-CNN, extends Faster R-CNN by adding a branch for predicting an object mask in parallel with the existing branch for bounding box recognition.

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Paper : Automated Online Exam Proctoring

Authors : Y. Atoum, L. Chen, A. X. Liu, S. D. H. Hsu and X. Liu

Summary : This paper is a multimedia wearable automated online proctoring system.Proposes a fully automated online exam proctoring system with visual and audio sensors for the purpose of maintaining academic integrity. Designs a hybrid two-stage multimedia analytics approach where an ensemble of classifiers extracts middle level features from the raw data, and transforming them into high-level features leads to the detection of cheating

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Existing System

Existing technologies like **Kryterion** and **ProctorU** allow students to take tests anywhere as long as they have an Internet connection. However, they still rely on a person watching the exam taking. For example, Kryterion employs a human proctor watching a test taker through a webcam from a remote location.

Online Proctoring Organizations	Description
Kryterion Inc.	Launched in 1999; a Drake International company (founder of Prometric in 1990)
Software Secure	Long-term provider of services; known for integrated camera a fingerprint device
ProctorU	Founded in 2008; associated with Andrew Jackson University
B Virtual	Member of B Wyze Group, a leader in remote workplace innovation.
Tegrity	Grew out of Tegrity lecture capture technology; a CTB-McGraw Hill company
ProctorCam	Founded in 2007 and based in Boston. Massachusetts
Respondus	Assessment applications for elearning market; entering the online proctoring market space
Loyalist Exam Services	A division of Loyalist College in Ontario, Canada

Proposed System

The utmost main feature that make our model different from the existing ones is that, all the existing proctoring systems are software that need to installed into the local computer to take the exam and these softwares usually comes with a specific price tag.

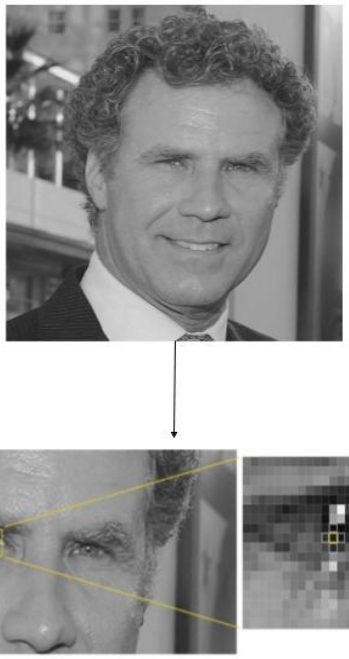
While the model we proposed is a web application that has integrated all the main features that a automated proctoring software has, this makes is easier to access and free of cost.. The model mainly has six features:

1. Username and Password Authentication
2. Face Verification
3. Phone Detection
4. Active Window Detection
5. Multiple People Detection
6. Continuous surveillance on whether or not the test taker is authorized until the end of the exam

ALGORITHMS

Face Recognition

1) **Face verification**: A one-to-one mapping of a given face against a known identity
   - e.g is this the person?
2) **Face Identification**: A one-to-many mapping for a given face against a database of known faces
   - e.g who is this person?
3) **Face Detection** : To find faces in an image, we use a method called Histogram of Oriented Gradients.



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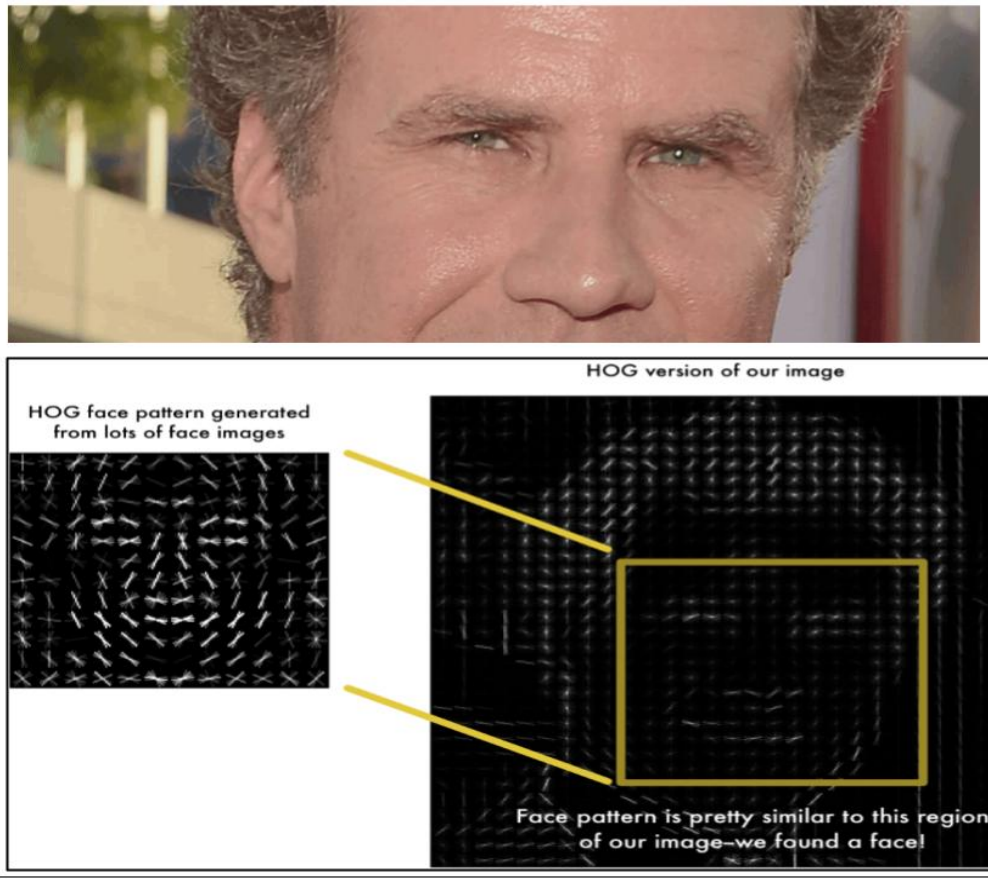


Encoding Faces:

We train each face to generate 128 measurements using Deep Convolutional Neural Network. This process works by looking at 3 face images at a time called **Triplet Training**.

1. Load a training face image of a known person
2. Load another picture of the same known person
3. Load a picture of a totally different person

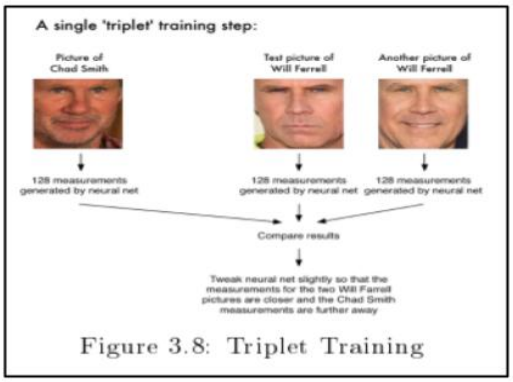


Figure 3.8: Triplet Training

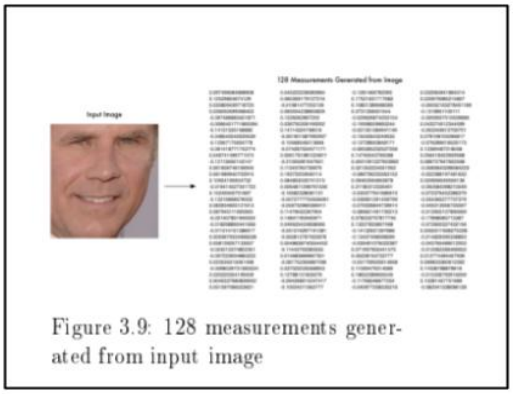
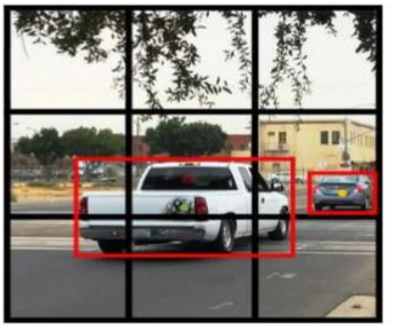


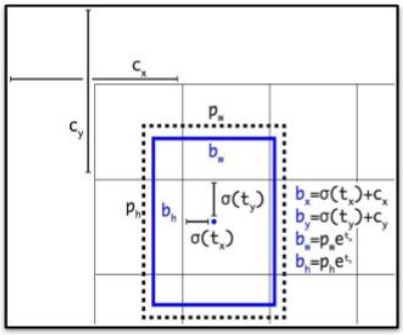
Figure 3.9: 128 measurements generated from input image

Object Detection:

YOLO algorithm takes an image as input and divides it into GxG grids.

- Each grid is responsible for object detection.
- Each grid cell now can estimate number of boundary boxes that can be used for an object.
- In the Fig.10 there are two objects. So, YOLO does it by taking the midpoint of each of two objects and then assigns the object to the grid cell containing it.
- Each grid cell has an output called Y, where Y is defined as a vector of elements.





Network Design

In our experiment we have used Darknet architecture to detect objects .

- YOLO v3 uses a Darknet-53 network with 53 convolution layers. It uses lter size of 3*3 and 1*1 along with skip connections as shown in.
- In YOLO v3 we use logistic classier for each class.
- Each convolution layer outputs a feature map that is obtained by the product of input image and the lter/kernel.

	Type	Filters	Size	Output
	Convolutional	32	3 × 3	256 × 256
	Convolutional	64	3 × 3 / 2	128 × 128
1×	Convolutional	32	1 × 1	
	Convolutional	64	3 × 3	
	Residual			128 × 128
	Convolutional	128	3 × 3 / 2	64 × 64
2×	Convolutional	64	1 × 1	
	Convolutional	128	3 × 3	
	Residual			64 × 64
	Convolutional	256	3 × 3 / 2	32 × 32
8×	Convolutional	128	1 × 1	
	Convolutional	256	3 × 3	
	Residual			32 × 32
	Convolutional	512	3 × 3 / 2	16 × 16
8×	Convolutional	256	1 × 1	
	Convolutional	512	3 × 3	
	Residual			16 × 16
	Convolutional	1024	3 × 3 / 2	8 × 8
4×	Convolutional	512	1 × 1	
	Convolutional	1024	3 × 3	
	Residual			8 × 8
	Avgpool		Global	
	Connected		1000	
	Softmax			

Active Window Detection:

The **Page Visibility API** provides us with two top-level attributes: document.hidden (boolean) and document.visibilityState (which could be any of these strings: hidden, visible, prerender, unloaded). This would not be not good enough without an event we could listen to though, that's why the API also provides the useful visibility change event.

Three typical methods used to determine if the user can see the HTML page, however none of them work perfectly:

1. The W3C Page Visibility API is supposed to do raises events when the browser tab is fully overridden

2. Using focus/blur based methods gives you a lot of false positive.

3. Relying on user activity (mouse move, clicks, key typed) gives you a lot of false positive too. Think about the same case as above, or a user watching a video.

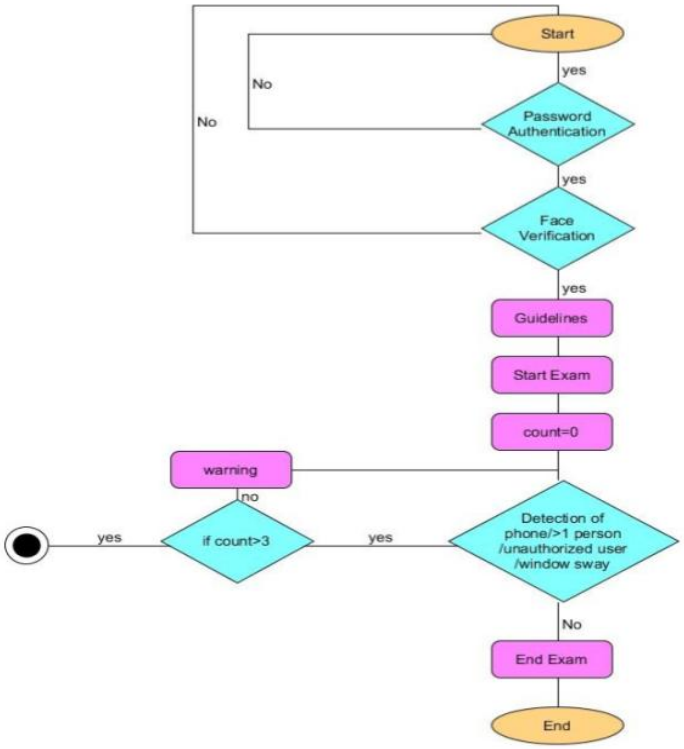
In order to improve the imperfect behaviors described above, I use a combination of the 3 methods: W3C Visibility API, then focus/blur and user activity methods in order to reduce the false positive rate. This allows to manage the following events:

1. Changing browser tab to another one (100% accuracy, thanks to the W3C Page Visibility API)
2. Page potentially hidden by another window, e.g. due to Alt+Tab (blur&focus)
3. User attention potentially not focused on the HTML page (mouse clicks)

Tools used

- Python version 3.7
- Sublime Text
- Flask
- PhpMyAdmin Database
- Google Web Browser
- LabelImg

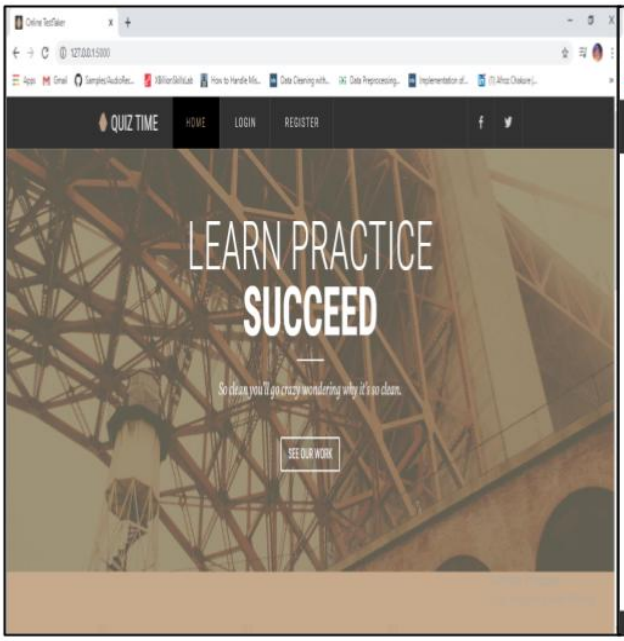
Architecture & Explanation

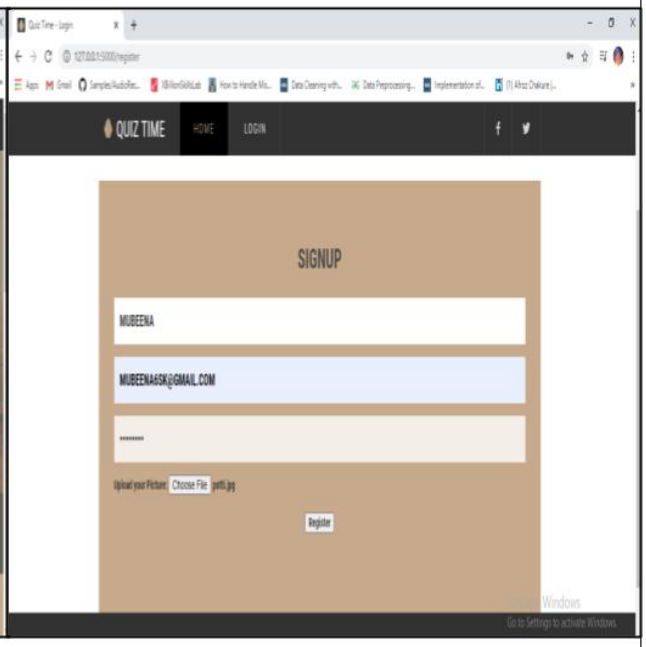


UI Design:

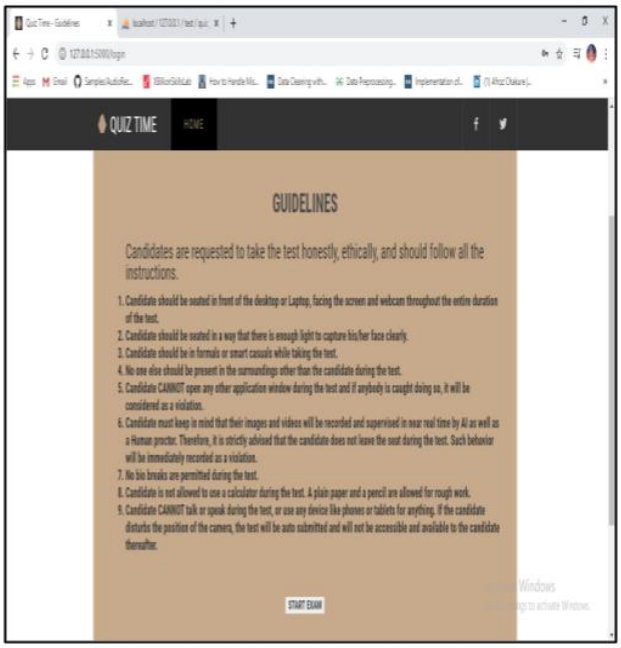
The UI part of the project is a web application designed using HTML,CSS, javascript,MYSQL The web application is majorly divided into 5 pages:

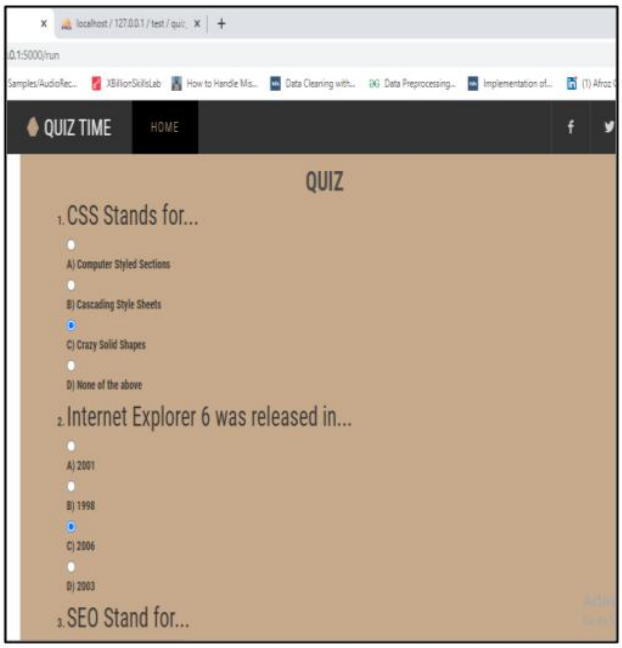
1. **Home**: Home page provides necessary information of the web application.
2. **Register**: A new user should get registered rst to access the services of the web application.
3. **Login**: Only after a successful login the test taker will be redirected to the test page.
4. **Guidelines**: Provides the test taker with the necessary guidelines, do's and don'ts.
5. **Test**: The test page is where the test taker takes the exam.





HOME PAGE **REGISTER PAGE**

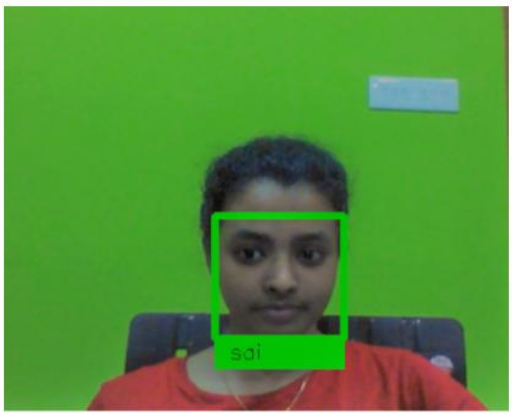




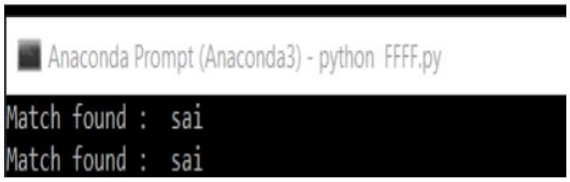
GUIDELINES PAGE **QUIZ PAGE**

Results

Sample Outputs for User Authentication

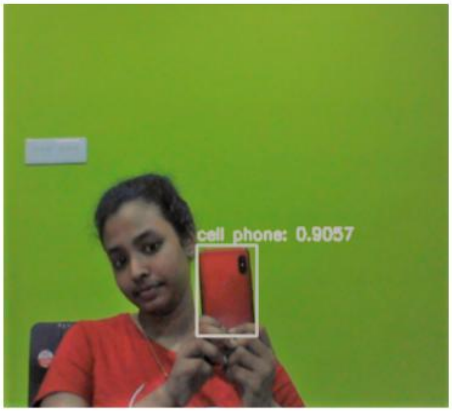


User Verification Output Console

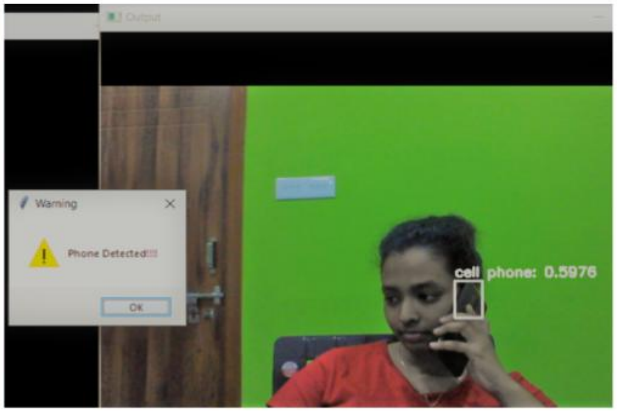


User Verification Output

Sample Outputs for Phone Detection



Phone Detection output



Phone Detection Alert Output

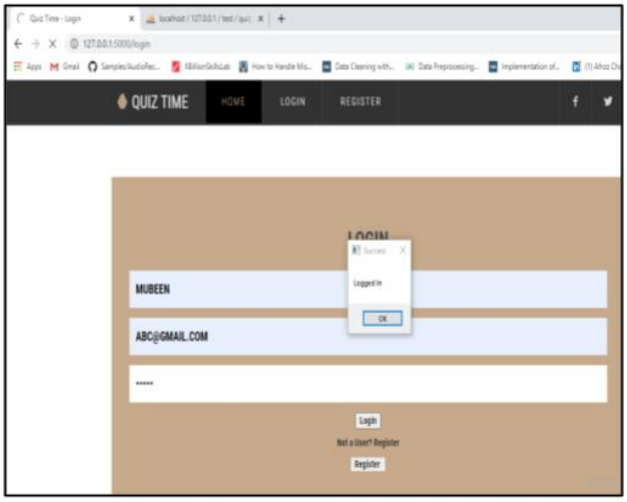
Sample Outputs for Multiple Persons Detection

Multiple Person Detection Output

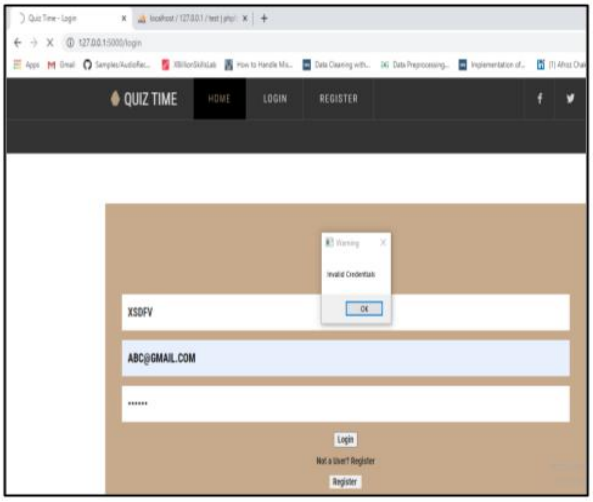
Multiple Person Detection Alert Output

USER AUTHENTICATION

During Login process,



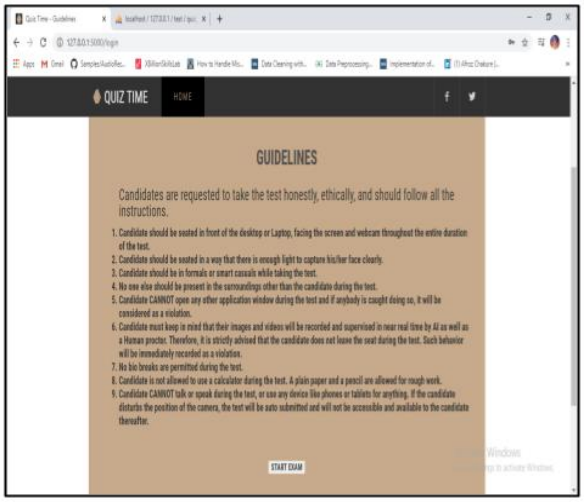
Case 1: If the user logins with correct credentials he/she would be considered for face verification process.



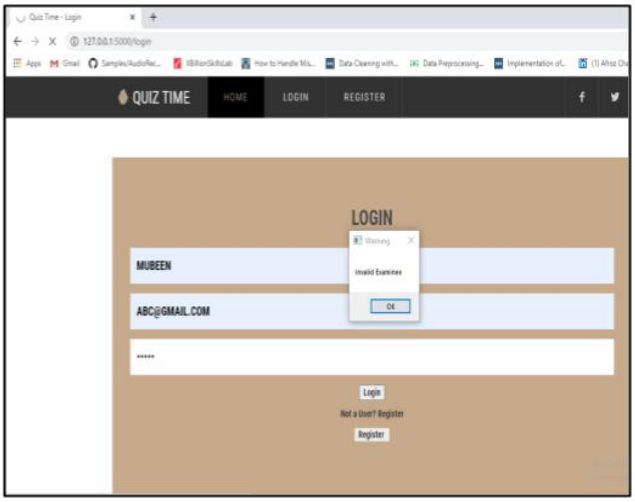
Case 2: If the user tries to login with incorrect credentials a warning is generated.

FACE VERIFICATION

Once after the user types in correct credentials the web camera automatically capture user's face to verify it.



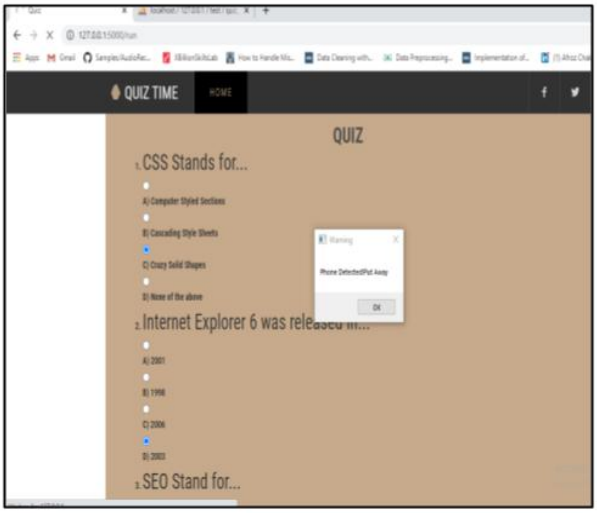
Case 1: If the user is authorized he/she would be redirected to Guidelines page.



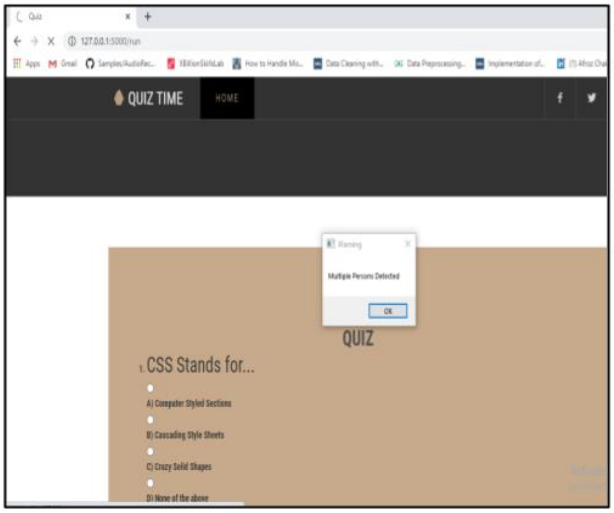
Case 2: If the user is unauthorized, a warning is generated.

PHONE DETECTION AND MULTIPLE PERSON DETECTION

During Test taking,



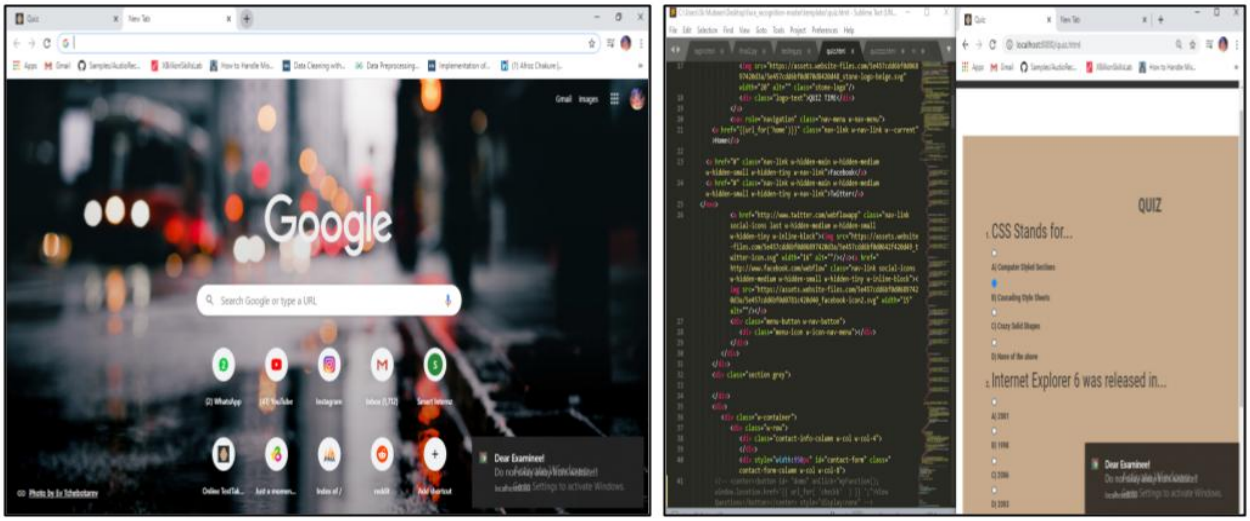
Case 1: If the user tries to use mobile then a warning is generated.



Case 2: If the test location consists of any other rather than the test taker a warning is generated.

ACTIVE WINDOW DETECTION

Once after the user starts to take the test a continuous track is kept on the activeness of the tab or window



Case 1: If the user tries to sway away from the tab, open a new tab, access local les, uses split screen etc then a warning is generated.

References

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THANK YOU