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REVOLUTIONIZING VOTING SYSTEMS WITH MACHINE LEARNING-BASED IRIS RECOGNITION FOR IDENTITY VERIFICATION

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ABSTRACT

The fingerprint-based iris recognition system and related technology form the basis of one of the validation system's primary outcomes. Compared to other forms of validation and recognition systems, the biometric process is entirely genuine and distinct. This has given people creative ideas for their everyday lives. Generally speaking, the multimodal biometric process has used a variety of applications to appropriately address the most important and pertinent shortcomings of the "unimodal biometric system." The correct sensitivity of noise, population coverage regions, variability instances of inter- and intra-class concerns, vulnerability cases of potential hacking, and the non universality requirements have all been typically incorporated in the procedure. The deep learning-oriented machine learning system has been the primary topic of the entire study work. Convolutional neural networks (CNNs) have been the primary method used in fingerprint-based iris recognition systems to properly validate human beings. The iris recognition system has mostly been used in relation to the "high security protection system with actual fingerprints" in the current data validation procedure. The best uniqueness, reliability procedure, and appropriate "validity of the iris biometric validation system" for the real goal of person identification have been briefly discussed throughout the entire text.

1. INTRODUCTION

The biometric process has been mainly used to recognize individual types of physical aspects and features. For this purpose, a tremendous amount of acknowledgement technologies have been generally provided with the actual fingerprint, iris procedures and voice acknowledgement. The biometric mainly deals with the proper technical and technological fields for the body controls and body dimensions. The authentication system is based on the appropriate biometric security system that has increased the actual importance within all countries. The used system has been shown the proper valid and best impressive performance based on all these procedures and aspects. For this purpose, the fingerprint is the only procedure for providing the proper security techniques to provide the true uniqueness and the strong privacy properties of the entire system. The exceptional fingerprint

assurance or the proper kind of imprint approval has been mainly insinuating the automated methods and procedures to ensure similarity between the two people fingerprints. The entire chapter has been generally provided with the actual purpose of the fundamental research that is overall dependent on the research objectives and respective research questions. In this chapter, the research framework of the entire study has also been provided. The fundamental research has described all the factors that are responsible for this recognition process.

2. LITERATURE REVIEW

The literature review chapter has been mainly provided with a detailed description of the various problems and different types of recognition aspects that has been mainly associated with the entire area of the research study. The fundamental research has been conducted with the help of the different types of research notes of different authors and researchers. The entire process is also evaluated by the brief description of the research from the different online articles, journals and various websites. The fundamental research has been conducted with respect to the in-depth analysis process of the entire validation based recognition system. Including all of these, this particular chapter has also demonstrated the particular models and theories of the proposed topic for evaluating the entire description process. In this part, there are also described the literature gaps that are generally missing in the existing research notes of various authors.

According to the author Alrahawe (2018), a biometric system is one of the safest ways to work with the digital world. Since biometrics such as fingerprints, face, and iris recognition are different for different persons, these are safer compared to any other processes to secure confidential data (Alrahawe, 2018). However, in the olden days, there was a lack of technology for which there was less security provided for any confidential information. With the advancement in technology in recent times, biometric security has been an integral part of any system. Moreover, the author states that these kinds of processes for security in digitalization have become error-free, for which this system is getting implemented in the latest systems (Singh & Kant, 2021). Due to minor errors in the system, this is pretty reliable for security purposes. The biometric system has used various types of recognition processes, among which it also uses the finger-knuckle recognition system.

According to the author Elhoseny (2018), there was a unimodal system for identification and verification processes. However, through the unimodal system, the accuracy was not fully maintained since it failed to meet the proper decision-making criteria. It was found that there was a significant amount of reduction in accuracy while using the unimodal system for verification (Elhoseny, 2018). Thus the multimodal system was introduced. As the

multimodal system uses fusion technology, the overall accuracy from the verification was achieved. While comparing the different sorts of modalities, fingerprint and iris always have the highest distinctiveness and permanence. Moreover, they are cost-efficient too, and the speed is relatively higher when compared to any other modalities. While the unimodal system was not totally involved in the decision making concept, the multimodal system covers four different tasks such as acquisition, extracting the feature from the modalities, matching with the actual one and then providing the decisions (La, 2021). The unimodal systems are also used in many cases where less security can be helpful. But for high-security purposes and the sectors that deal with massive amounts of confidential data require multimodal systems.

3. EXISTING SYSTEM

The process of encoding and processing an individual's irises requires a large number of new calculations. When it comes to built frameworks and calculations, almost always only superior is guaranteed. However, neither of the computations has been subjected to extensive testing due to the lack of publicly available large-scale and even medium-size databases. The largest collection of infrared frontal iris images is now available online. Two notable solutions to the calculation testing problem in the lack of data.

- **Disadvantages:**

Errors are probable due to hazy iris images and the fact that segmentation and noise detection are handled in separate processes.

4. PROPOSED SYSTEM

For this project, we are using the CASIA IRIS dataset, which contains photos of 108 people, to train a CNN model that may be used to predict or detect people based on their IRIS. To train a CNN model, we are using the IRIS features extracted from eye pictures by the HoughnCircles technique.

Advantages:

The algorithm has good clustering, as shown by theoretical analysis and comprehensive experimental findings.

**SYSTEM ARCHITECTURE**
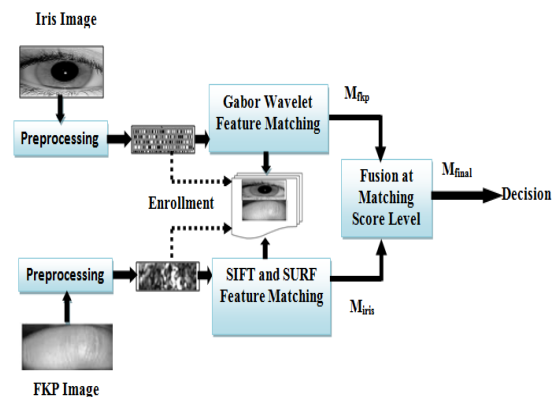
5. ALGORITHIMS

Convolution Neural Network technique (CNN)

The **"convolution neural network (CNN)"** is a specific type of deep learning-based algorithm. This algorithm has been taken as an appropriate input image, an important

attribute that is learnable weights with respect to the proper biasing system to the different types of objects. For this purpose, this particular system is very much effective to show the actual difference in the working process in each case. The actual requirement and necessity of preprocessing within the ConvNet are very much lower than the other classifier algorithms (Haytom *et al.*, 2019). The proper learning strategies and designing components and respective hierarchies of various factors should be done through "convolution neural network (CNN)" with various building structures like pooling layers, convolution layers and entire connected layers. The **"convolution neural network (CNN)"** has been recently provided various types of tasks like the object recognition, object detection, image captioning anf image segmentation. The **"convolution neural network (CNN)"** is the particular types of category that is mainly designed various types of models and methods for completing the entire process such as the respective videos and images that will be very much necessary for completing the entire finger based iris recognition process. This particular network technique is image classification, signal processing and image segmentation. The iris recognition system has been regarded with respect to the "reliable biometric recognition" process during the extraordinary and stable variation within the appropriate texture (Hernández-García *et al.*, 2019). This entire research note has explored the efficient technology and modern techniques which has been mainly

used for feature extraction and feature classification. This recognition system is mainly used for enhancing the respective recognition efficiency.
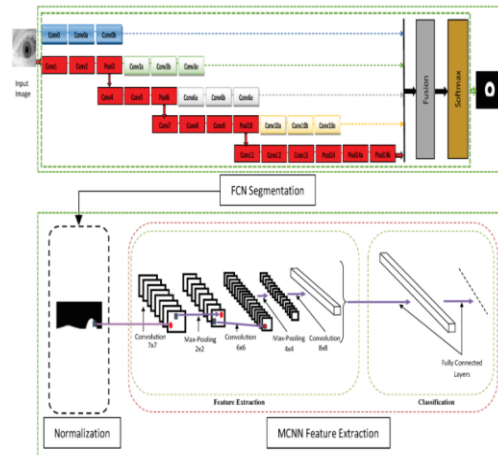
Convolution Neural Network technique (CNN) for Iris recognition system

Normalization process of Convolutional Neural Networking (CNN) model – This particular area has been mainly enclosed by both the outer boundaries and inner boundaries of the iris that will be mainly varied with respect to the contraction of the entire pupil. The extraction of the various features of the **"convolution neural network (CNN)"** is totally based on the classification module. The actual segmentation of the iris recognition system has been generally mapped by the proper region with respect to the fixed and proper dimension. The author proposed an appropriate model, Rubber sheet method for transformation of the different segmentation of iris images within a fixed rectangular area.

6. IMPLEMENTATION MODULES

https://doi.org/10.5281/zenodo.14066159

Upload Iris dataset

This section is for integrating the Iris dataset into the program.

Preparing the Data

When a dataset is preprocessed with this module, it is ready for further analysis.

Purpose: Feature Extraction

In this step, information is divided into two categories: training data and test data. Data, for instance, might be split into a "training" set and a "test" set with a 70%:30% split.

Synthesis of Models

As for the language used to actualize the strategy, it would be Python. Theano and tensorflow, two Python packages, are very potent for any given deep learning model. Indirectly constructing a model from these libraries, however, is challenging. That's why we utilize Keras and tensorflow as our backend library to make the model as precise as possible. Keras's sequential model includes components referred to as CNN layers. To improve the model's accuracy, these layers perform in-depth processing of the data by analyzing various patterns that emerge in the dataset. In the next step, the data are fed into the selected model to be trained.

Construction of a Convolutional Neural Network Model

Using this component, a CNN Model can be constructed for testing and training purposes.

Graph of Accuracy and Error

By doing so, we may compare the efficiency of different deep learning methods with that of feature extraction algorithms in a graphical format.
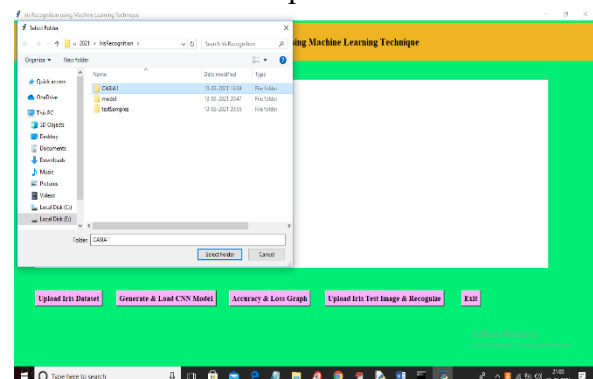
Iris Recognition Test Image Upload

With this feature, users can put an image through its paces by uploading it for testing and subsequent recognition by the software.

7. SCREEN SHOTS

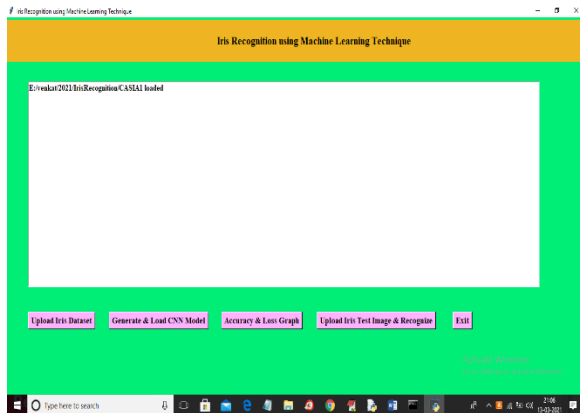To run project double click on 'run.bat' file to get below screen
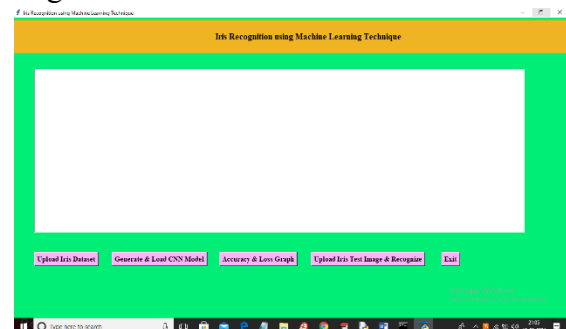
In above screen click on 'Upload Iris Dataset' button and upload dataset folder
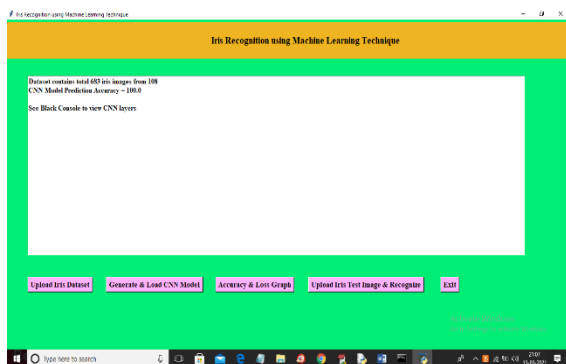

In above screen selecting and uploading 'CASIA1' folder and then click on 'Select

Folder' button to load dataset and to get below screen

In above screen dataset loaded and now click on 'Generate & Load CNN Model' button to generate CNN model from loaded dataset

In above screen 683 images loaded from different 108 peoples and we got it prediction accuracy as 100%. Now model is ready and now click on 'Accuracy & Loss Graph' button to get below graph
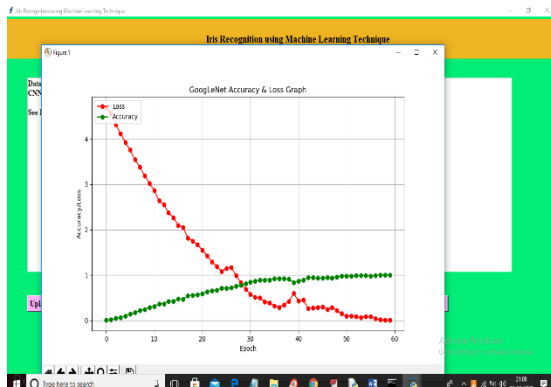

In above graph red line represents CNN model loss value and we can see at first iteration loss was more than 4% and when epoch increases then LOSS value reduce to 0 and green line represents accuracy and at first iteration accuracy was 0% and when epoch/iterations of model increases then accuracy reached to 100% and in above graph x-axis represents EPOCH and y-axis represents accuracy and loss values. Now click on 'Upload Iris Test Image & Recognize' button and upload any test image and then CNN will recognize person ID from that IRIS image. If you want you can upload test image from CASIA folder also and you will see prediction will be 100% correct
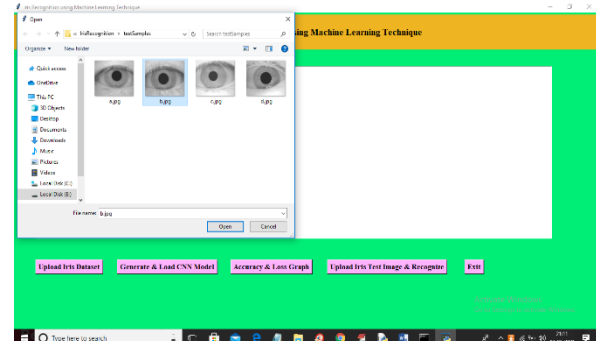

In above screen selecting and uploading 'b.jpg' file and then click on 'Open' button to get below screen
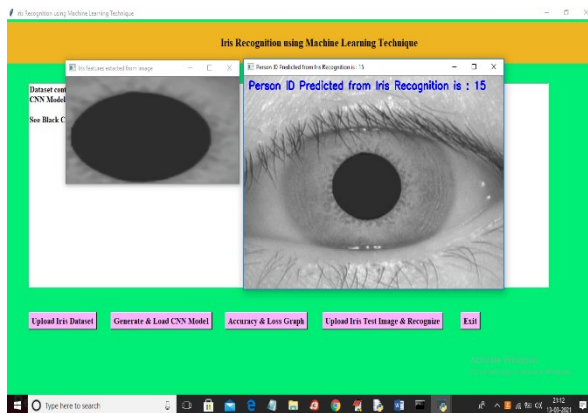
In above screen from uploaded image we extract IRIS features which is displaying in first image and then this image feeds to CNN and then CNN predicted that IRIS belong to person ID 15. Now I will upload one image from CASIA folder and then test whether CNN will predict correctly or not
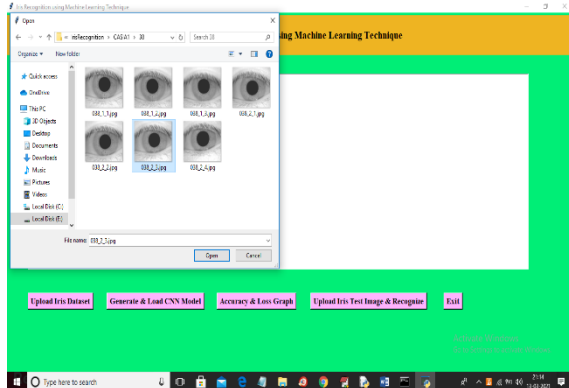
In above screen from CASIA folder I am uploading IRIS of person ID 38 and then click 'Open' button to get below result
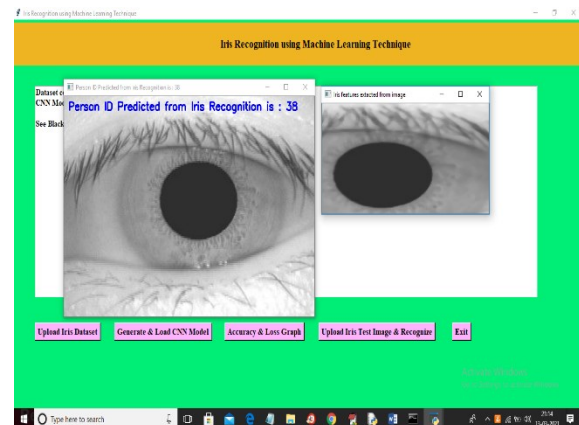
In above screen CNN predicted ID is 38 which is 100% correct

8. CONCLUSION

This study suggests an iris identification technique based on machine learning for smartphone images. When applied to iris images taken with a smartphone in the visible spectrum, the findings above show that machine learning approaches are competitive with, and in some cases better than, state-of-the-art technologies. However, accuracy can be improved. Additionally, we discovered that accurate segmentation plays a crucial role in accuracy. Consequently, a number of effective techniques may be applied to improve the segmentation result. Our goal was to keep things as simple as possible by identifying and splitting groups using only accepted methods. This was done in consideration of their simple implementation. The total recognition system, which might be utilised for identification, security, and recognition, looks promising given the high calibre of cameras present in modern smartphones. Samsung devices already come with a working iris scanner built in. Our next task is to develop a cloud-based server that

makes it easier for mobile devices to transmit iris data. A classifier that operates on the server will compare and validate the sent data. Because of this, a whole security system may be made using just cellphones.

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