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Application of Artificial Intelligence for Facial Accreditation of Officials and Students for Examinations

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ABSTRACT

Examination is a crucial aspect in all educational institutions from primary to the higher institutions of learning. Accreditation off officials and students for any examination is a key to every institution in order to curb impersonation, exams malpractice and prompt start off of examinations. Facial recognition technology is now being introduced across various aspect of public life to address issues of security in us cooperate organizations and institutions. This backdrop motivated this application development for facial accreditation of officials and students for examinations. The methods used in the application development are, deep learning for computer vision algorithm, hypertext markup language (HTML5), Cascaded style sheets (CSS3), JAVASCRIPT and python/flask. JAVASCRIPT were used for the front-end and python/flask was used for the back-end developments. The results of the developed application were satisfactory, it works in accordance to purpose and design specifications.

1. INTRODUCTION

Examination is a crucial aspect in all educational institutions from primary to the higher institutions of learning. Accreditation of officials and students for any examination is a key to every institution in order to curb impersonation, exams malpractice and prompt start off of examinations. This backdrop motivated this project using artificial intelligence for facial accreditation of officials and students for examinations.

Facial recognition technology is now being introduced across various aspect of public life to address issues of security in our cooperate organizations and institutions also in emotion detection of depressed persons (Lawrence et al., 1997; El-said, 2013; Okpeki and Adebari, 2012). This backdrop motivated this application development for facial accreditation of officials, students, and automated registration for examinations. The technology is a set of algorithms that work together in identifying persons in a video or static images. This technology has existed for decades, but it has become much more prevalent and innovative in recent years. One

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of such innovation is the integration of **artificial intelligence** (AI) within facial recognition systems. AI-based software can instantaneously search databases of faces and compare them to one or multiple faces that are detected in a scene with accuracy rates of 99.9% on public standard data sets (Udo et al., 2021; Alanizy et al., 2018; Sharif et al., 2017; Pentland,1994).

Face recognition system is a complex image-processing in real world applications with complex illumination effects. It is a combination of face detection and recognition techniques in image analysis. Detection application is used to find position of the faces in a given image. Recognition algorithm is used to classify given images with known structured properties, which are used commonly in most of the computer vision applications (Sirovich and Kirb, 1987; Lerato et al., 2015; Prakash, 2018; Intrator et al., 1996). These images have some known properties like, same resolution, facial feature components and similar eye alignment. Recognition applications uses standard images and detection algorithms detects the faces and extract face images which include eyes, eyebrows, nose, and mouth. That makes the algorithm much more complicated than single detection or recognition algorithm. The objective of this work is to develop an application that can be deployed across platforms to curb examination malpractices in our institutions of learning and a secure database for organizations to enable them to secure their sensitive data and records with high performance.

2. Materials and Method

2.1 Collection of Officials and Students Data

The purpose of this work is to develop a facial recognition application for Delta State University for accreditation of officials and students for examinations using artificial intelligence. The methodology and material used in the application development includes the following: The Javascript, HTMLs, CSS3, Python Flask and Deep Learning for computer vision algorithm was used in developing the application. The methodology applied are also stated accordingly below, Collection of officials and student's data. (Photograph and Names), Program flowchart, Code development, Training the algorithm and Program deployment (Jain and Dubes, 1998; Lawrence et al., 1997).

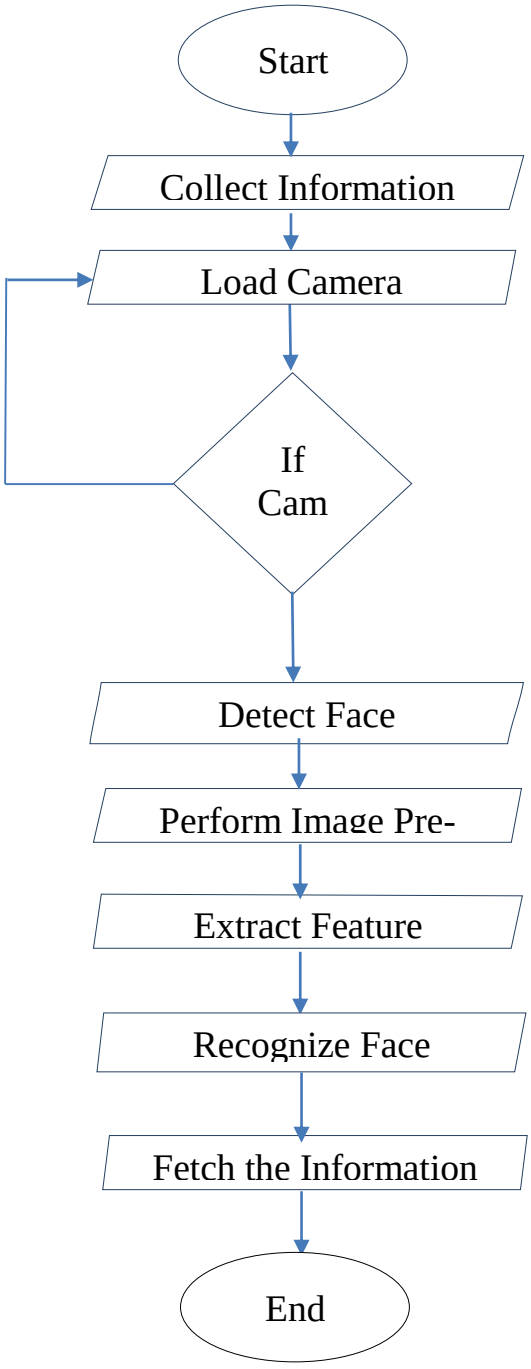

Figure 1. Program flowchart.

The database for the application was generated using Fifty (50) students and twenty (20) officials of the Department of Electrical/Electronic Engineering, with two (2) sample image of each person to create the database using the face detection parts.

```
<div class="border">
    <header id="header" class="attend">
        <form action="javascript:0" id="start-cam">
            <h4>Face Recognition Portal</h4>
        </form>
    </header>
    <div class="containerz">
        <div class="row">
            <form action="javascript:0" id="show-cam" class="col s12">
                <div class="containerz">
                    <div class="row">
                        <img id="attend-video" class="responsive-img" src="{{ url_for('video_feed') }}" >
                    </div>
                </div>
            </form>
        </div>
    </div>
</div>
```

2.2 Program Flowchart.

The step-by-step instruction used in developing the applications are shown in the program flowchart of figure 1.

2.3. Codes Development.

The Face Recognition Application was developed in two broad categories, the Front End and the Back End. The Front End was developed using the, HTML5, CSS3 and JAVASCRIPT technology

HTML is the standard markup language for creating Web pages, it stands for Hyper Text Markup Language, and it is used for structuring and presenting content on the World Wide Web. It is said to be presentational, which simply describes its ability to present user content to client in a structural wave. As a Markup Language, it consists of series of elements, each element tells the browser how to display the content attached to it. HTML5 also has extra features that makes it unique which includes, handling of multimedia and graphical contents, the new <video>, <audio> and <canvas> elements, support for scalable vector graphics (SVG) contents and MathML for mathematical formulas amongst others. It helps in integrating mathematical formulae into World Wide Web pages and other (Sharif, et al., 2017; Pentland et al., 1994).

2.4 CSS3

The <canvas>, <video> and the old plugin like <img> element were used in the application development for proper presentation of the content. Figure 3 shows a snapshot of the Face.

CSS stands for Cascading Style Sheets, it is the language for describing the presentation of Web pages, including colours, layout and fonts, thus making the web pages presentable to the users. It describes the presentation and structure made by the HTML into a more user-friendly ways, using styles and colors. CSS is independent of HTML and can be used with any XML-based markup language. CSS file was included to give the developed application a better appearance. Figure 4 shows a snapshot of the CSS rule used for the application developed.

Prior to adding the CSS rule figure 5 shows the interface outlook and figure 6 shows when CSS rule has been deployed.

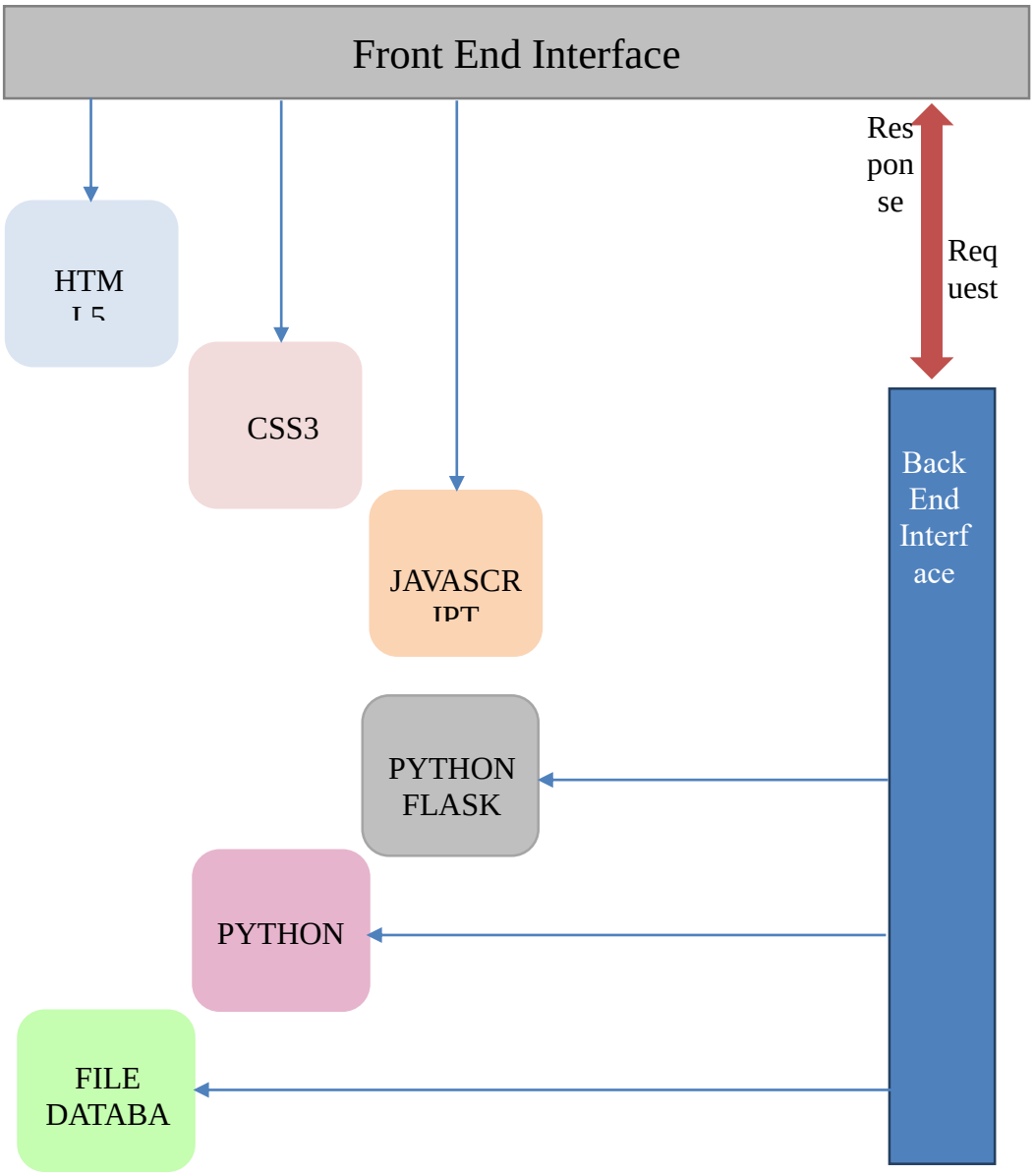

Figure 2. Block Diagram of the Facial Recognition App

```
<div class="border">
    <header id="header" class="attend">
        <form action="javascript:0" id="start-cam">
            <h4>Face Recognition Portal</h4>
        </form>
    </header>
    <div class="containerz">
        <div class="row">
            <form action="javascript:0" id="show-cam" class="col s12">
                    <div class="containerz">
                        <div class="row">
                            <img id="attend-video" class="responsive-img" src="{{ url_for('video_feed') }}" >
                        </div>
                    </div>
            </form>
        </div>
    </div>
</div>
```

Fig 3. HTML Markup for Face Recognition App

```
static > css > # paint.css > ...
1   html {
2       position: relative;
3       height: 100%;
4   }
5
6   body {
7       margin-bottom: 45px; /* Margin bottom by footer height */
8   }
9
10  a.brand-logo{
11      font-size: 24px;
12      font-weight: bold;
13      letter-spacing: 2px;
14  }
15
16  div > .row{
17      padding-top: 0px;
18  }
19
20  .border{
21      width: 95%;
22      max-width: 960px;
23      max-height: 100%;
```

Fig 4. A snapshot of the CSS rule used for the application

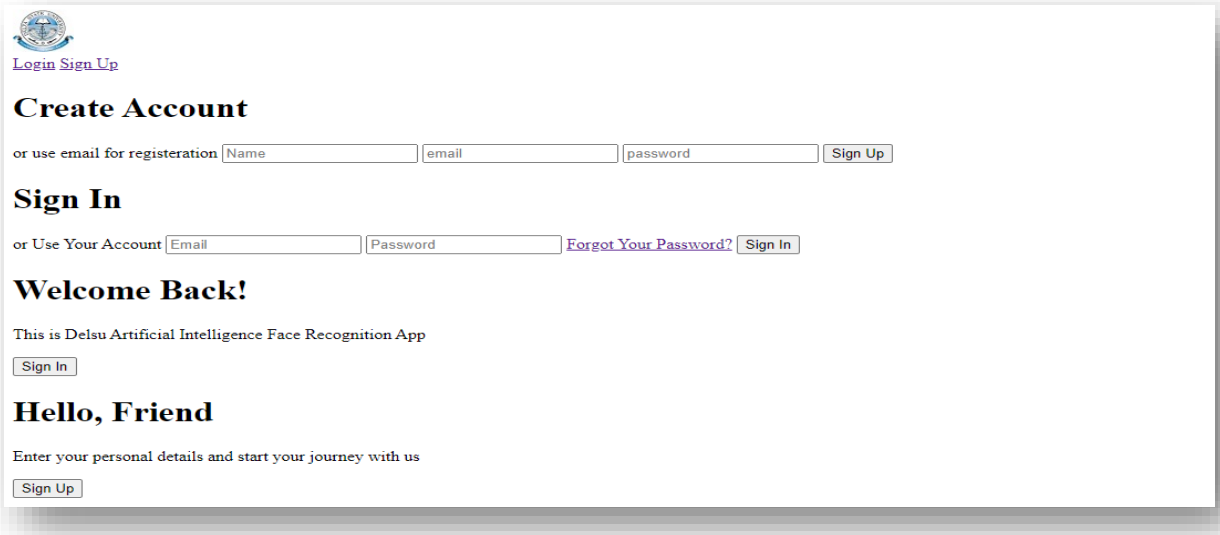

Figure 5. Face Recognition APP Without CSS Rule

2.5. JAVASCRIPT

JavaScript is a programming language that allows programmers to implement complex features on web pages like, displays of static information, content updates, interactive maps, animated 2D/3D graphics and scrolling video jukeboxes etc. JavaScript is the third layer of the layer cake of standard web technologies, including HTML and CSS. A very common use of JavaScript is to dynamically modify HTML and CSS to update a user interface, via the Document Object Model API.

Back End

The Back End was developed with Python and Python/Flask languages.

2.6. Python

Python is an object-oriented high level programming language with dynamic semantics. Its high-level built-in data structures combined with its dynamic typing

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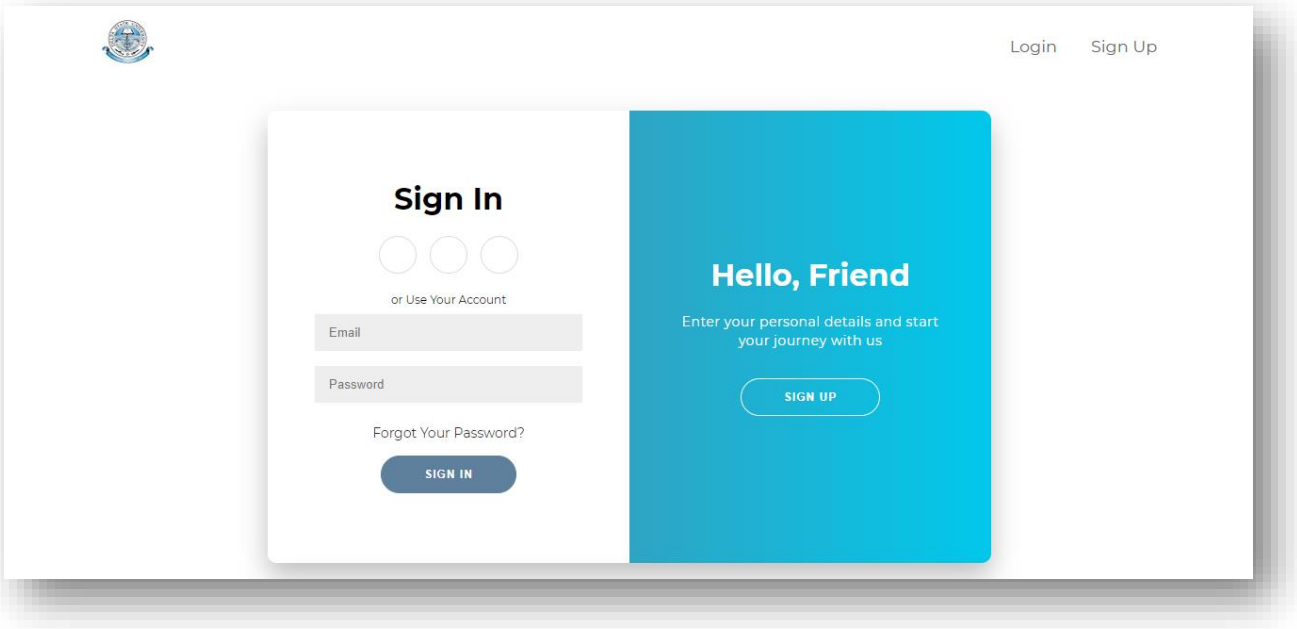

Figure 6. Face Recognition App with CSS Rule

```
@staticmethod
def frames():
    camera = cv2.VideoCapture(0)
    if not camera.isOpened():
        raise RuntimeError('Could not start camera.')

    while True:

        # read current frame
        _, img  = camera.read()

        #resize the read image form webcam
        img_small = cv2.resize(img, (0, 0), None, 0.25, 0.25)

        #Convert to RGB for consistency
        img_small = cv2.cvtColor(img_small, cv2.COLOR_BGR2RGB)

        #Locate face as camera can capture multiple faces at once
        face_current_frame = face_recognition.face_locations(img_small)

        #Encode the face captured from webcam
        encode_current_frame = face_recognition.face_encodings(img_small, face_current_frame)

        #Loop through the captured face and encoded frames in other to compare with the database
        for encoded_face, face_location in zip(encode_current_frame, face_current_frame):
            matches = face_recognition.compare_faces(encode_list_known, encoded_face)
            face_distance = face_recognition.face_distance(encode_list_known, encoded_face)
            # print(face_distance)
            match_index = np.argmin(face_distance)

            if matches[match_index]:
                name = class_names[match_index].upper()
```

Fig 7. Face Recognition App with CSS Rule

and binding abilities make it very attractive for Rapid Application Development, also as a scripting to connect existing components together. Python language have no compilation steps and that makes the edit-test-debug cycle incredibly fast, as a bug or bad input will never cause a segmentation fault. Figure 7 shows a code snippet of the Facial Recognition App written in Python.

Python/Flask

Flask is a Python micro web framework used for developing web applications. It is classified as a micro framework because it does not require tools or libraries and no database abstraction layer. However, Flask supports extensions that can add application features as if they were implemented in Flask itself. Flask was used to create the back-end service which receives requests from the Front end and render the requested content appropriately for usage. Figure 8 Shows the implementation of flask used as a web server to serve the Face Recognition App.

```
#Catch all route not defined
@app.route('/', defaults={'path': ''})
@app.route('/<path:path>')
def catch_all(path):
    return render_template('index.html')

#Home/Landing Page Route
@app.route('/', methods=['GET', 'POST'])
def index():
    if request.method == 'POST':

        if request.form['submit'] == 'Login':
            email_ = request.form['email']
            password_ = request.form['password']
            email  = email_verify(email_)
            password  = password_verify(password_)

            if(email  and password ):
                url = 'cv.html'
                return render_template(url)
            else:
                return render_template('index.html')

        elif request.form['submit'] == 'create':
            name = request.form['Name']
            email = request.form['email']
            password = request.form['password']

    return render_template('index.html')
```

Figure 8. Face Recognition Route Server with Flask

Training the Algorithm

The App was designed in two segments the Front end and the Back end. The Front end was designed with HTML5, CSS3 and JavaScript while the Back End was designed with Python and Python/Flask. The Front end is the section available for the user to interact with the APP by creating a user detail to access the Face Recognition Engine, the Front end is served by the Back end.

3. Results and Discussion

The face recognition Application begins by launching the App in the web browser, a user of the App is required to register by creating a simple login detail via the form provided. Upon registration if successful it leads you to the sign in profile, the user can login into the face recognition portal by filling its required details. If the details are invalid the user would have to check if his details inputted are correct then register again, but if details are valid the AI engine will be activated turning the camera ON, for the user to position his/her face for recognition. The Application makes use of the Face Recognition Library to uniquely identify and differentiate between different people.

The very first step done behind the scenes is finding user faces using Histogram of Oriented Gradient (**HOG**) technology. Once the face is captured, a WARP is applied, Warp is a special technology used to flatten captured faces so that all the face features (**landmark)** can be uniquely presented.

The second step is to send the Warp image to a neural network trained for Facial Recognition. The neural network returned the encoded features, which are basically the face contours. The encoded features the neural

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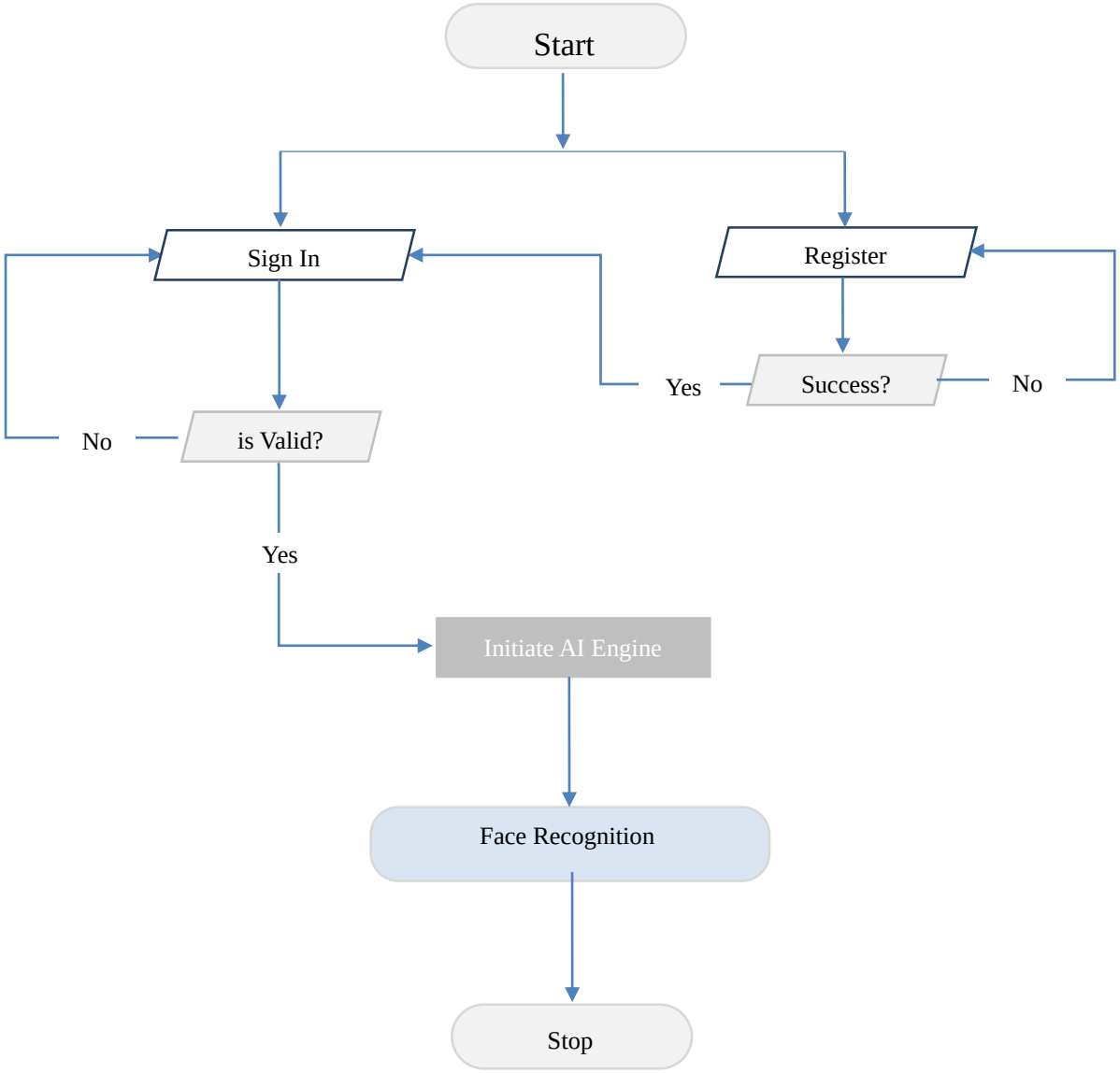

Figure 9. Block diagram the facial recognition algorithm.

network returns are 128 generated measurements, which are then used to defined a person and different between different people.To capture the name of each user, during the image capture, the name of each image fed into network is assigned a name,so that the machine can label the image accordingly. This type of training process is called **Supervise Machine Learning.**
The developed application deployment is illustrated in the application window of figure 9.

Rays of light can affect image detection there by distorting the image acquired. Shown in figures 10 and 11 are images acquired without rays of light affecting it and the one with rays of light distorting it.
The Application performed perfectly with 99.9% accuracy. All source code for the developed Application can be provided on request.

Adding Additional Persons.

Adding additional persons that was not initially in the database can be done by simply collecting the person's name and photograph then include them into the image attendance folder created for the face recognition application.
The System can handle multiple faces from the acquired images and classify them correctly, as shown in figure 12.

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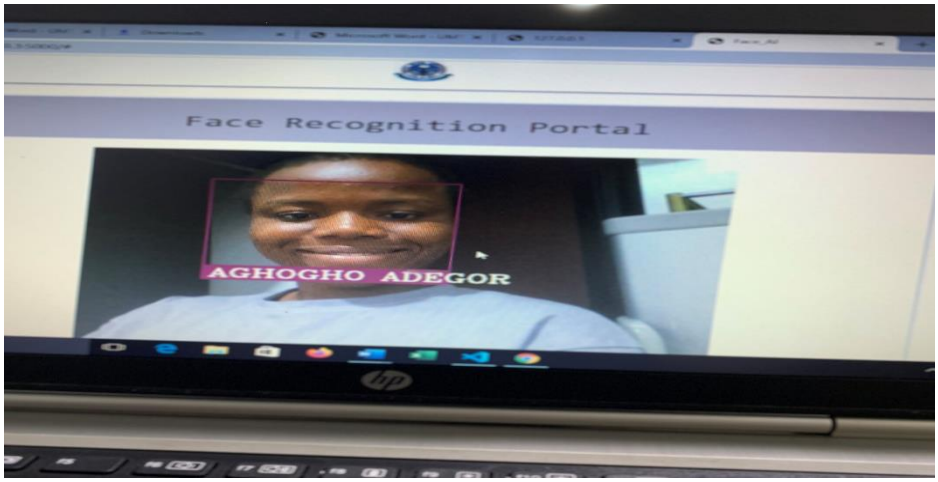

Figure10. Image acquired without light rays

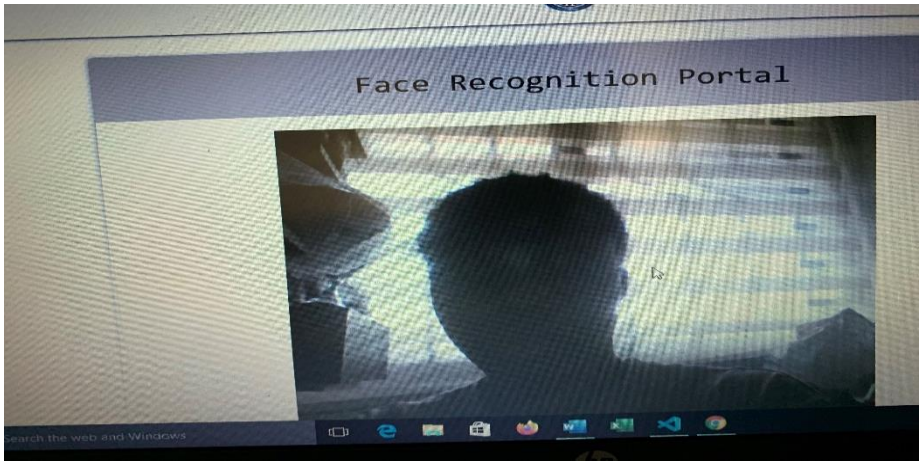

Figure 11. Image acquired with light obstruction

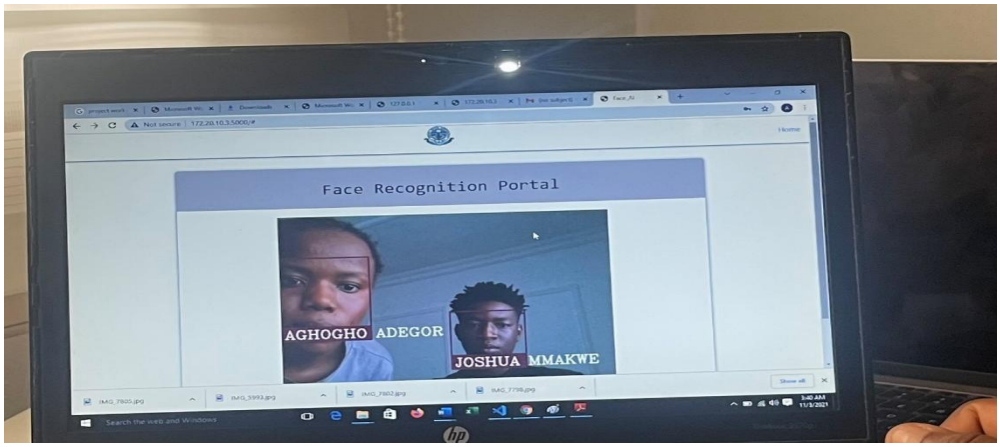

Figure 12. Multiple images classification

4. Conclusion

In this paper, we presented a developed facial recognition application for accreditation of officials and students for examination in Delta State University, using artificial intelligence. Examination is a crucial aspect in all educational institutions from primary to the higher institutions of learning, accreditation of officials and students for any examination is a key to every institution in order to curb impersonation, exams malpractice and prompt start off of examinations. Based on the findings, facial recognition technology is now being introduced across various aspect of public life especially for security activities.

The results obtained shows that the application can be deploy across all faculties of the University to help curb the menace of examination malpractices and other social insecurities.

The results also showed in image acquisition the system can handle multiple faces from the acquired images and classify them correctly with high computational efficiency and high robustness.

Conflicts of interest

The authors declared that there is no conflict of interest.

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REFERENCES

[1] Alanizy N., Alanizy, A., Baghoza, N., Al Ghamdi, M and Gutub, A., (2018), "3-Layer PC Text Security via Combining Compression, AES Cryptography 2LSB Image Steganography", Journal of Research in Engineering and Applied Sciences (JREAS), 3(4):118-124.

[2] El-said S.A., (2013), "Reliable Face Recognition Using Artificial Neural Network," Int. J. Syst. Dyn. Appl. 2(2):14–42. http://dx.doi.org/ijsda.2013040102

[3] Intrator N., Reisfeld D. and Yeshurun, Y., (1996). "Face Recognition Using a Hybrid Supervised/Unsupervised Neural Network," Pattern Recognition Letters, P. 10.

[4] Jain A. K. and Dubes R. C., (1988). "Algorithms for Clustering Data", Prentice-Hall, Inc.

[5] Lerator M., Tranos Z., Seleman N. and Omobayo E., (2015). "Face Recognition Techniques, their Advantages, Disadvantages and Performance Evaluation,"IEEE Conference Publication." https://ieeexplore.ieee.org/abstract/document/7374154.

[6] Lawrence S., Giles C.L., Tsoi A.C. and Back A.D., (1997). "Face Recognition a Convolutional Neural-Network Approach," IEEE Transactions on Neural Networks, 8(1):98–113.

[7] Okpeki U.K and Adebari F.A, (2012), "Application of Neural Network Technique to Telecommunication Faults Docket System." Journal of Engineering and Applied Science 4:30-37. www.cenresinpub.org.

[8] Prakash B., (2018), "ATM Card Fraud Detection System Using Machine Learning Techniques," Int. J. Res. Appl. Sci. Eng. Technol., 6(4):5124–5129, DOI:10.22214/ijraset.2018.4836 64.

[9] Pentland A., Moghaddam B. and Starner T., (1994). "View-based andmodulareigenspaces for face recognition", *Computer Visionand*

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DIO

Pattern Recognition, 1994. Proceedings CVPR'94., 1994IEEE Computer Society Conference on, IEEE, 84-91.

[10] Sirovich L. and Kirby M., (1987), "Low-Dimensional Procedure Forthe Characterization of Human Faces" JOSA A, **4**(3)" 519-524.

[11] Sharif M., Mohsin S., Jamal M. J. and Raza M., (2017). "Illumination Normalization Preprocessing for face recognition",*Proceedings of the 2nd Conference on Environmental Science and Information Application Technology*, 44-47.

[12] Udo E. U, Okpeki U. K, Okey D, Ogobuchi and Ugoji F.C, (2021). "Development of a Secured E-Payment System Using Image-Based Steganography. Bayero Journal of Engineering and Technology (BJET), 16(2): 35-50.