IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 7, July 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

9940 572 462 | 6381 907 438 | ijircce@gmail.com | www.ijircce.com

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

Iris Recognition Using Convolutional Neural Networks

B.Bhanu Prakash[1], Ch. Mahesh Srinivas[2]

Professor, Department of CSE, KKR & KSR Institute of Technology and Sciences, A.P, India. [1]

M.Tech Student, Department of CSE, KKR & KSR Institute of Technology and Sciences, A.P, India. [2]

ABSTRACT: Iris recognition is one of the maximum promising fields in biometrics. Notwithstanding this, there aren't so many research works addressing it via Machine Learning techniques. In this survey, we specially awareness on recognition, and go away the detection and characteristic extraction issues in the background. However, the kind of functions used to code the iris pattern may also extensively impact the complexity of the techniques and their overall performance. In different phrases, complexity affects getting to know, and iris styles require fantastically complex feature vectors, even though their length may be optimized. A move-evaluation of these parameters, feature complexity vs. Gaining knowledge of effectiveness, within the context of various mastering algorithms, could require an unbiased common benchmark. Moreover, at present it is nonetheless very tough to reproduce strategies and experiments due to the dearth of both sufficient implementation information and dependable shared code

I. INTRODUCTION

With the growing threats to personal non-public data, the improvement of an ever greater advanced biometric identification gadget is needed to shield the general public's hobby. A sincerely customized and easy system mitigates the issues related to passwords, which are easily hackable. Iris recognition allows the identification of an character to be determined by analyzing the iris pattern of the character. Making iris-based totally reputation to face out towards fingerprint is that it's been demonstrated to be a lot greater correct [1], mitigating the chance of falsifying someone's iris capabilities to be able to bring about identity robbery. The human eyes have numerous distinct structures that include 3 layers: fibrous tunic, vascular tunic, and retina, which can be quite precise from individual to character. Vascular tunic consists of the choroid, ciliary frame, pigmented epithelium, and iris. Iris controls the scale of pupils and its coloration is determined genetically. In additional, spots and filaments in a human eye additionally make a contribution to its unique features and uniqueness, making them be extraordinarily exclusive in nature. On the opposite hand, the have a look at of synthetic intelligence (AI) and deep learning was started out again inside the 1940s, where McCilloch et al. [2] proposed the McCulloch-Pitts (MCP) neuron modeled after the running principle of a biological neuron. The next breakthrough got here in 1958 in which Rosenblatt proposed the perceptron version as supervised-gaining knowledge of binary classifiers [3].

After that, the starting of AI winter saw the reduced interest in the field of artificial intelligence research, where the low point was seen in the 1990s. However, with access to a large amount of data and more powerful computing hardware, the development of AI has been rejuvenated especially the sub-field in machine learning. Since then, artificial neural networks have seen extensive application in various fields. Krizhevsky et al.[4] proposed a convolutional neural network (CNN)-based image classifier that is able to accurately classify the images in the ImageNet database. Soon et al. [5] proposed a PCA-CNN hybrid vehicle classifier that recognizes up to 357 classes of vehicles. In this investigation, convolutional neural network (CNN) has been used to develop a highly accurate iris recognition system that can recognize up to 20 individuals while deep learning algorithms form the backbone for the training of the model which is implemented in MATLAB.

In addition, in the main goals, we aim to determine the effect of the number of training epoch on the model prediction accuracy. This paper is separated into 5 sections, with Section 2 covering the background of iris recognition as well as convolutional neural network and deep learning. In Section 3, the methodology employed to develop the recognizer is being discussed while the results and discussions are included in Section 4. Lastly, in Section 5 we provide a conclusion to the paper and future works that can be conducted With the increasing threats to personal private data, the development of an ever more advanced biometric identification system is needed to afeguard the public's interest. A truly personalized and effortless system mitigates the problems associated with passwords, which are easily hackable. Iris recognition allows the identity of an individual to be determined by examining the iris pattern of the person. Making iris-based recognition to stand out against fingerprint is that it has been proven to be much more accurate [1], mitigating the risk of falsifying a person's iris features which will result in identity theft. The human eyes have several distinct structures that include three layers: fibrous tunic, vascular tunic, and retina, which are highly unique from person to person. Vascular tunic consists of the choroid, ciliary body, pigmented epithelium, and iris. Iris controls the size of pupils and its color is determined genetically.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

In additional, spots and filaments in a human eye also contribute to its particular features and uniqueness, making them is highly distinctive in nature. On the other hand, the study of artificial intelligence (AI) and deep learning was started back in the 1940s, where McCilloch et al. [2] proposed the McCulloch-Pitts (MCP) neuron modelled after the operating principle of a biological neuron. The next breakthrough came in 1958 where Rosenblatt proposed the perceptron model as supervised-learning binary classifiers [3]. After that, the starting of AI winter saw the reduced interest in the field of artificial intelligence research, where the low point was seen in the 1990s. However, with access to a large amount of data and more powerful computing hardware, the development of AI has been rejuvenated especially the sub-field in machine learning. Since then, artificial neural networks have seen extensive application in various fields. Krizhevsky et al.[4] proposed a convolutional neural network (CNN)-based image classifier that is able to accurately classify the images in the ImageNet database.

Soon et al. [5] proposed a PCA-CNN hybrid vehicle classifier that recognizes up to 357 classes of vehicles. In this investigation, convolutional neural network (CNN) has been used to develop a highly accurate iris recognition system that can recognize up to 20 individuals while deep learning algorithms form the backbone for the training of the model which is implemented in MATLAB. In addition, in the
main goals, we aim to determine the effect of the number of training epoch on the model prediction accuracy. This paper is separated into 5 sections, with Section 2 covering the background of iris recognition as well as convolutional neural network and deep learning. In Section 3, the methodology
employed to develop the recognizer is being discussed while the results and discussions are included in Section 4. Lastly, in Section 5 we provide a conclusion to the paper and future works that can be conducted With the increasing threats to personal private data, the development of an ever more advanced biometric identification system is needed to safeguard the public's interest. A truly personalized and effortless system mitigates the problems associated with passwords, which are easily hackable. Iris recognition allows the identity of an individual to be determined by examining the iris pattern of the person. Making iris-based recognition to stand out against fingerprint is that it has been proven to be much more accurate [1], mitigating the risk of falsifying a person's iris features which will result in identity theft. The human eyes have several distinct structures that include three layers: fibrous tunic, vascular tunic, and retina, which are highly unique from person to person. Vascular tunic consists of the choroid, ciliary body, pigmented epithelium, and iris. Iris controls the size of pupils and its color is determined genetically. In additional, spots and filaments in a human eye also contribute to its particular features and uniqueness, making them be highly distinctive in nature.

On the opposite hand, the look at of synthetic intelligence (AI) and deep gaining knowledge of changed into started out returned inside the Nineteen Forties, where McCilloch et al. [2] proposed the McCulloch-Pitts (MCP) neuron modelled after the running principle of a organic neuron. The subsequent breakthrough came in 1958 wherein Rosenblatt proposed the perceptron model as a supervised-getting to know binary classifiers [3]. After that, the beginning of AI winter saw the reduced interest in the subject of artificial intelligence research, in which the low point was visible within the Nineteen Nineties. However, with get entry to to a large quantity of information and more effective computing hardware, the improvement of AI has been rejuvenated especially the sub-subject in device studying. Since then, synthetic neural networks have seen extensive software in diverse fields. Krizhevsky et al.[4] proposed a convolutional neural network (CNN)-based totally photograph classifier that is capable of as it should be classify the pix in the ImageNet database.

Soon et al. [5] proposed a PCA-CNN hybrid car classifier that recognizes as much as 357 instructions of motors. In this investigation, convolutional neural network (CNN) has been used to broaden a pretty accurate iris reputation device that may apprehend up to twenty individuals at the same time as deep learning algorithms shape the spine for the training of the model that's carried out in MATLAB. In addition, within the principal desires, we intention to determine the effect of the variety of training epoch on the version prediction accuracy. This paper is separated into 5 sections, with Section 2 overlaying the historical past of iris popularity in addition to convolutional neural community and deep getting to know. In Section three, the technique employed to increase the recognizer is being discussed while the outcomes and discussions are blanketed in Section four. Lastly, in Section 5 we offer a conclusion to the paper and destiny works that may be conducted

The iris recognition is a biological verification technique that applies reputation of pattern technique through the decision of the exceptional photographs of the irises of someone's eyes. In current instances, the human iris has attracted a great deal interest in biometrics. Iris is a component inside the attention length of the scholar that is muscular in nature which controls the total light that is going into the eye. The iris is so different this is it not possible to have irises being the equal even for indistinguishable twins. Iris has a particularly interesting association which produces plentiful texture information. The unique textural sample offers in iris may be extracted using various techniques of function extraction, and additionally can be stored as a template for Manuscript acquired March 19, 2020 Adekunle, Y.A, Computer Science Department, Babcock University, Ilishan-Remo, Nigeria. Aiyeniko, O, Computer Science Department, Babcock University, Ilishan-Remo, Nigeria (e-mail: royalgrace2000@yahoo.Com Eze, M.O, Computer Science Department, Babcock University, Ilishan-Remo, Nigeria. Alao, O.D, Computer Science Department, Babcock University, Ilishan-Remo, Nigeria. Biometric in a repository for advance processing. The recognized features produce neighborhood-global or both neighborhood and worldwide facts. Features useful resource in the evaluation of the important textural traits of an iris [10]. The extraction of functions from the portion of an iris is considered to be one of the considerable steps in iris popularity system due to the truth that it is needed to be finished with least feasible classification and computational time. The popularity price of the iris recognition device solutions to the number of functions obtained from the iris element. A feature may be described as a characteristic of 1 or

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

extra measurements of the item, which is computed such that it qualifies a few huge characteristics of the item [3]. Only significant and discriminated records of iris texture must be extracted and encoded in order that comparisons among templates may be made with no trouble and effectively. Robust recognition rate and a discounted category time of two iris templates can be inspired through characteristic extraction technique. Development of an effective iris reputation system calls for that first-class discriminating facts available in an iris pattern to be well extracted [3]. The trouble in features extraction impacts the complexity of the program and processing speed of the iris popularity gadget. The applicable functions of the iris must be encoded in order that comparisons among templates may be made [11]. Inadequate iris photographs representation can also have an effect on the class accuracy of the iris reputation machine. It could be very essential in iris recognition to look at the performance of techniques of feature extraction.

II. LITERATURE SURVEY

The previous work explains the various approaches that were undertaken and researched in this context of work approach.

The In Springer 2018 [1], Alaa S. Al-Waisy et al.,
Presented a multi-biometric iris recognition system based on a deep learning approach. The authors put forth a really innovative approach on the Multimodal biometric systems. The biometric systems have been widely used for various purposes all around the world and henceforth the authors put their focus on the multi biometric system of Iris recognition using the deep learning concept. The various image templates of Iris collected are then used for the segmentation purpose. This is one of the most important phases of the entire process. Third comes the feature extraction phase. In this the useful features and useful Iris image templates are extracted and the redundant ones are discarded. This proved to be a very useful approach in the biometric recognition domain.

In IEEE 2018, Cunjian Chen et al.
in [2] put forth a Multitask Convolutional Neural Network for Joint Iris Detection and Presentation Attack Detection. In this work the authors presented a scheme that consisted of a convolutional neural network that could detect the iris as well as perform PAD. It suggested a novel concept that could be used widely. It is inspired by an object detection scheme that could suppress the parameters needed for the optimal functioning. There re sensors at work that carry out the sensing and recognition mechanisms. The classification needs to be highly accurate. This is followed by pattern matching step. This is yet another very important part of the entire system. . Many a times, the facial features are so complex and detailed that the classification and feature extraction might fail to accurately identify the Iris. Also in cases of slight facial modifications like use of expressions etc, the system might not work properly.

In IEEE Shabab Bazrafkan et al. IN [3],
proposed nhancing iris authentication on handheld devices using deep learning derived segmentation techniques. The authors in the paper proposed a novel approach based on the improving the Iris authentication method in hand held devices and it would also employ the deep learning methods of segmentation. The iris segmentation and localization features are so widespread that it actually does not provide proper outcomes. As the number of users and data keeps on increasing, the number of frauds and illegal and unauthorized attempts to breach the systems also are taking place. So to handle such instances, proper and effective biometric authorization systems need to be ready. So this approach was sought after immensely.

In IEEE 2017, Ritesh Vyas et al. in [4]
explained about Cooccurrence Features and Neural Network Classification Approach for Iris Recognition. In this paper, an approach for iris recognition was proposed based on co-occurrence features and neural network classification. It was shown that he proposed approach with gray co-occurrence features prove to be highly effective in separating iris based images. The evaluation of the proposed method was checked based on the accuracy of classification. The data base used was the MMU iris database. The best accuracy is achieved with the proposed scheme is 97.83% which is at par with state- of-the-art approaches. [4]In 2017 IEEE, Kien Nguyen et al. presented a paper Iris Recognition With Off-the-Shelf CNN Features: A Deep Learning Perspective.

In IEEE 2017, R. Raghavendra et al. in [5]
presented ContlensNet: Robust Iris Contact Lens Detection Using Deep Convolution Neural Networks. In many cases, many people resort to use of contact lenses. In such cases the method of Iris recognition approach has to be a little bit different. As the Iris recognition is a little difficult as the contact lenses covers the real iris part of the ye so the iris sensor is not able to detect it easily. Hence in this work, a model of Contlens is proposed for effective Iris contact lens detection using the

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

convolutional neural network mechanism. It is built with nearly 15 layers and has a very solid detection method in place. There are cases where many Iris images have similar pixel attributes and values and it is hard to decipher the unique Iris.

In IEEE 2016, Nianfeng Liu et al. in [6]
has provided accurate iris segmentation in non-cooperative environments using fully convolutional networks. In favorable conditions , the iris recognition methods work in a particular way. With high user cooperation and also cooperative set of conditions, it is a relatively easy task. Whereas for non cooperative environments such as incidence of blur, disturbances, less user cooperation nd other unforeseen circumstances, it becomes an arduous task. So this paper focuses on the accurate iris authentication in non cooperative environments. It utilizes the concept of fully conventional neural networks. Noisy iris images are a big problem. Also people on the move perform a lot of movements. In such cases this approach is used.

III. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM:

Most of the works considered pertain to the last decade and two thirds of them have been presented in the last five years, showing an increasing interest of scientific community for this topic. It is worth remarking that the present paper is specifically focused on the machine learning methods applied to the recognition problem and, consequently, it does not cover in detail any feature extraction methods unless this step is a characterizing part of the ML approach. In the same way, as we wanted to provide a coherent and uniform view of the state of the art, almost the totality of the papers cited in this survey concern iris/particular recognition instead of their detection. On the contrary, some missing works especially tackle these two problems, leaving less space to the investigation of original ML techniques.

3.2 PROPOSED SYSTEM:

In the mentioned work, the SVM classifiers yield slightly higher prediction accuracy than ANN, irrespective of the features extracted to encode object characteristics, the size of the training data sets, and the algorithms employed to train the two network architectures considered. However, a previous comparison of SVM to several machine learning methods (Burbidge et al., 2001) had shown that an SVM classifier outperformed other standard methods, but a specially designed and structurally optimized neural network was again superior to the SVM model in a benchmark test.

IV. SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE:

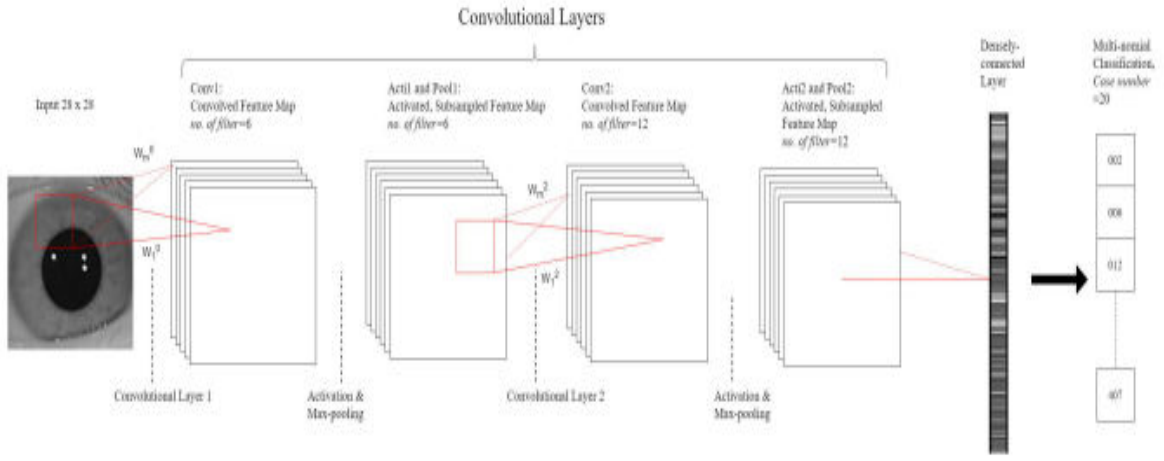


Fig. 4. The architecture of the CNN-based iris recognition system

IMPLEMENTATION:
MODULES:

- **Load Dataset**
- **Data Preprocessing**
- **Spilt Data**
- **Build CNN Classifier**
- **Accuracy**

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

Testing From the splitting of the dataset into training and testing set, the training set is used to train the model with a specified number of training epoch, while the testing set is used to verify the performance of the model. We started the training of the model with 100 training epochs to provide a baseline for the effect of the number of training epoch on the testing accuracy. With only 100 training epochs, the model failed to recognize any iris image in the testing set, achieving an accuracy of 0%. However, since the prediction accuracy of the model is directly related to the number of training epoch before over-fitting occurs, we passed the training set through the model for an increased number of times. As seen from TABLE II. , the model managed to perform better in the testing phase with increasing number of training epoch, showing an early sign of convergence at 600 epochs (Fig. 5). However, the increment

B. Real-time recognition Due to the random splitting of the training and testing set, there are two cases that are not found in the testing set (Case 119L, 310L). Thus, after the model has been trained with 2000 training epochs, we conducted a real-time recognition test. It also aims to verify the recognition performance of the trained model. We specifically included the images for 119L and 310L in the real-time recognition testing set which contains other randomly selected images as shown in Fig. 7. As seen from Fig. 8, the model made the correct prediction for all 18 images in the real-time recognition set, indicating the model has generalized well.

V. CODING

Irisrecognition.py

```
import numpy as np
import cv2
import os
import sys
import math
import random
import cPickle as pickle
import copy
import gzip
import inspect
import itertools
from matplotlib import pyplot as plt
def compare_images(filepath1, filepath2):
    print "Analysing " + filepath1
    rois_1 = load_rois_from_image(filepath1)
    print "Analysing " + filepath2
    rois_2 = load_rois_from_image(filepath2)
    getall_matches(rois_1, rois_2, 0.8, 10, 0.15, show=True)
def compare_binfiles(bin_path1, bin_path2):
    print "Analysing " + bin_path1
    rois_1 = load_rois_from_bin(bin_path1)
    print "Analysing " + bin_path2
    rois_2 = load_rois_from_bin(bin_path2)
    getall_matches(rois_1, rois_2, 0.88, 10, 0.07, show=True)
def load_rois_from_image(filepath):
    img = load_image(filepath, show=True)
    print "Getting iris boundaries.."
    pupil_circle, ext_iris_circle = get_iris_boundaries(img, show=True)
    if not pupil_circle or not ext_iris_circle:
        print "Error finding iris boundaries!"
        return
    print "Equalizing histogram .."
    roi = get_equalized_iris(img, ext_iris_circle, pupil_circle, show=True)
    print "Getting roi iris images ..."
    rois = get_rois(roi, pupil_circle, ext_iris_circle, show=True)
    print "Searching for keypoints ... \n"
    sift = cv2.xfeatures2d.SIFT_create()
    load_keypoints(sift, rois, show=True)
```

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

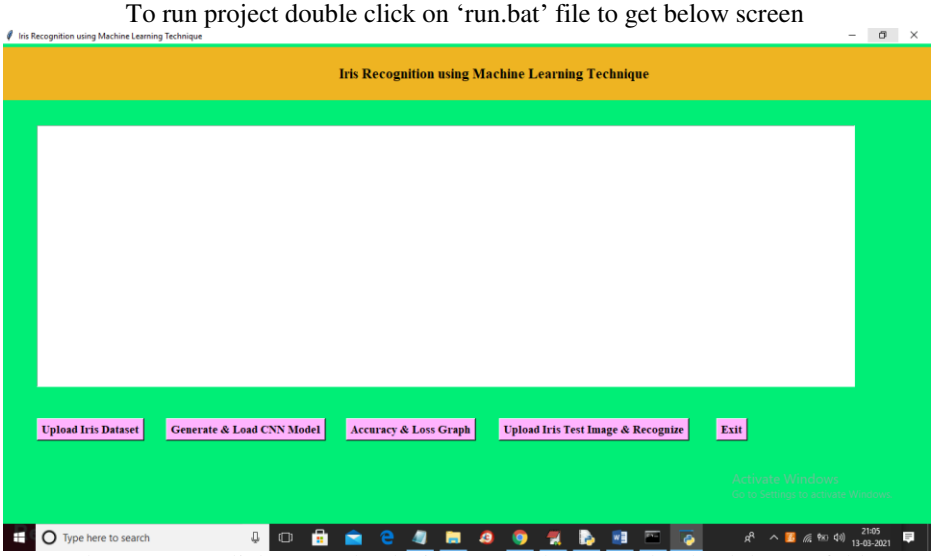
|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

```
    load_descriptors(sift, rois)
    return rois
def load_image(filepath, show=False):
    img = cv2.imread(filepath, 0)
    if show:
        cv2.imshow(filepath, img)
        ch = cv2.waitKey(0)
        cv2.destroyAllWindows()
    return img
def get_iris_boundaries(img, show=False):
    # Finding iris inner boundary
    pupil_circle = find_pupil(img)
    if not pupil_circle:
        print 'ERROR: Pupil circle not found!'
        return None, None
    # Finding iris outer boundary
    radius_range = int(math.ceil(pupil_circle[2]*1.5))
    multiplier = 0.25
    center_range = int(math.ceil(pupil_circle[2]*multiplier))
    ext_iris_circle = find_ext_iris(
                    img, pupil_circle, center_range, radius_range)
    while(not ext_iris_circle and multiplier <= 0.7):
        multiplier += 0.05
        print 'Searching exterior iris circle with multiplier ' + \
            str(multiplier)
        center_range = int(math.ceil(pupil_circle[2]*multiplier))
        ext_iris_circle = find_ext_iris(img, pupil_circle,
                                center_range, radius_range)
    if not ext_iris_circle:
        print 'ERROR: Exterior iris circle not found!'
        return None, None
```

VI. SCREENSHOTS

To run project double click on 'run.bat' file to get below screen

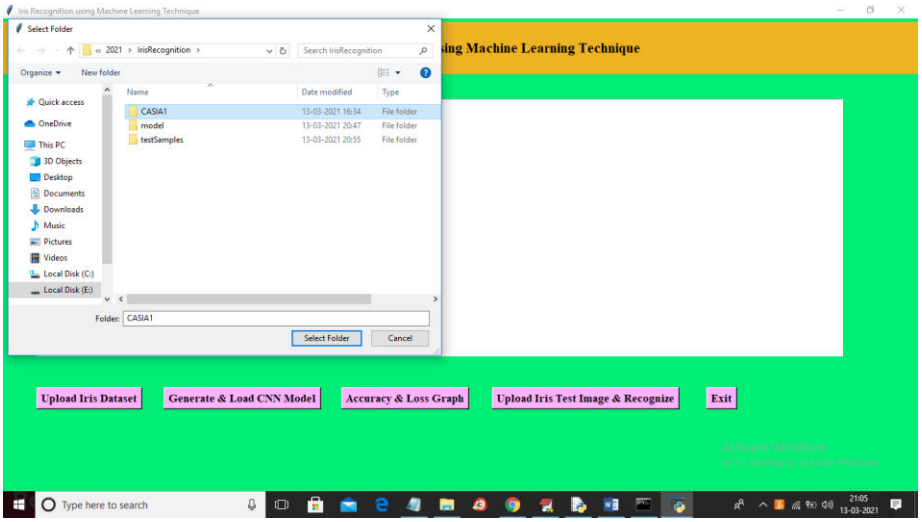


In above screen click on 'Upload Iris Dataset' button and upload dataset folder

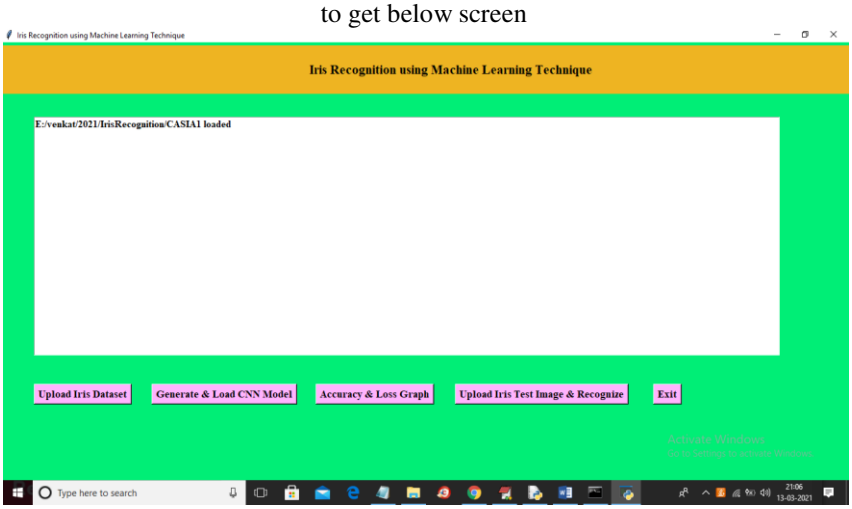
| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

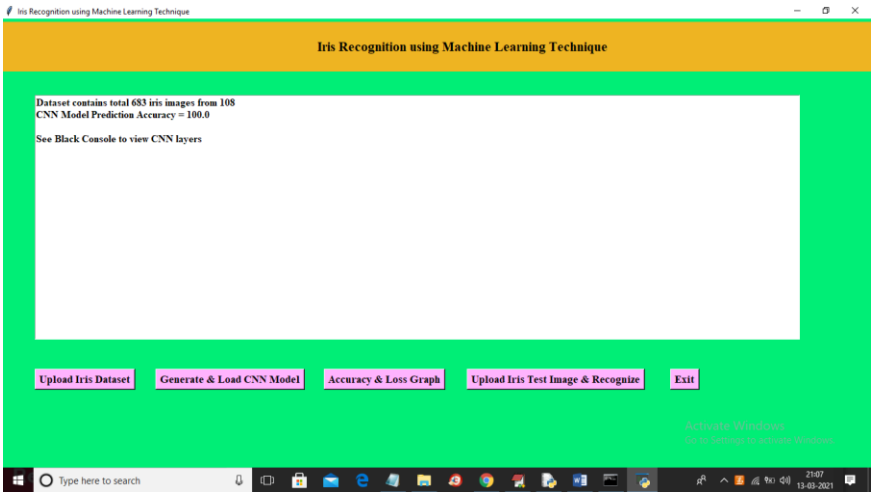
| DOI: 10.15680/IJIRCCE.2022.1007079 |



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

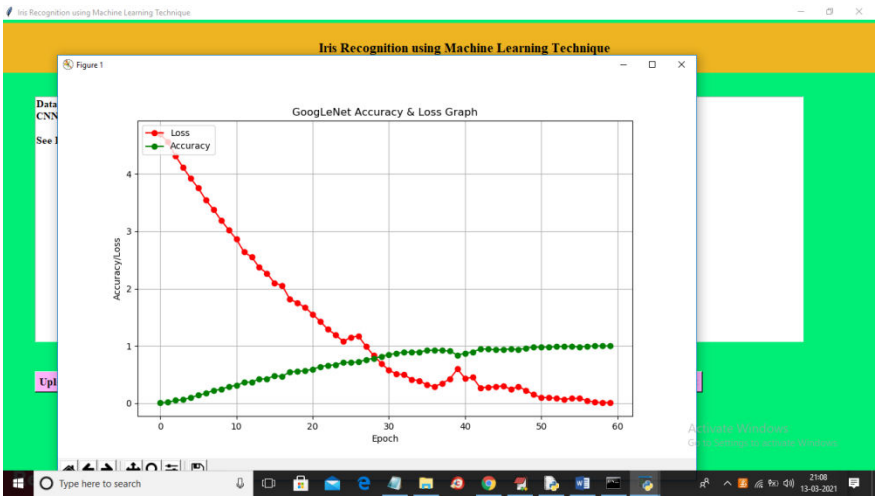


In above screen 683 images loaded from different 108 peoples and we got it prediction accuracy as 100%. Now model is ready and now click on 'Accuracy & Loss Graph' button to get below graph

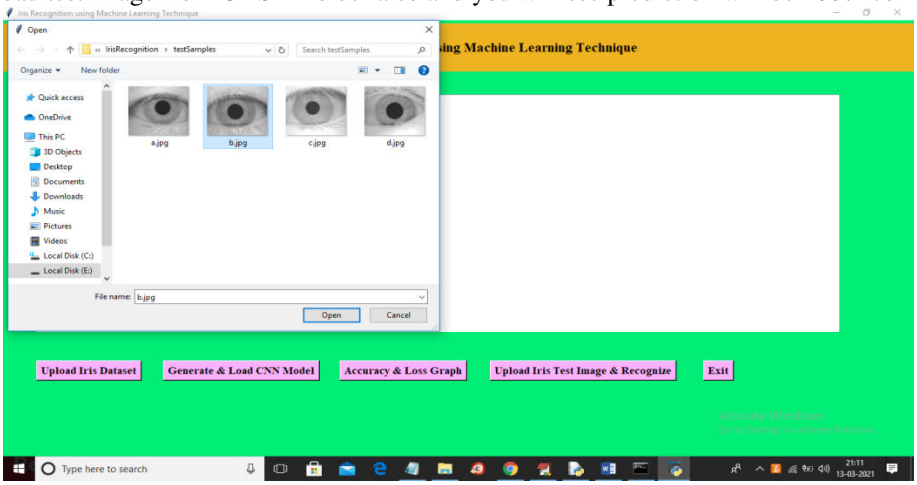
| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

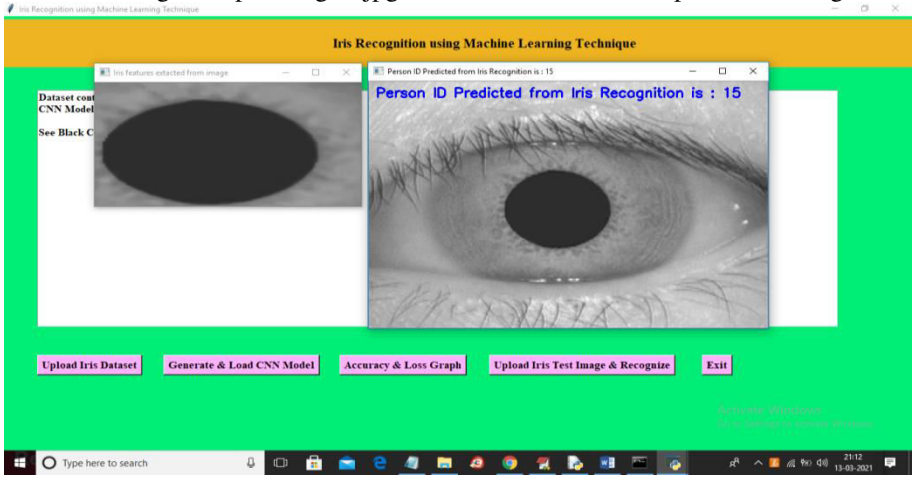
| DOI: 10.15680/IJIRCCE.2022.1007079 |



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

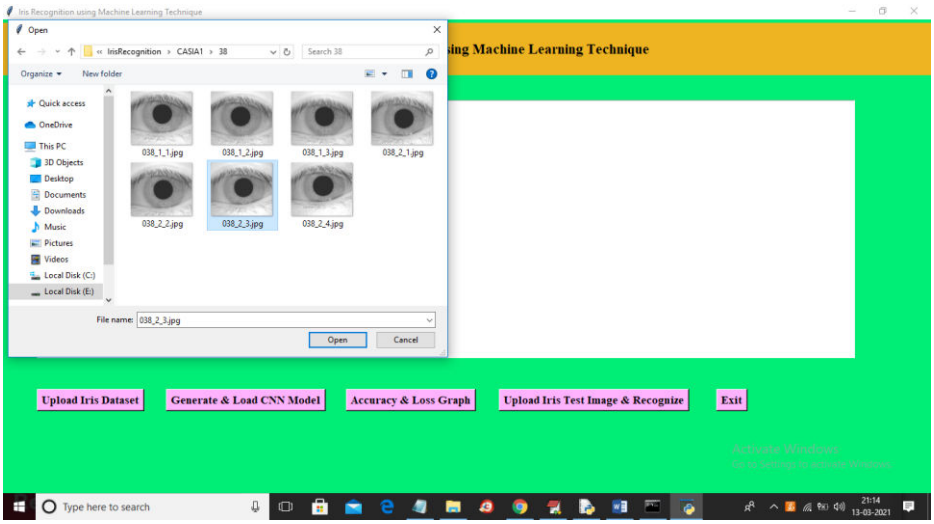


| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

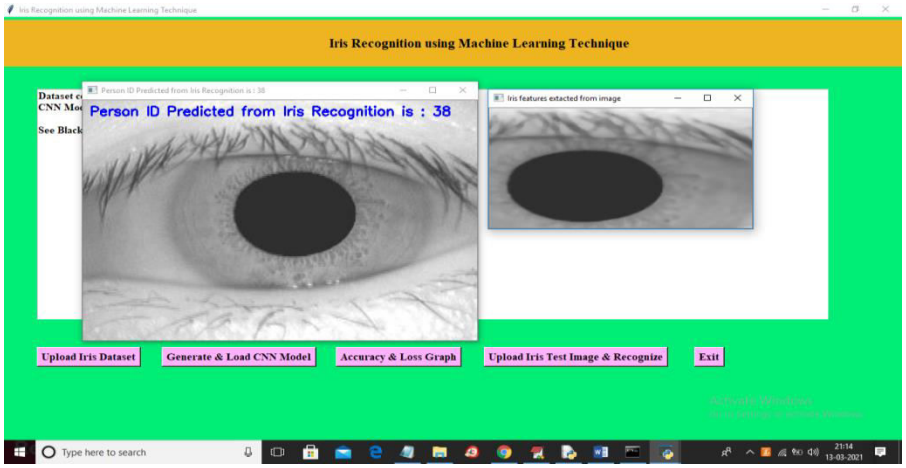
|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

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

VII. CONCLUSION

The proposed CNN-based iris recognition system can identify the iris of up to 20 individuals with very high prediction accuracy, making it very well-suited to be used in future works. However, there are still a few issues associated with the system, among them being the relatively small number of iris pairs that are used to train the model, the computational complexity which leads to long training time, as well as the black box nature of the model, in which the inner operating principle of the system is not understood. As a result, future works shall focus on increasing the number of different iris samples while maintaining the prediction accuracy, increase the computational efficiency with methods like incorporating hybridization into the architecture of the network to reduce the processing complexity

REFERENCES

[1] E. Jung and K. Hong, "Automatic retinal vasculature structure tracing and vascular landmark extraction from human eye image," in Hybrid Information Technology, 2006.

[2] W. S. McCulloch and W. Pitts, "A logical calculus of the ideas immanent in nervous activity," The bulletin of mathematical biophysics, vol. 5, no. 4, pp. 115-133, 1943.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165

|| Volume 10, Issue 7, July 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1007079 |

[3] F. Rosenblatt, "The perceptron: A probabilistic model for information storage and organization in the brain," Psychological Review, vol. 6, no. 65, pp. 386-408, 1958.

[4] A. Krizhevsky, I. Sutskever and G. Hinton, "ImageNet Classification with Deep Convolutional Neural Networks," in Advances in Neural Information Processing Systems, Lake Tahoe, 2012.

[5] F. C. Soon, H. Y. Khaw, J. H. Chuah and J. Kanesan, "PCANet Based Convolutional Neural Network Architecture For Vehicle Model Recognition System," IEEE Transactions on Intelligent Transportation Systems, vol. PP, no. 99, pp. 1 - 11, 2018.

[6] J. Daugman, "How Iris Recognition Works," IEEE Transactions On Circuits And Systems For Video Technology, vol. 14, no. 1, pp. 21 - 30, 2004.

[7] N. Aloysius and M. Geetha, "A review on deep convolutional neural networks," in Communication and Signal Processing (ICCSP), 2017.

[8] Y. LeCun, Y. Bengio and G. Hinton, "Deep Learning," Nature, vol. 521, p. 436–444, 2015. [9] Y. LeCun, L. Bottou, Y. Bengio and P. Haffner, "Gradient-based Learning Applied to Document Recognition," Proceedings of the IEEE, vol. 86, no. 11, pp. 2278-2324, 1998.

[10] H. Wu and X. Gu, "Max-Pooling Dropout for Regularization of Convolutional Neural Network," in International Conference on Neural Information Processing, 2015.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details