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Iris Recognition Using Machine Learning in Advanced Voting Systems

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ABSTRACT
Based on the iris recognition system and related technologies, one of the primary outcomes of the validation system is the fingerprint-based system. The whole biometric procedure is much more genuine and distinct than the other kinds of validation procedures and recognition systems. This has given people creative ideas for their everyday lives. In general, the multimodal biometric process has used a variety of applications to appropriately address the most important and relevant shortcomings of the "unimodal biometric system." In general, the complete process has been incorporated, taking into account the appropriate noise sensitivity, population coverage regions, situations of variability involving both intra- and inter-class concerns, vulnerability involving potential hacking, and non-universality criteria. The machine learning system with a deep learning orientation has been the primary topic of the whole research article. Convolutional neural network (CNN) technology has been primarily used in the fingerprint-based iris recognition system to provide accurate human validation. 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 optimal 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 whole text.

1. INTRODUCTION

The primary use of biometrics has been the identification of distinct physical characteristics and attributes. For this reason, a vast array of recognition technologies, including voice, iris, and fingerprint processes, have been widely made available. The appropriate technical and technological domains for body controls and body measurements are the primary focus of biometrics. The proper biometric security system, which has grown in significance across all nations, is the foundation of the authentication system. Based on all of these processes and factors, the used system has shown the appropriate, legitimate, and most outstanding performance. The fingerprint is the sole method that offers the appropriate security measures to ensure the system's complete uniqueness and robust privacy features. The automated techniques and processes to guarantee fingerprint similarity between two individuals have been the major focus of outstanding fingerprint assurance, also known as the appropriate kind of imprint approval. The real goal of the basic research, which is ultimately based on the research goals and related research questions, has been presented throughout the whole chapter. The research framework for the whole study is also presented in this chapter. Every element that contributes to this identification process has been outlined by basic research.

2. LITERATURE REVIEW

The chapter on literature review provides a comprehensive elucidation of the many aspects and constituents of recognition that are principally associated with the whole domain of the research investigation. The fundamental research has benefited from the numerous types of study notes from different authors and academics. Another aspect that assesses the whole process is the summary of the research that may be found on several websites, journals, and online publications. Basic research has focused on a comprehensive analysis of the validation-based recognition system as a whole. In addition to all of them, this chapter has also shown the particular theories and models associated with the recommended topic for evaluating the description process overall. This section also outlines the gaps in the literature that are often missing from the research notes that are currently available and are authored by various authors.

According to author Alrahawe (2018), one of the safest ways to engage with the digital world is via a biometric system. Since each person's biometrics are distinct, biometric techniques—such as fingerprint, face, and iris identification—are seen to be safer than alternative ways to safeguard sensitive data (Alrahawe, 2018). On the other hand, prior to the development of technology, sensitive data was not adequately protected. Recent technological advancements have made biometric security an essential part of any system. The newest systems use this technique since, according to the author, security processes in digitalization are now error-free (Singh & Kant, 2021). Despite minor system flaws, this is very trustworthy for security purposes. The biometric system has used several recognition approaches, one of which is the finger-knuckle recognition method.

The author, Elhoseny (2018), asserts that a unimodal approach was used in the identification and verification processes. However, the accuracy was not fully maintained since the unimodal system did not meet the proper requirements for making decisions. Elhoseny (2018) found that there was a significant reduction in accuracy when the unimodal approach was used for verification. After then, the multimodal system was unveiled. Fusion technology is used by the multimodal system, therefore total accuracy of the verification was achieved. When compared to other modalities, the iris and fingerprint always have the highest permanence and uniqueness. In addition, compared to other forms of transportation, they are speedier and more reasonably priced. While the unimodal system was not completely incorporated in the concept of decision making, the multimodal system manages four unique tasks, including acquisition, feature extraction from the modalities, matching with the actual one, and decision providing (La, 2021). Unimodal systems are also employed in a few scenarios where a lesser degree of security may be useful. Industries managing significant amounts of sensitive data need multimodal solutions for high security reasons.

3. EXISTING SYSTEM

Much more processing power is needed to encode and analyze each individual's iris. Preeminence is practically guaranteed in matters of calculations and established frameworks. Unfortunately, none of the computations have been thoroughly validated due

to the lack of publicly available large-scale or even medium-sized datasets. Now you may browse the largest online collection of infrared pictures of the frontal iris. When testing computations without data, there are two important fixes.

- **Disadvantages:**

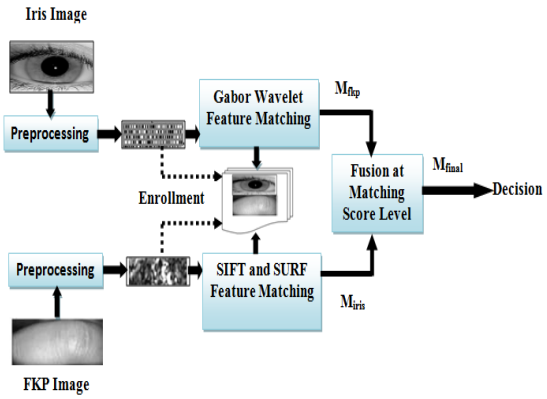
There is a higher chance of mistakes when using hazy iris photos and when noise detection and segmentation are done independently.

4. PROPOSED SYSTEM

We are using the 108 images from the CASIA IRIS dataset to train a convolutional neural network (CNN) model that might be used to identify or predict people based on their IRIS. Utilizing the IRIS features extracted from eye pictures by the HoughnCircles method, we are training a convolutional neural network (CNN) model.

Advantages:

Extensive experimental results and theoretical research confirm that the technique has excellent clustering.



SYSTEM ARCHITECTURE

5. ALGORITHIMS

Convolution Neural Network technique (CNN)

An example of an algorithm based on deep learning is the "convolution neural network (CNN)". The correct biasing system for various object kinds may be learned using this algorithm's weights, which are a crucial input picture characteristic. With this method, we can clearly see how the working process differs in each scenario, which is our main objective. Compared to other classification methods, ConvNet's actual demand and necessity of preprocessing are much lower (Haytom et al., 2019). "Convolution neural network (CNN)" with different construction structures including pooling layers, convolution layers, and complete connected layers should be used to create components and hierarchies of different elements, as well as to implement appropriate learning algorithms. In recent times, several kinds of tasks have been assigned to the "convolution neural network (CNN)" such as object identification, object recognition, picture captioning, and picture segmentation. When it comes to

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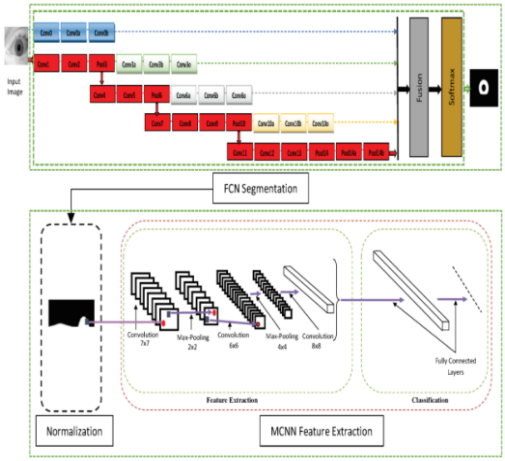
designing models and methods for completing the entire process, such as the respective videos and images that will be crucial for completing the entire finger based iris recognition process, the "convolution neural network (CNN)" is the category that mostly applies. The three main applications of this network method are picture segmentation, signal processing, and classification. In the remarkable and consistent change within the suitable texture, the iris recognition system has been evaluated in relation to the "reliable biometric recognition" procedure (Hernández-García et al., 2019). The current methods and efficient technologies that have been used mostly for feature extraction and feature classification have been thoroughly examined throughout this study paper. Improving the respective recognition efficiency is the primary application of this recognition system.



Convolution Neural Network technique (CNN) for Iris recognition system

Method for Convolutional Neural Network (CNN) model normalization - The iris's outer and inner borders, which will change mostly in relation to the whole pupil's contraction, have largely encircled this specific location. The classification module is the only basis for feature extraction in the "convolution neural network (CNN)". The correct area in relation to the fixed and correct dimension has typically mapped the real iris recognition system segmentation. Rubber sheet approach, an acceptable model for transforming various iris image segmentations inside a defined rectangular region, was suggested by the author.

6. IMPLEMENTATION

MODULES

Upload Iris dataset

Incorporating the Iris dataset into the application is the focus of this part.

Preparing the Data

After running this module's preprocessing steps, a dataset is prepared for further analysis.

Purpose: Feature Extraction

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The next step is to sort the data into two sets: training and test. One common split is 70% training data and 30% test data. This creates a "training" set and a "test" set.

Synthesis of Models

Python would be the language utilized to put the approach into action. For any deep learning model, the Python tools Theano and tensorflow are excellent choices. However, it is difficult to indirectly build a model using these libraries. In order to get the highest level of accuracy in the model, we use Keras and Tensorflow as our backend libraries. CNN layers are a part of Keras's sequential model. By examining different patterns that arise in the dataset, these layers do extensive data processing, which improves the model's accuracy. The data is then loaded into the chosen model for training.

Construction of a Convolutional Neural Network Model

With this part, you may build a convolutional neural network (CNN) model to use for both training and testing.

Graph of Accuracy and Error

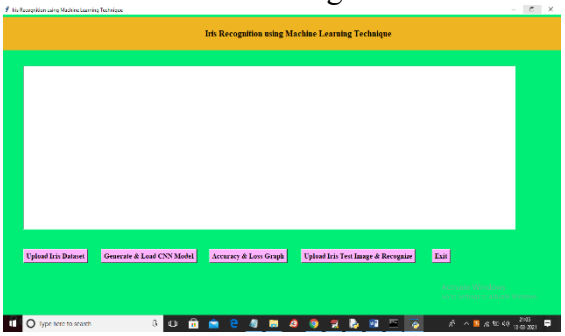
This will allow us to visually compare the efficacy of various deep learning techniques with that of feature extraction algorithms.

Iris Recognition Test Image Upload

By uploading a picture, users may test it and see how well the program recognizes it using this capability.

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

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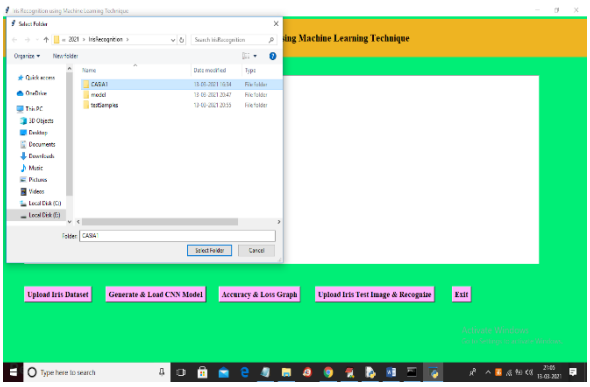
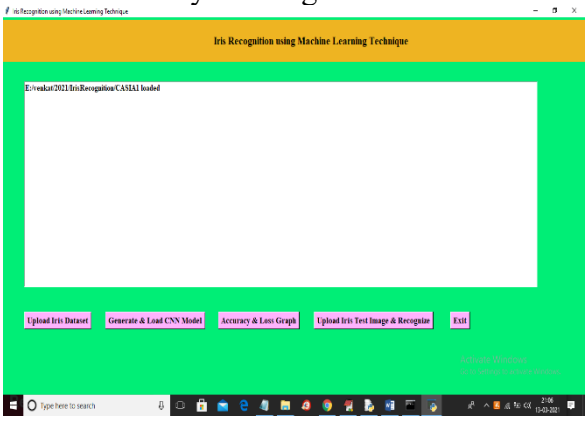
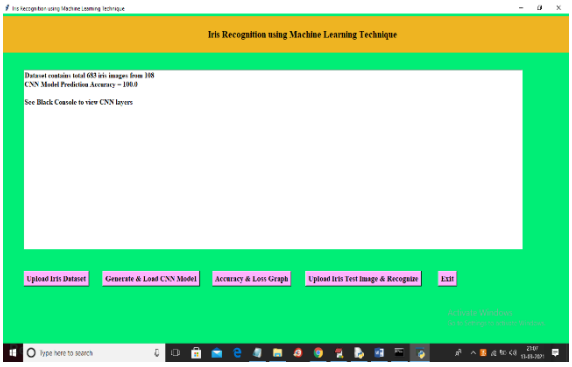


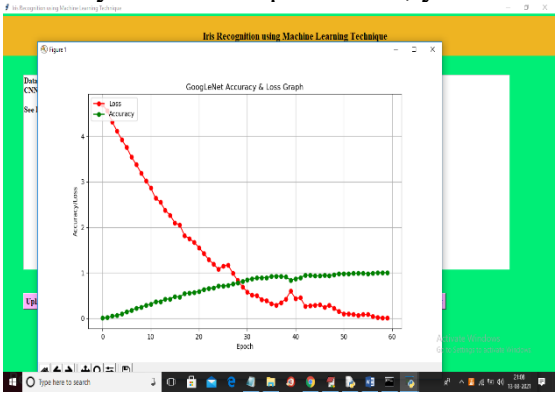
After choosing and uploading the "CASIA1" folder in the previous page, you may load the dataset on the one below by clicking the "Select Folder" button.



After you've loaded the dataset into the screen, you can construct a CNN model by clicking the "Generate & Load CNN Model" button.



The prediction accuracy was 100%, as seen in the above screen, which contains 683 photographs uploaded by 108 unique individuals. You may get the following graph when you click the "Accuracy & Loss Graph" button; your model is now ready.



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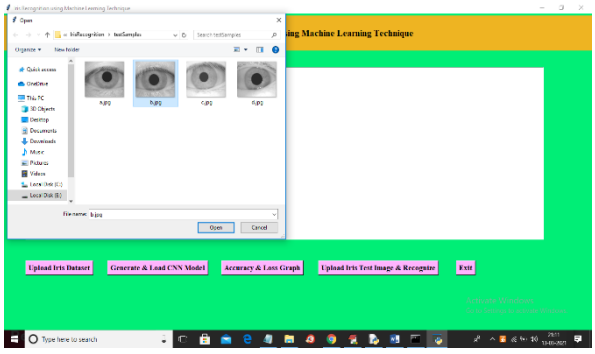
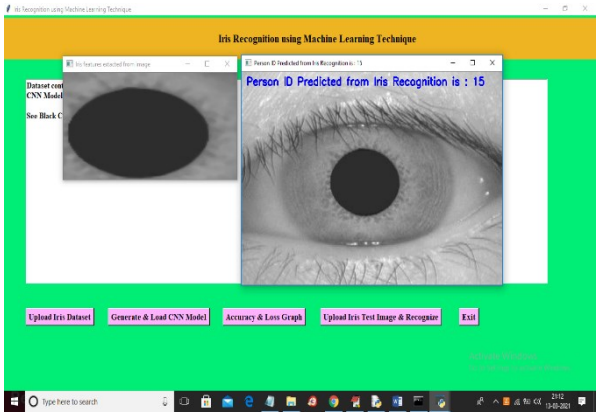
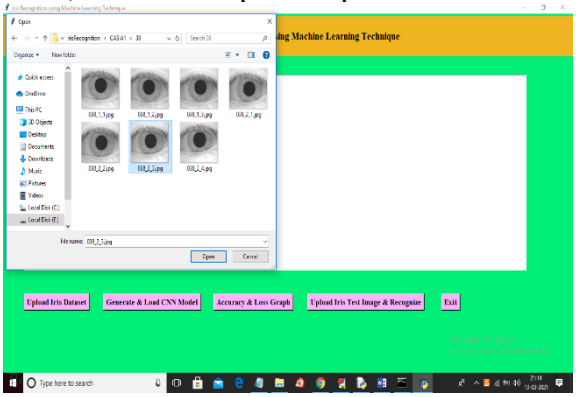
In the graph above, we can observe that the CNN model's loss value, represented by the red line, was over 4% at the beginning of the iteration but dropped to zero as the number of iterations increased. On the other hand, the accuracy value, shown by the green line, was zero at the beginning of the iteration but eventually rose to one hundred percent as the number of iterations increased. The x-axis of the graph represents EPOCH, and the y-axis shows the values of accuracy and loss. To have CNN identify a person's ID from an iris scan, just click the "Upload Iris Test Image & Recognize" button and choose an iris scan. You may also use the CASIA folder to submit test images; doing so will ensure that your forecast is accurate to within one percent.



In above screen selecting and uploading ‘b.jpg’ file and then click on ‘Open’ button to get below screen



We extract the IRIS characteristics shown in the first picture from the uploaded image; CNN then used this image to make a prediction about whose person ID the IRIS belonged to (person ID 15), as seen in the upper screen. To see whether CNN can make accurate predictions, I will now upload a picture from the CASIA folder.



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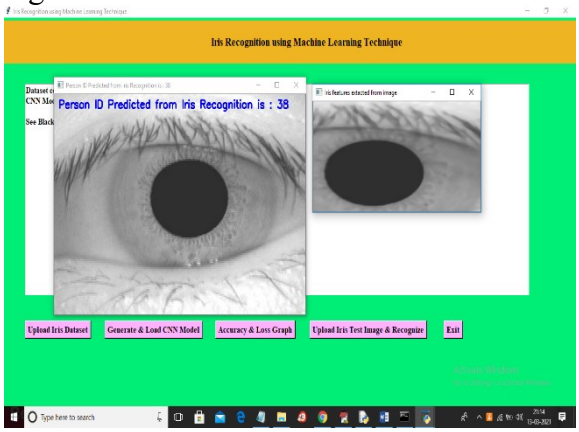
In above screen from CASIA folder I am uploading IRIS of person ID 38 and then click 'Open' button to get below result



In above screen CNN predicted ID is 38 which is 100% correct

8. CONCLUSION

An approach to iris identification using smartphone photos that is based on machine learning is suggested in this article. According to the results shown above, applying machine learning algorithms to visible-light smartphone iris photos may make them competitive, and in some cases even superior, than state-of-the-art solutions. Having said that, precision might be enhanced further. Additionally, we found that precise segmentation is crucial for accuracy. Consequently, a variety of efficient methods may be used to enhance the segmentation outcome. We strictly adhered to established protocols for group differentiation in an effort to make things as straightforward as feasible. Their ease of implementation was considered throughout the process. All things considered, the recognition system—which might find applications in security, identification, and recognition—stands to benefit from the high-quality cameras found in today's smartphones. There is an iris scanner already embedded into Samsung cellphones. Building a server in the cloud to facilitate the transfer of iris data from a mobile device is our next objective. Validation and comparison of the provided data will be performed by a classifier running on the server. Thus, it is possible to set up a comprehensive security system using simply telephones.

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