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Review JoIPPRP

Land Verification System Using Artificial Intelligence

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Abstract

Our analysis in "Land Verification System Using AI", runtime security and secure key disposal procedures carried out using sandboxing method eliminate risks linked to private keys. Depending on the type of land ownership, the framework's usefulness varies, and the discussion's end objective takes care of future tasks. A useful and practical solution for land vault confirmation using a biometric-based enhanced signature scheme is the end result of this investigation. The management and organization of land properties is one of the most well-known and frequent issues faced by non-industrial countries like India and Japan due to poor land proprietorship confirmation practices used by the government in the domain of land vault division. This gives rise to situations like land fraud, trespassing, abuse, and neglect. This research study outlines the conditions of a biometric-based check system for land executives that ensures the validity of land ownership, the veracity of land data, and the non-disavowal of land trades. The aim of the research is to use a staff member's unique mark to create biometrically based random keys that can be used for securely marking land library reports and then checking that mark in a safe manner. To ensure the security and robustness of the system, some key strategies should take place inside a separate area like sandbox weather.

Keywords: Biometric, AI-based system, face detection, API, deep learning, face capturing, feature matching

INTRODUCTION

Land is an essential part of the human lifestyle because it is one of the most valuable human possessions, with commercial and financial market values that support societal and economic growth. The process of recording information about the land, such as ownership, boundaries, area, location, and various other details, is known as land registration. However, based on past events, we can infer that there have been a sizable number of land frauds, encroachments, misuses, and disuses of land across the nation. The domain of land assets is plagued with frequent problems arising from poor verification procedures. Some of the most common issues faced by the general public include uncertainty of ownership of a piece of land, multiple claims by different parties for the same property, contradictions between land documents of different parties regarding critical fields such as land limits, area, and location, fraudulent selling of land to an unsuspecting buyer by an impersonator using fake documents, land encroachment and misuse, dominance over a plot of land controlled by one party with multiple co-owners, difficulty establishing rightful ownership of a piece of land, misappropriation of state-owned land, and problems

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associated with selling real estate using a power of attorney [1]. Checking whether a person's face image matches one of the facial photographs in a database is a biometric technique. Although it is not the most accurate biometric recognition method, face recognition provides a few advantages over other methods [2, 3]. It is commonly utilized in fields including forensics, police inspections, security and access control, and other attendance management systems. The several methods for tracking biometrics include signature-based, fingerprint-based, iris-recognition-based, and RFID-based systems. In essence, this is a collection of multiple connected issues that are resolved one at a time. We must teach the computer programming each stage of facial recognition separately because computers are unable to generalize this kind of high-level procedures.

BACKGROUND OF RESEARCH

Background

The development of computer vision systems includes an important discussion of effective and precise object detection. Deep learning approaches have significantly improved object detection accuracy [4]. The project's goal is to use cutting-edge object identification methods to achieve good accuracy and performance. The other computer vision based techniques to support the deep learning approach, which results in slow and subpar performance, is a significant problem in many object detection systems. In this project, we tackle the object detection problem from beginning to end using a wholly deep learning approach. The most challenging publicly available data set, which is tested yearly for object detection, is used to train the network. The finished system is quick and precise, which benefits applications that need object detection.

Basic Terminologies

Local Binary Pattern (LBP)

Histograms are extracted from the small regions that make up the face. As an upgraded histogram created by concatenating these histograms can be utilized to match faces [5]. Although this approach is more resistant to circumstances, it cannot be used in real-time settings.

Principal Component Analysis (PCA)

Turk and Pentland were able to recognize people using PCA [6]. The legitimate data space's depth is decreased by the area defined by the recognition method, known as the Eigenface methodology [7]. This condensed domain of information is utilized for recognition.

Genetic Algorithms

In actuality, it is a machine learning problem of global optimization. In order to increase efficiency and accuracy, it is used to remove redundant, noisy, and unnecessary features from the data as shown in Figure 1. The search strategies for feature selection have been improved by methods based on evolutionary algorithms [8, 7]. Using this in real-time applications can be especially beneficial. They have been combined with other methods, such as PCA to catch faces with good accuracy up to 99% of accuracy.

Deep Learning and CNNs

A CNN has been effective for facial recognition algorithms. A novel approach to leveraging deep neural networks for facial recognition has been put forth by Gupta, Priya, and colleagues [9]. In this method, raw pixels are substituted for input by merely supplying the facial traits that have been retrieved. Although this method is less complicated than the conventional one, it nevertheless manages to reach a 97.05% accuracy rate [4]. There are four dense layers in the neural network. A different framework is known as region-based CNN (RCNN) [7].

We're planning to employ:

1. Design a rectangle and arrange the (x, y, w, h) around face found in the picture using the OpenCV module for Detect Multiscale.

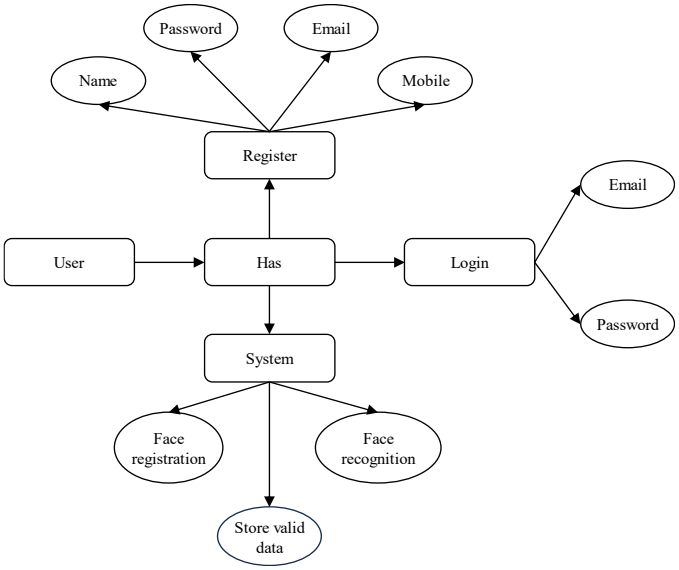

Figure 1. System architecture.

2. *Scale factor:* This number shows how much the picture area is shrunk at each scale. A small value downscales with smaller step.
   As a result, the algorithm can locate the face.
3. *Minimum neighbours*: The minimum number of "neighbours" that each rectangle of an applicant should have.
   A bigger number produces smaller detections but detects images of higher quality [10].
4. *Minimum size:* The image size is typically (30, 30). However, if the face in the image is smaller, it is preferable to decrease the minimum size value to a lower number [7, 4].

EXISTING SYSTEM

The management and administration of land holdings is one of the most prevalent and frequent issues facing emerging nations like Sri Lanka because of the inadequate property ownership verification processes used by the government in the division of land registration. This results in situations like land fraud, invasion, misuse, and neglect. A biometric-based verification system that ensures the veracity of land ownership, the accuracy of land data, and the non-repudiation of land transactions is used to manage land property [6]. The objective is to create biometric-based asymmetric keys from a person's fingerprint that can be used to digitally sign a land registry document [11, 3]. These keys will then be verified in a secure manner, and some of the key operations will need to take place in a sandbox environment to guarantee the system's security and robustness. Also, there are established methods for resolving conflicts that may arise from using a land management system with biometric verification steps. Many other closely related domains where the verification procedure is necessary and essential can be addressed by adapting this biometric-based verification technique and using it as a general solution. It extends beyond the limits of the land registry district [12–14].

PROJECT DESIGN

The project design portion of a report contains a thorough explanation of the proposed project, a management strategy, and techniques for quantifying the project. It also contains the necessary documents and materials for validating the proposed project's specifications [9].

Project Outline

These parts are considered as follows:

1. Machine learning model; and
2. Flask application.

Machine Learning Model

Similar to computer software, a machine learning model uses data or experience to identify patterns or behaviours. With the help of historical data that is kept in a database, machine learning is used to make predictions. Similar to computer software, a machine learning model uses data or experience to identify patterns or behaviours. A machine learning (ML) model catches the patterns found in training data produced by learning algorithm after examining a training data for patterns. The Random Forest with PCA Algorithm will be used to identify AIS abnormalities, and the Gradient Boosting Classifier will be used to determine whether or not the vessel is purposefully turning its AIS on and off [15].

Flask Application

One should look into one-page applications if they wish for development of outcome for clients. Python is used to create the microweb framework Flask. It is regarded as a microframework because specific tools or libraries are not required. The elements where pre-existing libraries offer ordinary functionalities, such as a database abstraction layer and others, are absent. Nonetheless, Flask provides extensions that will add application performances just like they were built into the core of Flask [16].

OpenCV

It is free for both commercial and academic use to use OpenCV (Open-Source Computer Vision Library), which is listed under a public BSD-license. It is compatible and offers interfaces for C++, Python, and Java; iOS, Android, Linux, and Mac OS are all supported.

You can benefit from the underlying heterogeneous computing. Platform's hardware acceleration when OpenCL is enabled [4, 17].

- cv2.VideoCapture(URL): A video capture object used to collect IP camera images even when the camera is not recording video capture from cameras, video files, or image sequences. Camera URL is a parameter.
- cv2.CascadeClassifier("cascades/haarcascade frontalface alt2.xml"): refers to a picture input. If the location is likely to highlight the object, the classifier returns a "1", otherwise a "0".

Parameters: XML file. If the system contains Intel's Integrated Performance Primitives, it will speed up using these exclusive optimised routines.

Activity Diagram

The activity diagram is crucial to the success of our concept. It provides a visual representation of the influx of conditioning and the linkages between various activities, which is crucial for comprehending our design process. The Effort Diagram will be fully explained in this part, including with its purpose, symbols, and conclusion. By doing this, we intend to provide a concise and clear explanation of our design methodology. The picture and justification will make it easier for the anthology to understand our strategy and outcomes.

The system will read data from the test set, as shown in (Figure 2) to find the Landowner Documents of the target Land. The data experiences the following steps:

1. Face detection.
2. Facial land estimation.
3. Encode the face.
4. Person tracking.
5. Face recognition.
6. Display lands documents and download it.

Face Detection

The most cutting-edge technology for identification and authentication now is facial analysis. The suggested device takes use of a FaceNet device, which efficiently maps face photographs into

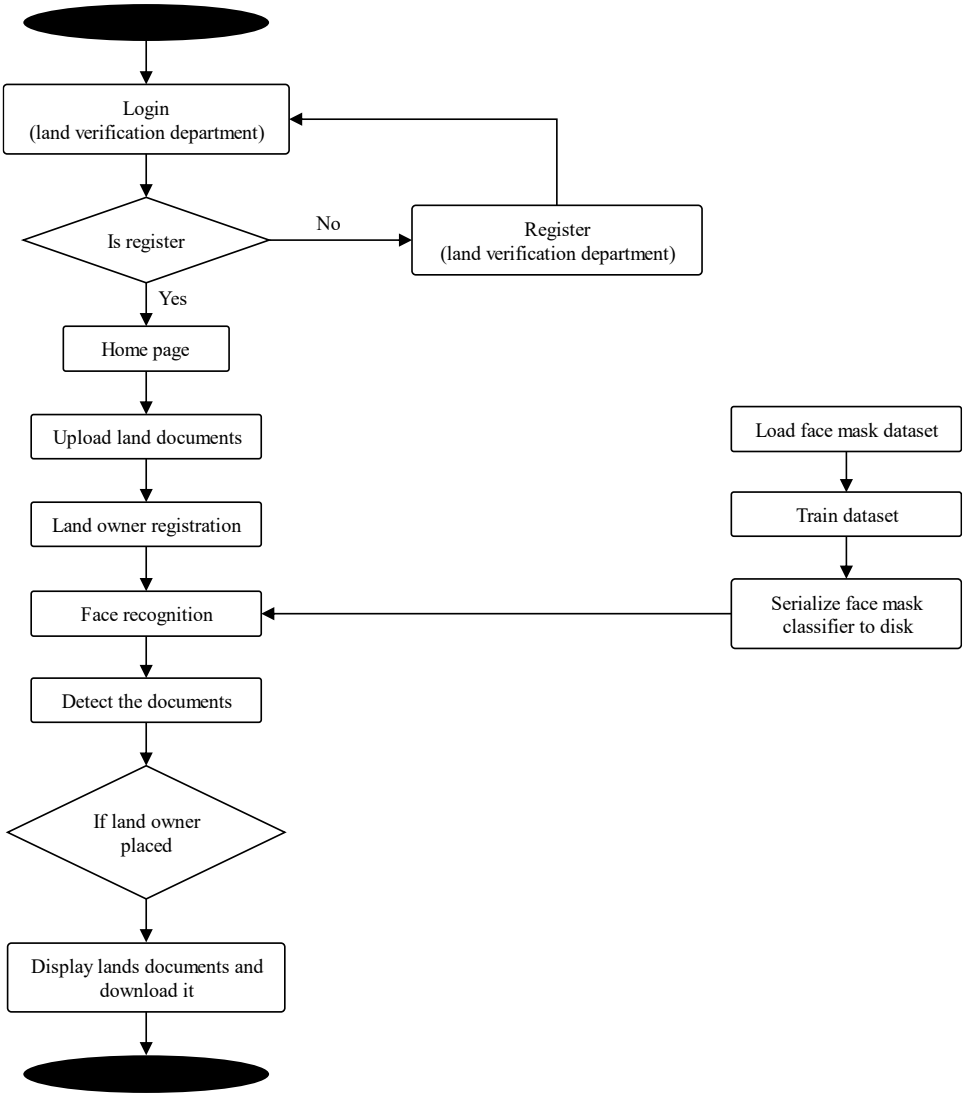

Figure 2. Activity diagram.

a condensed representation where length simultaneously corresponds to a similarity metric. Structure has been established, Functions like identification, verification, and grouping may be easily completed by using popular FaceNet embedding techniques as characteristic vectors. Instead of an intermediate bottleneck, the device uses a Deep Convolutional Network that has been trained to optimize the embedding immediately similar to earlier deep learning techniques. It employs a novel online triplet mining technique to produce coarsely aligned matched/mismatched face patch triplets for training [4, 17]. This strategy has the advantage of significantly increased rendering effectiveness. The system achieves a 99.63% new file accuracy rate (Labeled Faces in the Wild (LFW)). Possesses a rating of 95.12% on YouTube Faces Database.

Facial Land Estimation

The most widely used biometric option for internet authentication systems is face recognition. The facial recognition algorithms Eigenface, Fisher Face, and LBPH (Local Binary Pattern Histograms) Detection are all implemented by OpenCV. These algorithms make use of the Paul and Michael's Haar cascade classification technique to identify faces [18]. The 68 reference points for the identified image need to be calculated, considering faces with diverse orientations and appearances. They can be the same person, unlike a computer, and these characters can be used to quickly identify them [14]. The final step is a direct comparison of the detected images with the database-stored previously discovered faces.

Encode The Face

The concept of forehead recognition aims to match a known face with an unknown one. However, when faced with multiple directions, it may take a considerable amount of time to recognize everyone. We require an approach to extract some basic measurements from each face; so, we can measure our unspecified face and the known face, indicating their proximity [4, 19–21].

Person Tracking

Whenever the person is identified on the particular camera, the system snaps a photo of the identified individual on that particular camera. Upon person detection, the user interface displays relevant uploaded documents on the screen [10]. These land records were downloaded and analyzed.

PLAN OF THE PROJECT

Proposed System Architecture

Dataset

We are using the Dataset for Land Documents. This is a dataset for training machine learning solutions for detecting land documents (Figure 3). We use a similar dataset to train and show the appropriate ownership to the documents. The data are stored as individual CSV files, one for each document [3].

Algorithms

We tested and trained the data using a variety of techniques before selecting the optimal one to utilize when building the model. Random Forest and Gradient Boosting had the highest accuracy, according to our tests using PCA, Genetic Algorithm, Deep Learning, and CNN. Gradient Boosting has an accuracy rate of 97.49%. Using PCA, Random Forest has a 98.48% accuracy rate.

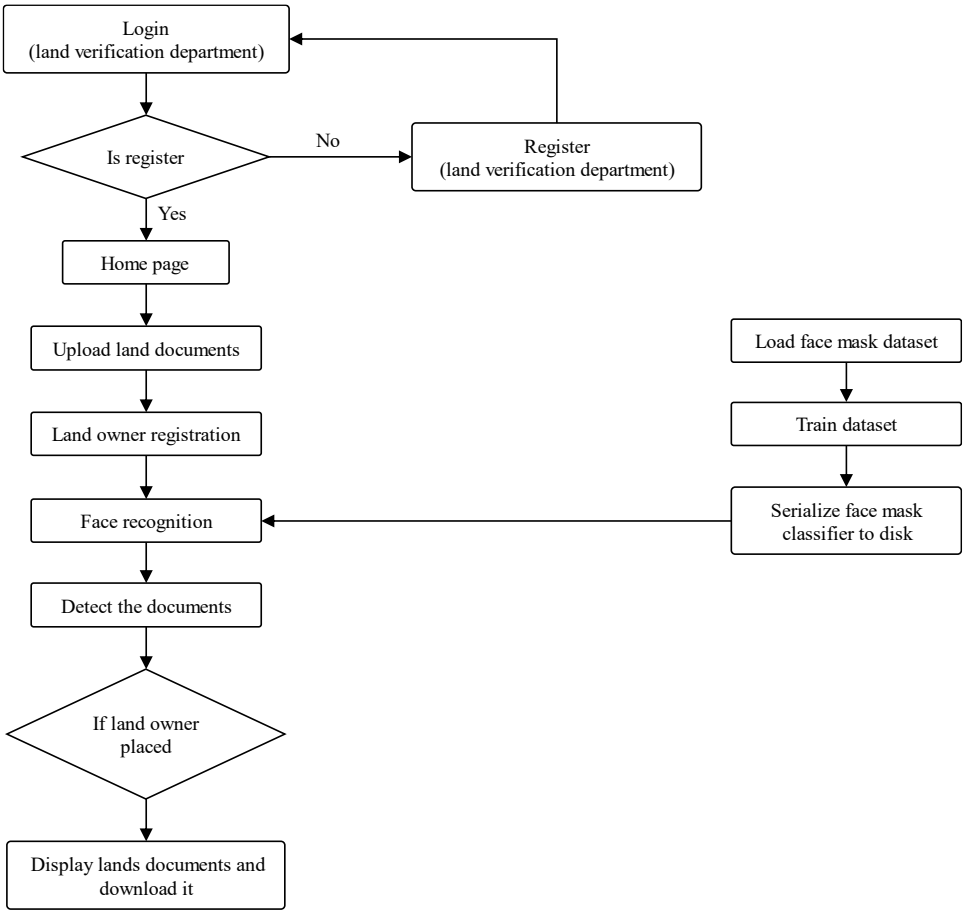

Figure 3. Proposed system architecture.

Methodology

Waterfall Methodology

The Waterfall model has been shown in Figure 4.

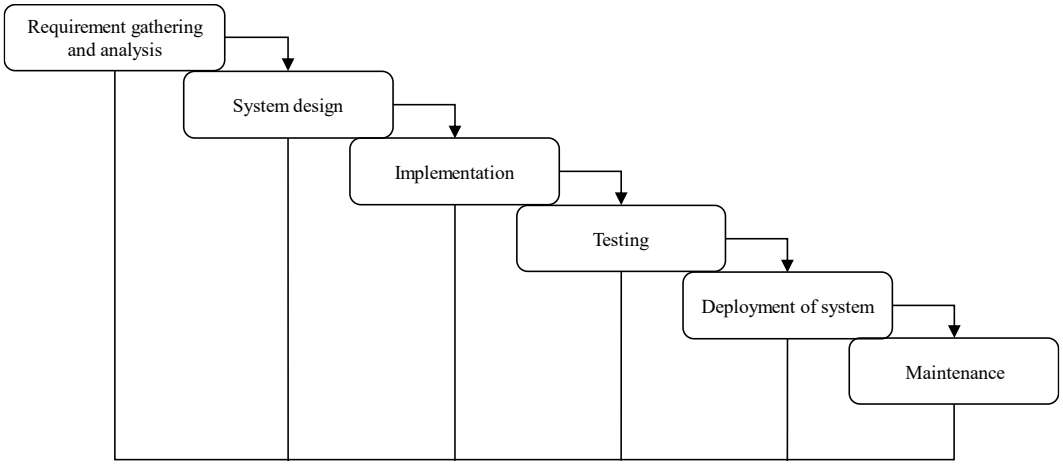

Figure 4. Waterfall lifecycle.

At the start of our project, this phase began. We divided the project into modules and formed groups. Considerations included the following:

1. Clearly define and depict each objective.
2. Compile specifications and assess them. Assess the necessary technical specifications before gathering the technical details of the numerous peripheral components (Hardware) that are needed.
3. Examine the code dialects required for the project.
4. Describe coding techniques.
5. Examine prospective dangers or issues.
6. Outline precautionary measures and potential solutions to these problems.
7. Verify the economic viability.
8. Provide Gantt charts and give each phase inspection a time limit.

RESULTS

The resultant of the application for the land verification system using artificial intelligence has been shown in Figures 5–9.

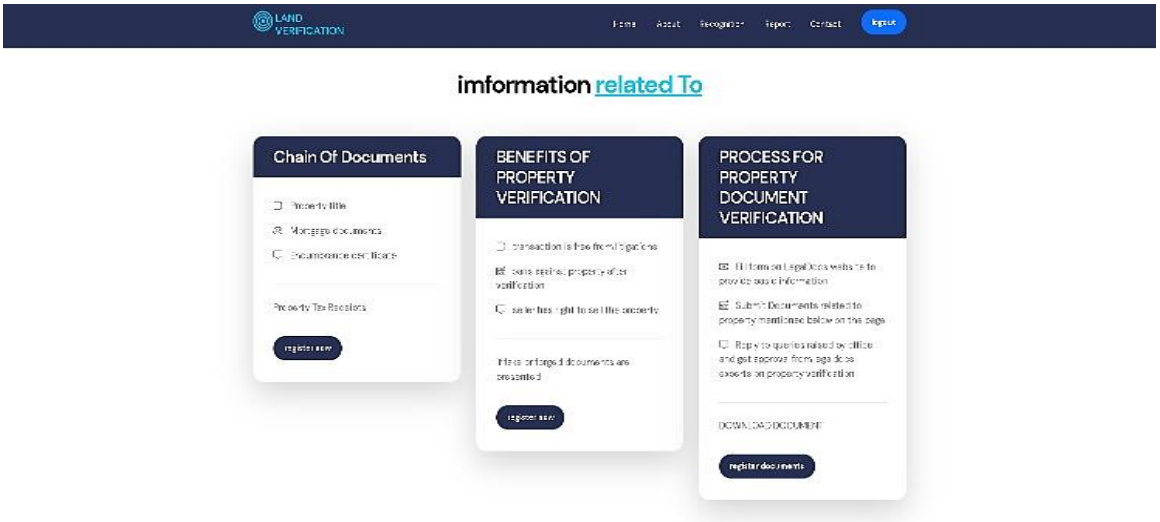

Figure 5. Verification page.

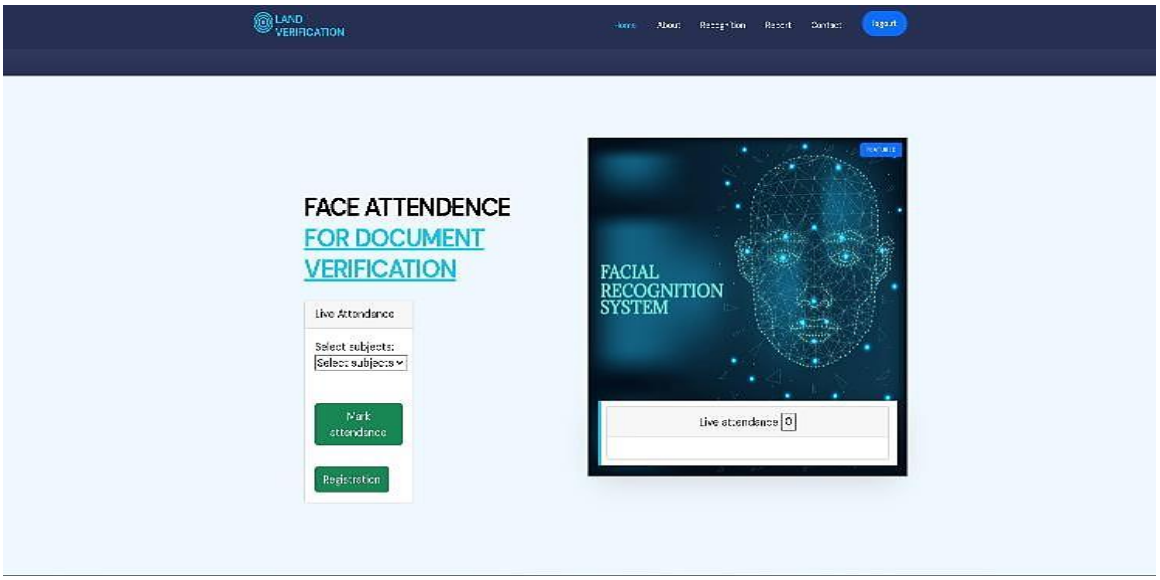

Figure 6. Face attendance for doc verification.

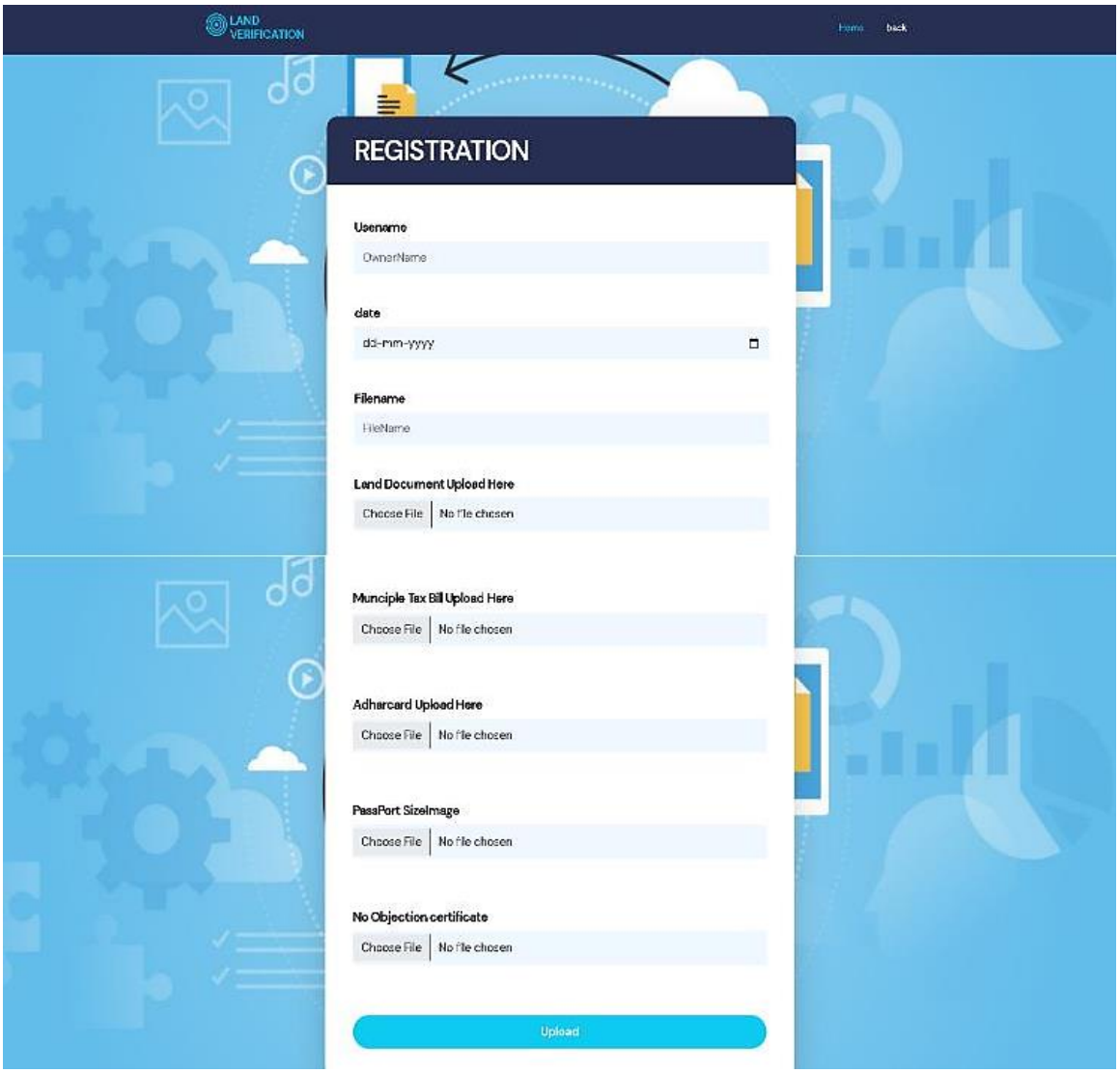

Figure 7. Registration page.

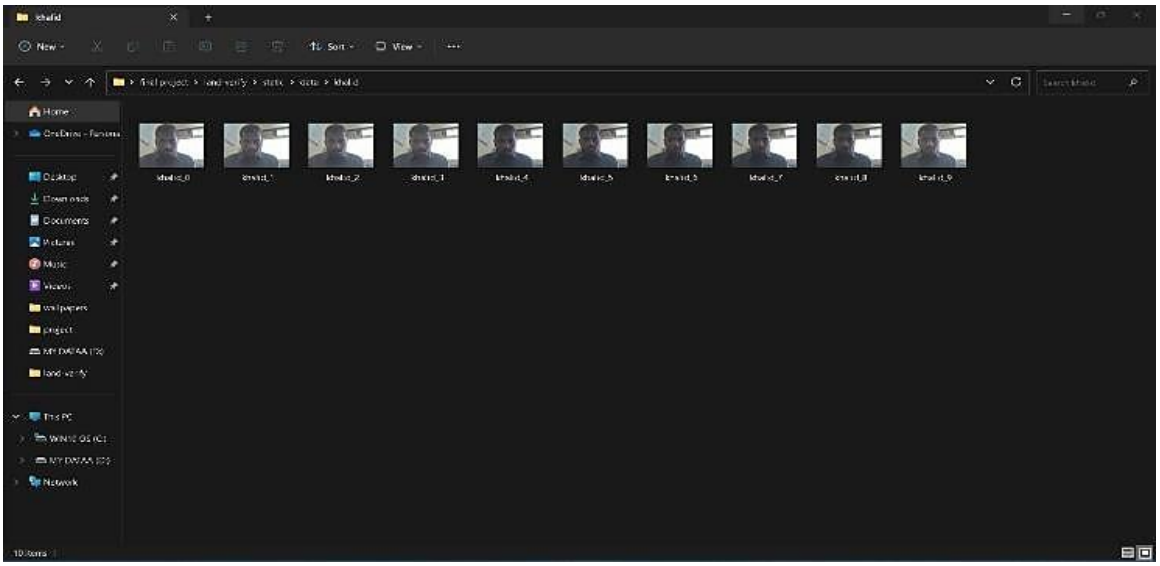

Figure 8. Image selection.

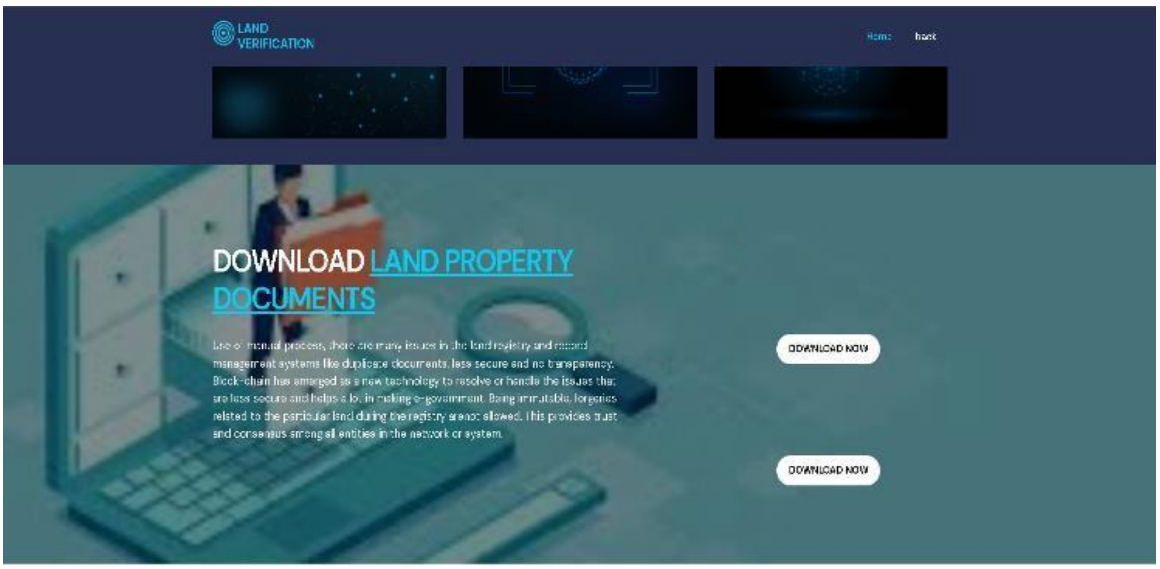

Figure 9. Download the document.

CONCLUSION

In conclusion, the basics of object detection, as well as the various approaches and the scope of the problem were discussed. Python was chosen over Matlab for integration with Open CV because Matlab code is built on Java, which means that when a Matlab programme is run on a computer it is recommended to begin studying any object detection concepts using Opencv. Python understanding and matching are the primary processes in object identification and should be performed well and with high accuracy. The majority of social media applications recommend deep face over haar-cascade, like Facebook, Snap Chat, Instagram, etc. as the most reliable face identification approach. In the near future, Opencv will have enormous popularity among programmers, and these businesses will prioritise enhancing the effectiveness of object detection techniques.

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