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Machine Learning based Face Recognition System for Virtual Assistant

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Abstract - *This project aims to provide enhanced security by allowing a user to know who is exactly accessing the system using facial recognition. The system allows only authorized users to gain access. Python is a programming language used along with Machine learning techniques and an open source library which is used to design, build and train Machine learning models. Interface mechanism is also provided for unauthorized users to register to gain access with the prior permission from the Admin.*

***Key Words*: Machine Learning, Face Recognition, Classification, Face Detection, Feature Extraction.**

1. INTRODUCTION

This chapter characterizes the introduction of the project Machine Learning Based Facial Recognition System for Virtual Assistant.

Machine Learning is the core part of Artificial Intelligence. Artificial Intelligence is concerned with the design of machines that possess the abilities concerned with humans. In Machine Learning Based Facial Recognition System for Virtual Assistant project, machine learning techniques are used to detect and recognize faces. Here there are two types of users -authorized user and unauthorized user. During the training process the user stands in front of the camera which takes multiple images of him/her. The captured images undergo a face detection process. This process detects faces in the images. The detected faces undergo preprocessing process which is used to reduce the dataset. The preprocessed images undergo feature extraction process which is used to extract facial characteristics. These facial features are then stored in the system. This entire process is carried out under the supervision of the admin.

Face detection, preprocessing and feature extraction are the processes that take place in the testing phase. The extracted facial features are then used for classification. The process of classification classifies data into predefined classes. After classification the face is identified as a authorized user or unauthorized user. If it is an authorized user, he/she is given access to the system. The user can then avail the services of the virtual assistant. The virtual assistant provides services like fetching information from Wikipedia. In case of an unauthorized user, he/she is prompted to register with the admin. The register process includes capturing images of the user under the supervision of the admin.

2. PROBLEM STATEMENT

"Machine Learning Based Face Recognition System for Virtual Assistant" identifies a user(authorized/unauthorized) by using face recognition. Authorized user provides service. Unauthorized user is provided a prompt to register with the admin.

3. ARCHITECTURE OF THE PROPOSED MODEL

Architecture Diagram shows the relationship between different components of a system. The figure shows the architectural diagram of the proposed system.

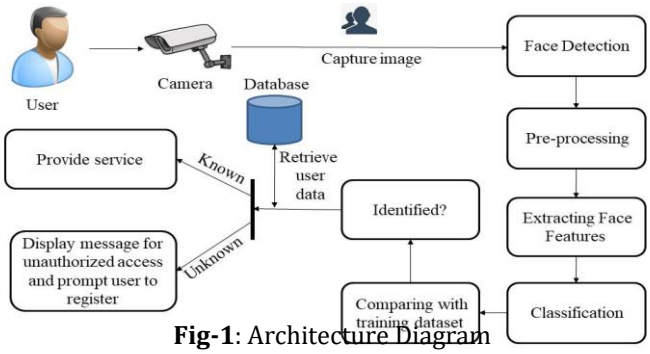

Fig-1: Architecture Diagram

The proposed system consists of a camera that captures images of a user. These captured images are then sent to the Face Recognition System(FRS) which further does pre-processing, face detection and feature extraction. Classification step is used to identify whether the user is authorized or not. If it is an authorized user, service is provided to it in the form of virtual assistant. Otherwise, the user is prompted to register with the admin.

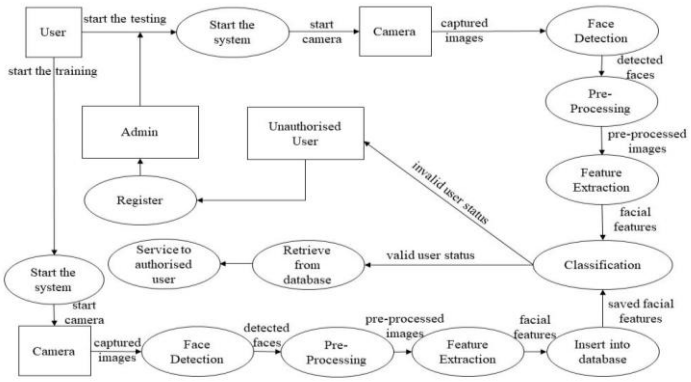

Fig -2: DataFlow Diagram

A dataflow diagram gives a graphical representation of a flow of data through the system. It is used to provide an overview of the system. In the proposed system user and camera acts as external entities. During the training process the camera is used to capture the images. The captured images are the send to face detection process which gives the detected faces a the output. These are further sent to the preprocessing process which reduces the data set. The preprocessed images are sent to the feature extraction process which gives facial features as the output which is then saved in the system. During the testing phase face detection, preprocessing, feature extraction is carried out along with classification process, the classification process is used to detect the user's status. If it a valid user he/she is provided with service in the form of virtual assistant. If it is a invalid user he/she is prompted to register with the admin.

4. METHODOLOGY

This section tells about the implementation of the proposed system.

4.1. Pseudocode for Recognition

1. Capture user image
2. Create result folder
3. Create result folder if not exist
4. Write images to the result folder
5. For that image in the folder
6. Detect face
7. If no face detected
    a. Delete image
8. EndIf
9. Append all faceid
10. Identify the detected face
11. If not identified
    a. Request to register
    b. Call admin.py
12. Else
    a. Get personId
    b. Connect to database
    c. Get username from database
    d. Print recognised username
    e. Call va.py
13. EndIf
14. EndFor

4.2. Pseudocode for Register

1. Input username
2. Create four digits random number
3. Create person Id
4. Print person Id
5. Insert value into database
6. Create dataset folder
7. Capture images
8. Write images into dataset folder
9. For each image in dataset folder
    a. Detect face
    b. If no face is detected
        i. Delete face
    c. Else
        i. Add face to person Id
        ii. Print result
        iii. Train person groupId
        iv. If successful
        v. Print ("Successfully trained")
        vi. Else
        vii. Print("Unsuccessful")
10. EndFor

5. RESULTS AND ANALYSIS

This section tells about the output of our project.

5.1. Recognition Accuracy

The underlying graph shows the recognition accuracy. X axis is the number of the images and Y axis is the con dent measure. If the percentage value is 50% or more then faces are correctly recognized.

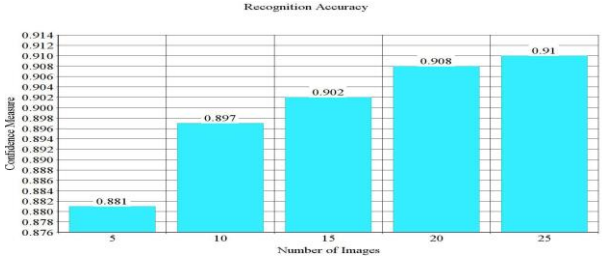

Fig 3 - Recognition Accuracy

5.2. Recognition Time

This graph shows the recognition time. X axis is the number of the images and Y axis is Time in seconds.

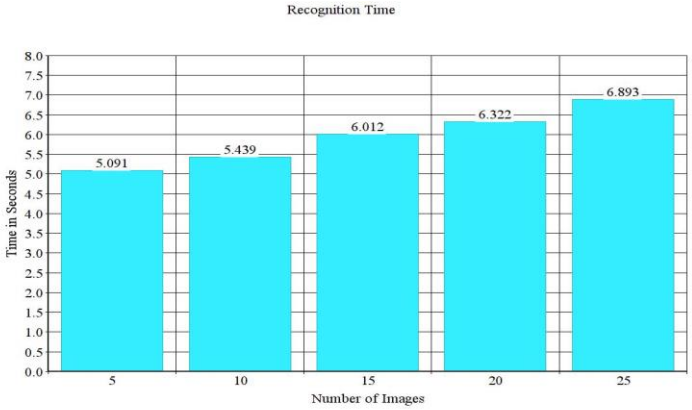

Fig 4 – Recognition Time

6. CONCLUSION

The proposed system ensures that only an authorized user can access the system and avail the services of Virtual Assistant. The benefits include tighter security, ease of access and usage even by a physically handicapped person.

7. FUTURE WORK

For future work, we propose iris recognition which has higher accuracy. We would also want the services of the Virtual Assistant to be provided even in offline mode.

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