



**A PRO JE CT REPORT ON**  
**IRIS RECOGNITION USING MACHINE LEARNING**

Submitted in the partial fulfilment of the requirements for the award of

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SUBMITTED BY

Baradi sindhu

20BK1A1212

Gudipally Abhigna

20BK1A1242

ChowdarapuGangothri

20BK1A1231

Chennamaneni Niha

20BK1A1225



DEPARTMENT OF INF ORMATION TECHNOLOGY

St. Peter's Engineering College (UGC Autonomous)

Approved by AICTE, New Delhi, Accredited by NBA and NAAC with 'A' Grade,

Affillated to JNTU, Hyderabad, Telangana

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# 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.

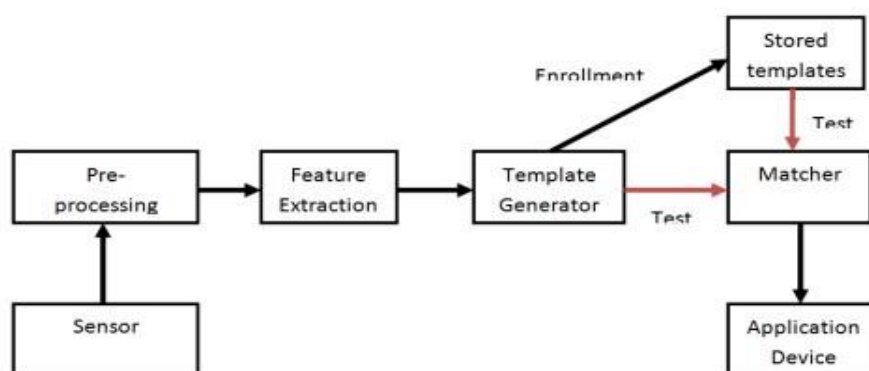
## 1.1. Background of the study

In this particular recognition system, the outer and the inner boundaries of the iris area have been mainly detected by the different types of integro differential operators. The real success of the biometric system and the biometric process is totally based on the proper classification and proposed recognition system. The entire process mainly depends on the proper robustness and efficiency of the "feature extraction and classification stages". In this case, most choices of the fingerprint game-planning images have been proposed for the various types of bunch fingerprints in four to five classes between the four types. Among all these four aspects, the primary vital priorities and the initial step are the AFIS. The particular types of the biometric process use the unique certified cations for gathering informative data from the various estimations. This kind of data is very much necessary and essential for the various cases of individual priorities. It still remains important and essential for this recognition system. The Iris recognition of the entire development of enthusiasm has been found within the sound stage of biometrics for human ID. For the proper discussion of the entire recognition system, there

are used the "Bayesian graphical models" match the respective images of such types of tests. Among all the classifiers, "convolution neural networks" have been mainly considered the most robust and straightforward aspects to overcome all the obstacles within this system. This entire research study has been proposed as the "integrated approach to the proper iris recognition validation system" for the retention process of a human fingerprint.

## 1.2. Problem statement

There are various types of problems and significant issues that have been mainly faced by the biometric security system. The central and foremost issue is the **biometric authentication process**, and technologies have been mainly raised in the various types of privacy concerns and security concerns (Hamd & Ahmed, 2018). During the processing time of the biometric data, there is no other option to undo or retrieve the respective information from the damage. For the case of the compromised passwords, anyone can modify it with fingerprint, iris scanner and the ear image effects. So for all these aspects, the simple working performance of the biometrics remains within the security risks and privacy risks. There are various types of problems that have been shown in the different slides of the **iris recognition system**, such as the sensor module, preprocessor module and feature extraction process. All these security and privacy issues can be adequately solved by the appropriate types of technologies and modern and advanced techniques. The security process should also be secured with the help of a strong password and robust system process.



**Figure : various stages of fingerprint iris recognition process**

### 1.3. Motivation

For this purpose, several types of publications have been mainly documented with respect to the high accuracy states and the excellent reliability of the neural networks like the multilayer perceptions (MLP). This is mainly provided between the present times patterned recognition and accurate classifier applications. This research study there mainly used the particular machine learning technique "**convolution neural network (CNN)**" for improving the privacy security process within the validation system. The input image is mainly needed for reducing the size of the processed data and to achieve satisfactory working performance (Herbadji *et al.* 2020). The respective working performance has been done within several image processing states like image enlargement, image partitioning and factor extraction.

### 1.4. Research Aim

The entire research paper aims to mainly initiate the removal of the particular gap among the existing study notes with respect to the various types of validation system. This section also has been used to present the best overview of the entire validation system that is totally based on the iris fingerprint method. The system is also used for properly enhancing the better approach for the excess proactive cases of the security system and privacy system such as the human fingerprints. With the help of the research topic, it has been easily understood that for this case, the entire validation system is totally dependent on the "fingerprint iris recognition" methods and procedures.

### 1.5. Research Significance

The iris biometric authentication process is very complex, and it has been mainly shown the various types of recognition techniques. The recognition technique has been included with the "mathematical pattern recognition technique" for proper identification of the unique video images and stable video images of both the individual or proper distanced ranged authentication process. The proper types of the various characteristics of the iris recognition process with respect to the "convolution neural network (CNN)" are efficiently unique and accurate for each recognition method (Iula & Micucci, 2019). The most significant advantage of the fingerprintbased iris recognition system is the best accuracy status, proper scalability system, accurate hyphenation, and stability, and live detection, the most secure and fastest matching criteria. In this case, the iris authentication process has been shown the best types of similarity

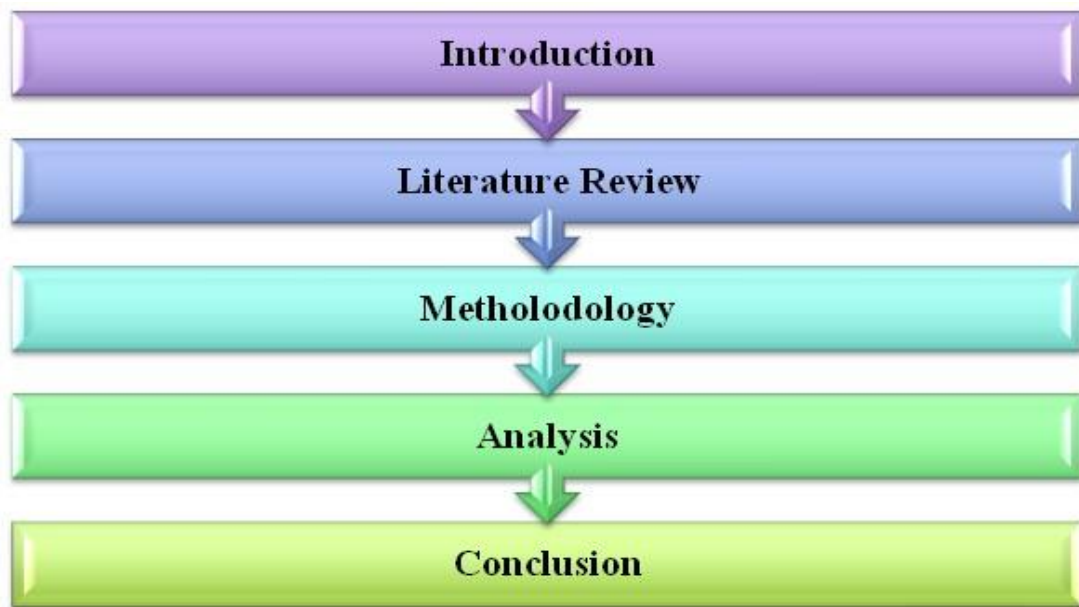
in the case of the most complicated mathematical patterns for performing the uniqueness of the entire validation process. In the proposed system, many types of layers are applied in the "convolution neural network (CNN)" for the purpose of the "multimodal biometric human authentication" process. The authentication process mainly has been done with respect to the face, veins, iris scanner, fingerprints and palm for increasing the robustness and visibility of the entire recognition system (Jain & Kumar, 2019). The entire recognition process is very much tricky for hacking and copying.



**Figure : Fingerprint iris recognition process by convolution neural network**

## 1.6. Research Framework

The entire research study has been subdivided into five parts. The first part is the introduction. This section provides the background of the study, research aim, objectives, and research significance. The second part is the literature review. This section provides the various processes and strategies of the entire study from existing research notes. The third part is the work methodology. This part has mainly described the methods for successfully conducting fundamental research. The fourth part is the finding and analysis, and the last part is the conclusion of the fundamental research.



**Figure : Research Framework**

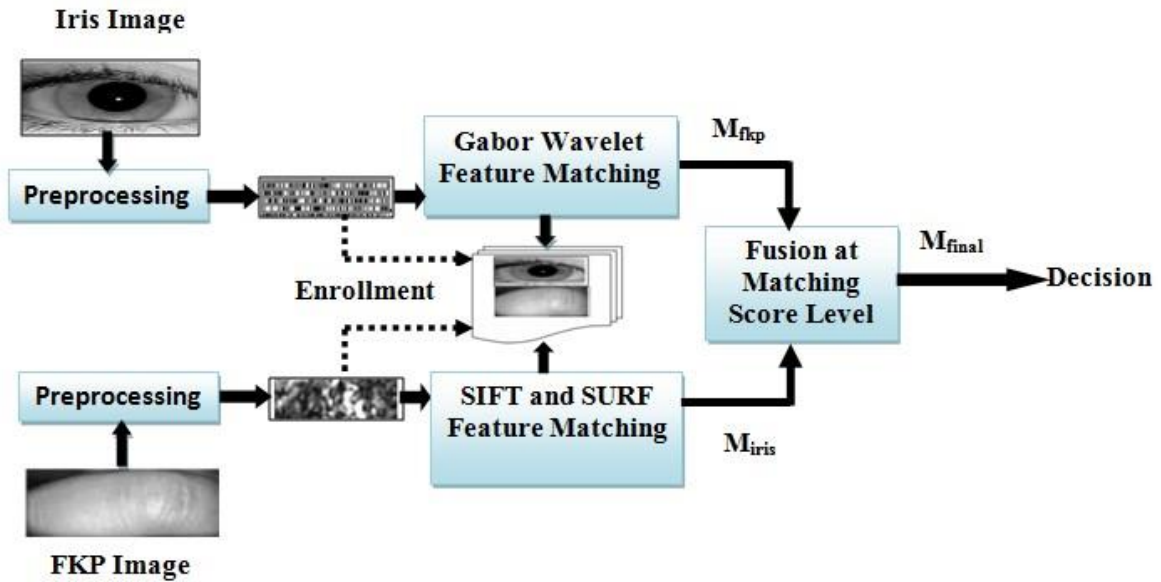


## **2. LITERATURE SURVEY**

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.

### **2.1. Empirical Study**

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.

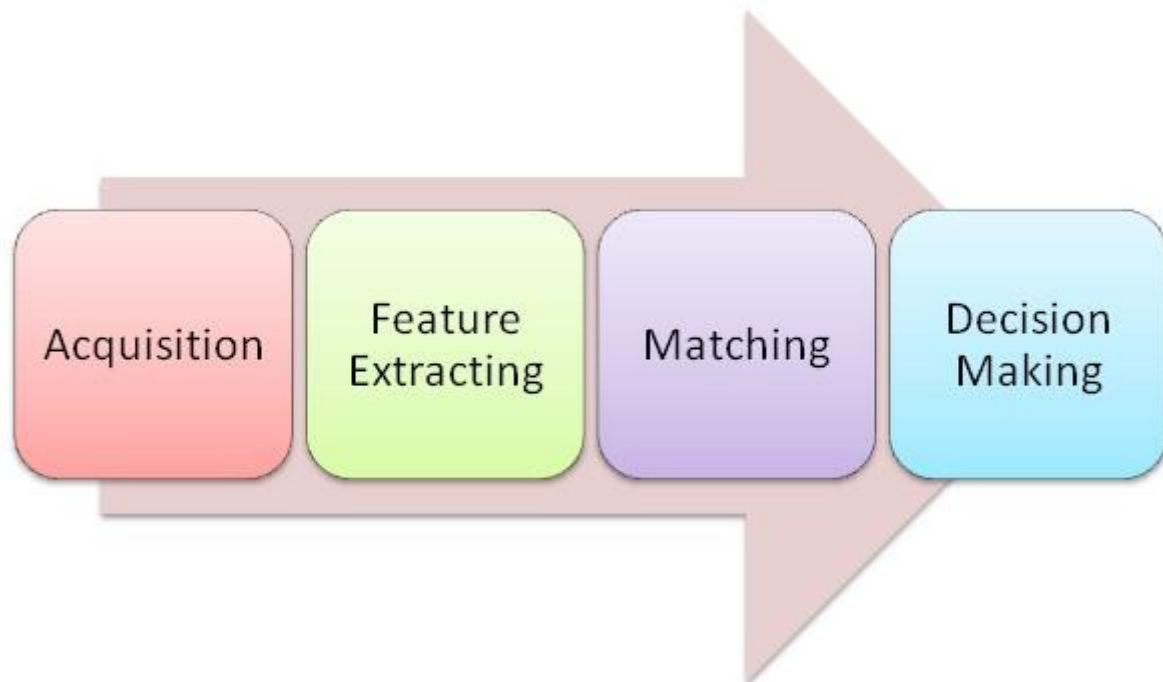


**Figure : Architecture for fingerprint recognition method**

The knuckle surfaces provide a curved surface to produce the reflection. This is one of the modalities for biometric recognition (Kaur & Garg, 2018). When compared between the biometric security processes, iris recognition is one of the most robust methods since the iris structures vary from person to person. Even an imposter will find it challenging to trick an "iris biometric 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

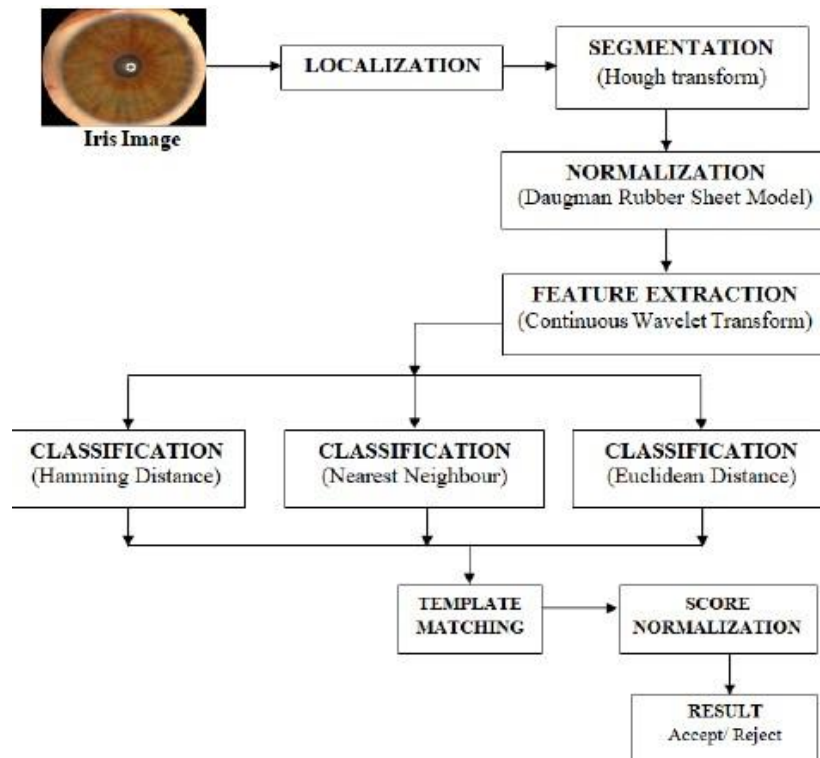
cases where less security can be helpful. But for high-security purposes and the sectors that deal with massive amounts of confidential data require multimodal systems.



**Figure : Tasks of Biometric Systems**

According to the author Garg & Gupta (2017), iris recognition has been mainly considered as the popular types of biometric methods for the purpose of the human identification procedures and verification stages. This particular method is mainly used for the purpose of the unique characteristics and unique features and aspects that have been mainly used to show the dissimilarity between all persons with respect to the security purpose. The entire study has proposed the multi algorithmic characteristics for the proper types of extraction techniques in the case of the personal iris recognition process. The ultimate localization and the segmentation technologies are used with respect to the circular transformation process (Garg & Gupta, 2017). The process can be used for isolating the iris from the entire human body for detecting the particular noise. With the various types of factors, the investigation process should be quickly done with respect to the specific angles, ergonomic aspects and features, and various types of mental viewpoints of the customer. The entire has been enhanced for the case of the best impression of the particular impression of the client based on the proper convenience stages of the specific biometrics. These specific factors have been compromised with the proper adequacy level and the best effectiveness on the concentration process (Nelufule & de Kock, 2020). The ergonomic features have been mainly considered various types of physical attributes

and psychological attributes of the clients, such as availability, affordability (academia.edu, 2017).



**Figure : Framework of the recognition system**

With respect to the research note of the author Gogate & Azad (2021), the biometric oriented individual identification process has been mainly observed like the practical and particular necessary techniques. All the techniques are mainly used for the automatic working process and working performance with the high quality of the confidence levels for proper identification of the person (Gogate & Azad, 2021). The multimodal oriented biometric system has been mainly consolidated with proper access with respect to the respective biometric modality sources by the actual evidence. This particular system has used different types of technologies for properly overcoming the various types of issues and challenges based on the combination of the various types of informative data under the same identity process (Oyeniran & Oyeniyi, 2019). In this case, all the ethical issues have been mainly done with respect to the proper acceptance of the fingerprint method for validation of the system to enhance the complete security and privacy based networking system to increase the validity rates. The facial acknowledgement process and administration oriented various types of issues can be easily solved by the uniqueness of the entire process and specific characteristics of the fingerprintbased iris recognition process. The entire type of recognition system can be done

quickly with the help of the "convolution neural networks (CNN)" (Wang *et al.* 2018). The best types of biometric framework have generally included various types of methods and proper consolidation of the best innovative working procedures with respect to the internet of things (IoT) process in the entire system. With the help of advanced and modern technologies, security risks and privacy errors can be easily reduced.

### **2.1.1. The necessity of intelligent devices for the iris recognition system**

With the help of the research note of the author, Attia *et al.* (2020) state that in the present time, the innovative biometric process has made the most significant difference between all people with the help of the various types of methods. This method is mainly experimented with through the human body parts and mainly done by the proper utilization of the human body qualities to identify or verify the different types of essential and efficient purposes and values. The sound effect of the proper advancement of the biometric process has been mainly done to meet the open obstruction process. Including all of these, the biometric process must be associated with the proper defamtion due to the long term based for permanent use of the fingerprints in recognizing all the crooks (Attia *et al.* 2020). The final evaluation of the biometric framework should be client-driven and should be very easy for the proper evaluation of the biometric gadget. The particular specialized approach has the adequacy and the functionality that has been widely centralized in light of the moving patterns that have enhanced the client's wellbeing process. The fundamental and the primary value of this is to assess all the required benefits of those intelligent gadgets without elaborating all the strategies such as education for the respective client of the system. In the present situation, all the evaluations have been mainly performed for facilitating the proper use of the biometric frameworks for the quantitative gauge performance with respect to the proper time analysis and good accuracy.

## **2.2. Contribution Chapters**

### **2.2.1. Existence**

According to the author Hansley (2018), the particular type of information technology (IT) artifact has been done based on the main focal point of the entire research. The actual types of the biometric process are very much unique for providing all the physical features and accurate behaviors in the validation process. The proper concept of the study is mainly based on information technology, and the entire system has been done in the proper context of

socioeconomic values. The main challenge for these community stages has to be generally engaged with the multiple, dynamic aspects and all respective factors and the emergency values purpose (Hansley, 2018). The information technology (IT) strategy has been mainly categorized into various points such as the proper construction, accurate model, proper method and the various types of instantiation position. The entire process is very much useful for providing the best service as the digital identifiers that the respective system can be easily able to utilize the identity oriented different applications.

### **2.2.2. Suitability and justification of artifact**

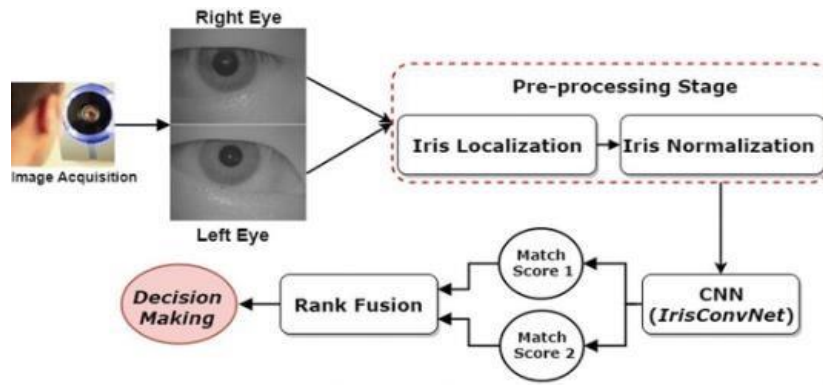
The iris recognition system with respect to "convolution neural network (CNN)" is very much authentic, and it generally developed with respect to the commercial process to reduce the existing limitations (Albakri and Alghowinem, 2019). There are seven numbers of stages that are very much needed to evaluate the entire suitability criteria of the iris recognition system, and these are described below.

- **Uniqueness** - The particular pattern of the iris system is very much variable and unique for each factor. All the symbols are very much effective due to embryonic gestation.
- **Universality** - It has a very low amount of the "FER (Failure to Enroll Rate)". For this purpose, the technology is very much authentic for biometric processes.
- **Collectability** - The actual shape of the iris recognition system pattern is very much authentic for providing all types of solutions. The system is so predictable that the face recognition system.
- **Permanence** - The iris recognition system has a lot of advantages for internal purposes. But the entire system is externally visible. The single-time enrollment process is very much effective for lifetime achievement.
- **Acceptability** - The main process for the contrary to the particular retina can be easily able to scan all the iris system-oriented documents against the fingerprint-based system.
- **Performance** - In this case, the identification and recognition process is very highly authentic and efficient than other processes. So the "iris code matching algorithm" has been generally used as per the very much low acceptance rates.
- **Circumvention** - The common issue is the liveness detection for completing the entire biometric system. There are very few possibilities for the liveness detection, that is, the proper verification of the low-intensity variation.

### **2.2.3. Design, implementation and evaluation of the recognition system**

According to the author Akbar (2019), the particular implementation and the evaluation methods of the various types of images have been adequately performed. For thresholding purpose, the created image has been mainly required to be converted the entire image to the grayscale. Based on the proper types of the color differences of the iris from the sclera and the iris can be mainly subdivided and segmented with respect to the various types of methods and procedures (Akbar, 2019). The final stage of the "canny edge detection" has been used for the purpose of the determination of the edge. This particular edge detection is mainly affected by external environmental disturbances and noises. For scrutinizing the entire working "performance of the iris recognition system," the entire performance process and respective tests have been mainly performed for providing the proper location of the best detachment. The particular analysis status has been appropriately done with respect to the formation of the iris recognition system.

The system has been mainly described as the biometric process for the uniqueness of the identification of individuals (Guerra-Segura *et al.* 2020). For this purpose, the true uniqueness of the human iris factors should be used for deducting the appropriate numbers of the different types of connected components that are available in the entire iris portrayal. In this case, the proper quantity of the various patterns and factors within the iris recognition system for validation purpose has been mentioned. The optimum values under all these factors have been mainly required for discussing and providing the appropriate numbers of the accurate recognition rates of the entire system. In this case, the input data have been appropriately influenced by the correct types of identification rate and values. The particular amount of the identification rate mainly depends on the radial resolution practice set and the angular resolution practicing set based on amid normalization. For this purpose, the respective framework of the biometric process is totally automatic for providing identification proof. The actual proof is totally based on the appropriate and unique characteristics and factors of all the individuals.



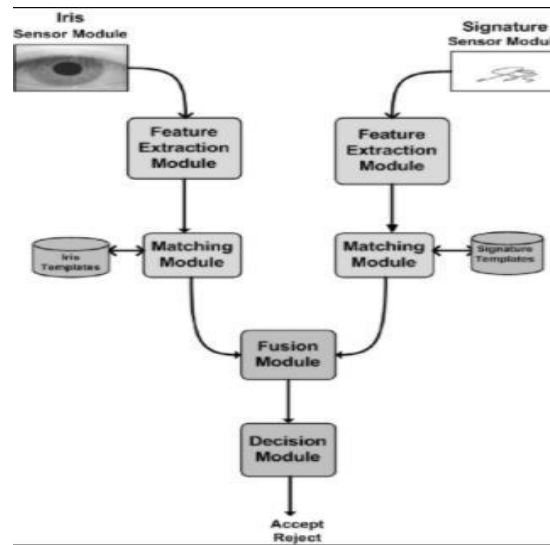
**Figure : Design, implementation and evaluation of the recognition system**

## 2.3. Theories and Models

### 2.3.1. Multimodal Model

Due to the lack of accuracy in the unimodal system, the recognition process was not fully validated. While the accuracy was not fully maintained since it failed to meet the proper decision-making criteria, a multimodal model was introduced. This system refers to the implementation of more than one biometric trait together to achieve higher accuracy. It was found that there was a significant amount of reduction in accuracy while using the unimodal system for verification and validation (Kim *et al.* 2021). With the advancement of technology and software systems, the multimodal system is widely used as the success rate is quite good. Since the multimodal system uses fusion technology, the overall accuracy from the verification is achieved easily. While comparing the different sorts of modalities, fingerprint and iris always have the highest distinctiveness and permanence. Moreover, these two recognition systems are cost-efficient too, and the speed is relatively higher when compared to any other modality like finger vein or face recognition (researchgate.net, 2019).



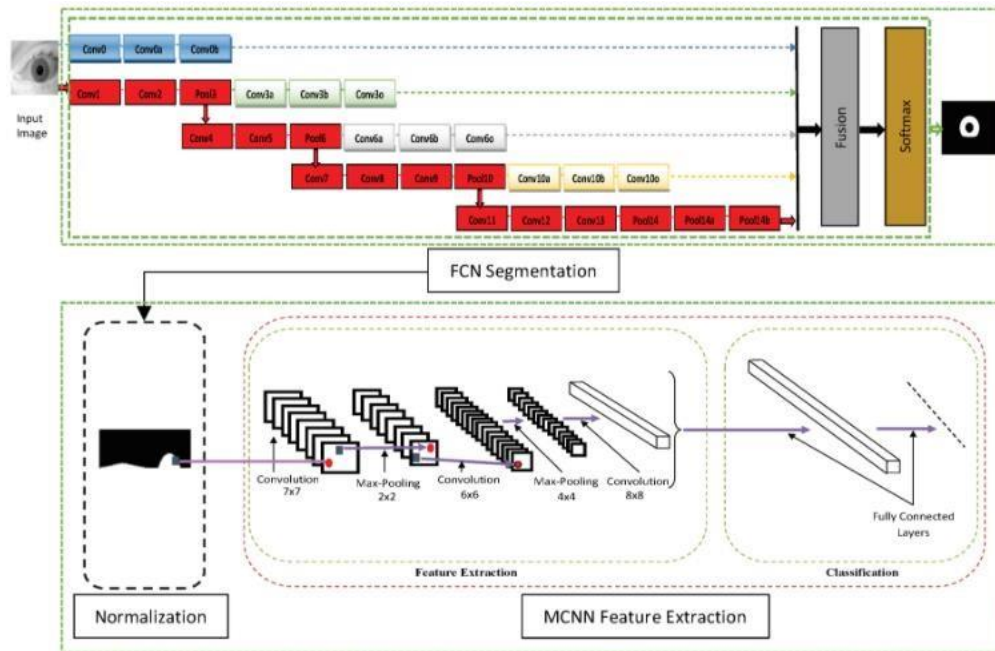


**Figure : Multimodal Model of fingerprint-based Iris recognition system**

### 2.3.2. 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 and 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.



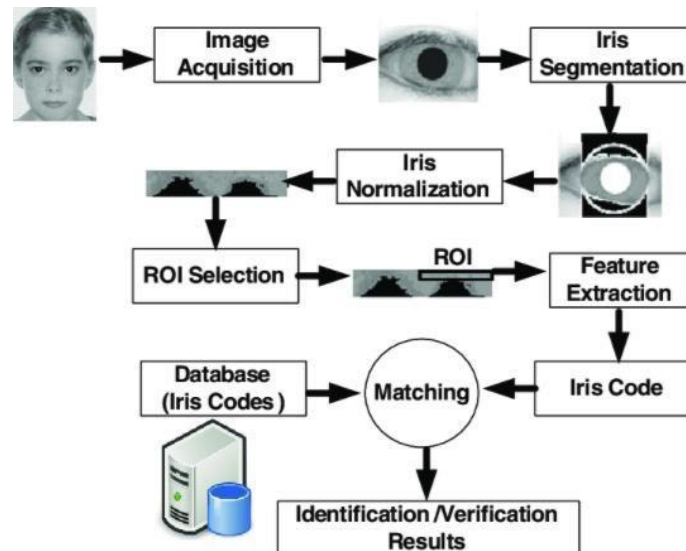
**Figure : Convolution Neural Network technique (CNN) for Iris recognition system**

**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.

### 2.3.3. Iris Recognition Model

The recognition model has been described within various categories, such as the image acquisition stages that are mainly used for obtaining the eye image. The proper segmentation process has been based on the working area. It is mainly used for showing the actual representation of the different segmentation in the various types of regions. The normalization step has been discussed various types of achievement for invariance of the proper size of the iris, actual position and the different types of degree stages of the iris dilation in respect of the

matching with different types of iris patterns. With the help of these models, the security system and the privacy networking sites can be easily modified and developed within the entire process of validation. There are four major steps that are mainly used for the "iris recognition enrollment" process to make the actual biometric authentication (Cortès Sebastià, 2018). All four steps are capturing the respective image, checking all compliances and the enhancement of the image, the compression of the image and the respective creation of the biometric template to match properly. In this case, the high-quality input data and images should be properly captured by the specific camera (Gonzalez-Sosa *et al.*, 2018). All these specific cameras use the "near-infrared (NIR)" sensors for properly capturing the entire image accurately. In this case, the system needs specific and unique software for analyzing the respective with proper characteristics and features like the proper sharpness, accurate quality, margin and accurate compression methods.



**Figure 21: Iris Recognition Model of the validation system**

## 2.4. Literature gap

The convolution neural technique for the fingerprint-based iris recognition system is very much effective and more authentic for providing an accurate validation system. Within the research note, the authors are unable to describe various types of techniques and strategies for this recognition system. This advanced technique-oriented biometric process is very much costeffective and expensive (Gonzalez-Sosa *et al.*, 2019). It is very much costly with respect to the other biometric modalities and factors.

### 3. METHODOLOGY

Biometrics systems have been one of the safest ways to secure and verify any system. In recent times, multimodal biometric techniques are widely implemented in several real-world applications. Due to the lack of validation processes in the unimodal systems, the multimodal biometric system was introduced with the help of deep learning algorithms. The “Convolution Neural Network (CNN)” is nothing but an algorithm that uses deep learning architecture. Validation through biometric systems is evolving day by day and has become a much promising technology that can be used for the identification and authentication of any person. Peer technologies are recently used in the system for solving the validation difficulties through the biometric system. In this part of the research, different analyzing methods will be discussed. For every research work, there is a particular approach which is obtained to reach the final outcomes that will be accomplished in this chapter. Being one of the latest and safest technologies in the history of validation, there are several limitations that are faced while processing the entire task. Some of the systems and software are required to improve so that better services are provided to the clients. So the limitations of the research have also been attached in part. Here the analysis will be done on the basis of the software and technologies that have been used for developing the entire software work. The fingerprint and iris recognition system requires an exemplary user interface as the validation and verification process is given significant priority. Through the wireless communication model, the software work will be done. Deep learning algorithms are another vital part that would be used for this purpose. Through the implementation of the “convolution neural network (CNN)” architecture, reshaping the biometric system would be done.

#### 3.1. Method Outline

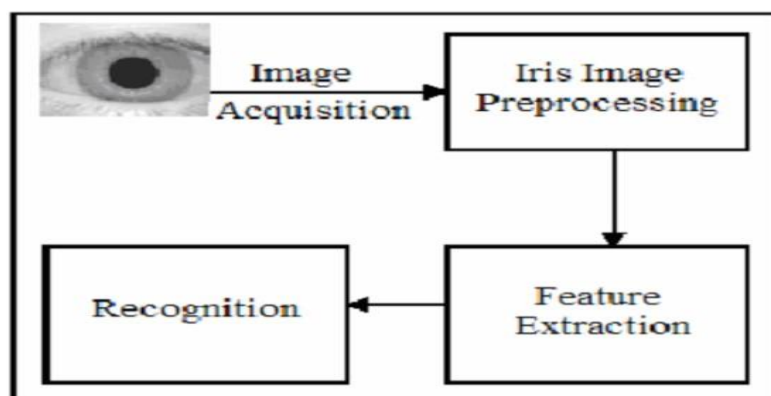
This particular research work follows a "Systematic Approach" that helps to reach the actual targets. Though the preliminary stage of the research is more focused on determining the strategies and objectives that will be considered for obtaining the final goals, the central section consists of the software work that involves the “convolution neural network (CNN)” architectural model and RF wireless communication model (Salve *et al.*, 2019). This part of the study helps to outline the proper approaches that would include the software analysis of the system. This paper has been dealt with the fingerprint and iris recognition system strategies and the problems that are usually faced while implementing the system.

### 3.2. Research Approach

The approach is considered as the essential aspect of the methodology chapter that plans the conduction of the research work. The main methods that are generally implemented for developing the validation system would be described here. For any particular research work to complete, different approaches can be followed, such as "Inductive" and "Deductive" approaches (Sameh *et al.*, 2020). However, this particular study follows the deductive approach since the analysis is done on the queries and software from which the outcomes will be achieved. The deductive approach is nothing but the systematic approach where the first priority is given to the research questions based on which the analysis is done, which leads to gaining appropriate outcomes. The required software would be analyzed using “convolutional neural network (CNN)” architectural models and deep learning techniques. The research work will be carried out on the basis of knowledge on the current validation systems that includes fingerprint and iris recognition.

### 3.3. Research Design

The research design depicts the processes that a particular research work undergoes. There are mainly two kinds of approaches, such as "Qualitative" and "Quantitative" methodologies. Since this exploration work is a kind of software and technology-related, a different approach is followed purposely (Sharma *et al.*, 2019). For implementing the validation system using the “convolution neural network (CNN)” architecture and models, the software work would be done. The design of the exploration work would be done in a way that it becomes easier for the audience to understand the processes. Moreover, the implementation of wireless communication models, etc., would be demonstrated for obtaining the appropriate validation system.



**Figure : Iris Recognition system methodology**

### **3.4. Data Collection Method**

The data collection method is one of the most critical sections of any research work. Since most of the research follows primary or secondary analysis, data collection plays a significant role. Based on the collected data, the analysis is done. Since this particular research work is a kind of software work, the data collected that will be collected from the software would be used in the entire analysis process (Spinoulas *et al.*, 2020). Since most of the work is based on the proper validation and decision making criteria, gathering information related to these scenarios were quite essential. In addition to this, the attached factors for the setup of the validation system, such as processing of the image, extraction, “convolution neural network (CNN)” models, would be required for collecting and storing data. Since the whole task is related to the software, it is purely dependent on the data and software itself. This would benchmark the application.

### **3.5. Research Ethics**

While working on the exploration topic, it is essential to maintain some ethics that would help to continue with the research topic without doing any harm to the outside environment. A validation system through fingerprint and iris recognition is one of the safest ways to protect confidential data (Sun *et al.*, 2019). During the research work, several considerations are made. Maintaining the standards is crucial in order to perform the task in a well-planned manner.

1. This research work has been done on the basis of consent given by the participants involved in the work.
2. No damage has been caused to the society or the communities while conducting the research work.
3. No damage has been caused to the outside environment, as well as to the animals.
4. The overall exploration work has been done without discriminating against any kind of participants or concepts.
5. Moreover, the entire process has been done with truthfulness. Therefore, this paper provides reliable data on the validation system by “convolutional neural network (CNN)” architecture.
6. This research paper doesn't include any kind of data manipulation.

## **4. SYSTEM REQUIREMENTS**

### **4.1 Software Requirements**

Operating System : Windows 10

Python IDLE : Python 3.7.0

Coding Language : Python

### **4.2 Hardware Requirements**

Processors : Any Intel or AMD X86-64 processor

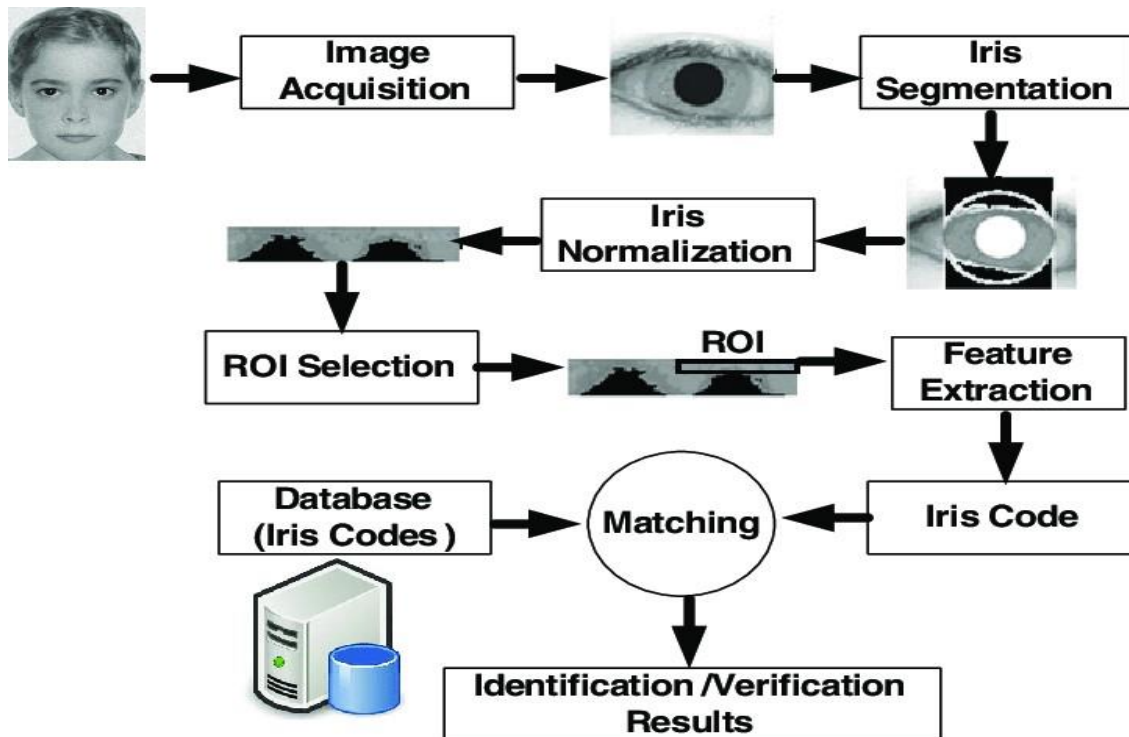
Disk : 500GB minimum

RAM : 4GB and Higher

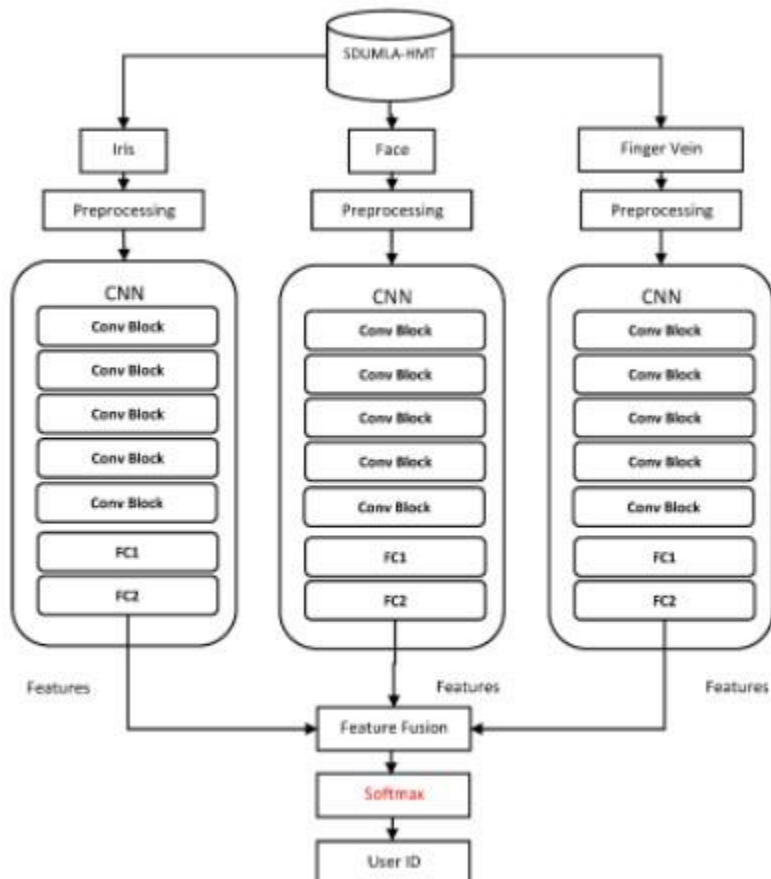
Monitor : 15"LED

## 5. SYSTEM DESIGN

### 5.1 SYSTEM ARCHITECTURE



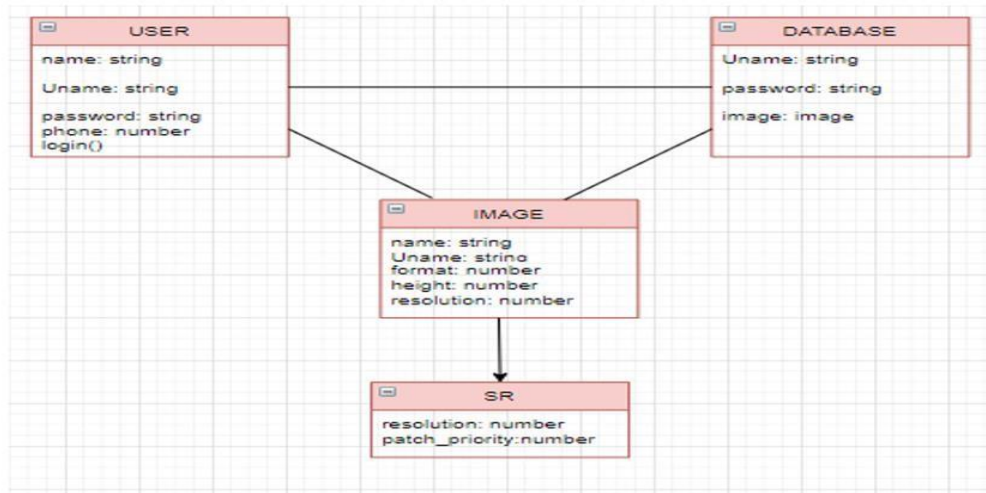
### 5.2 DataFlow Diagram



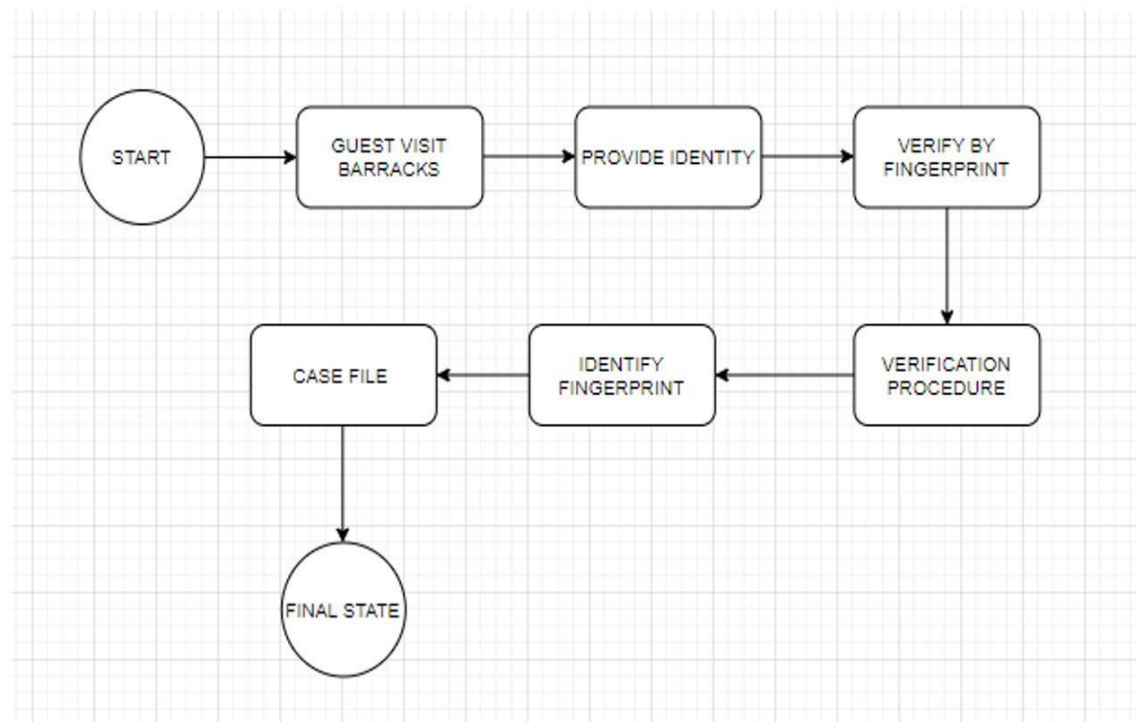


## 5.3 UML DIAGRAMS

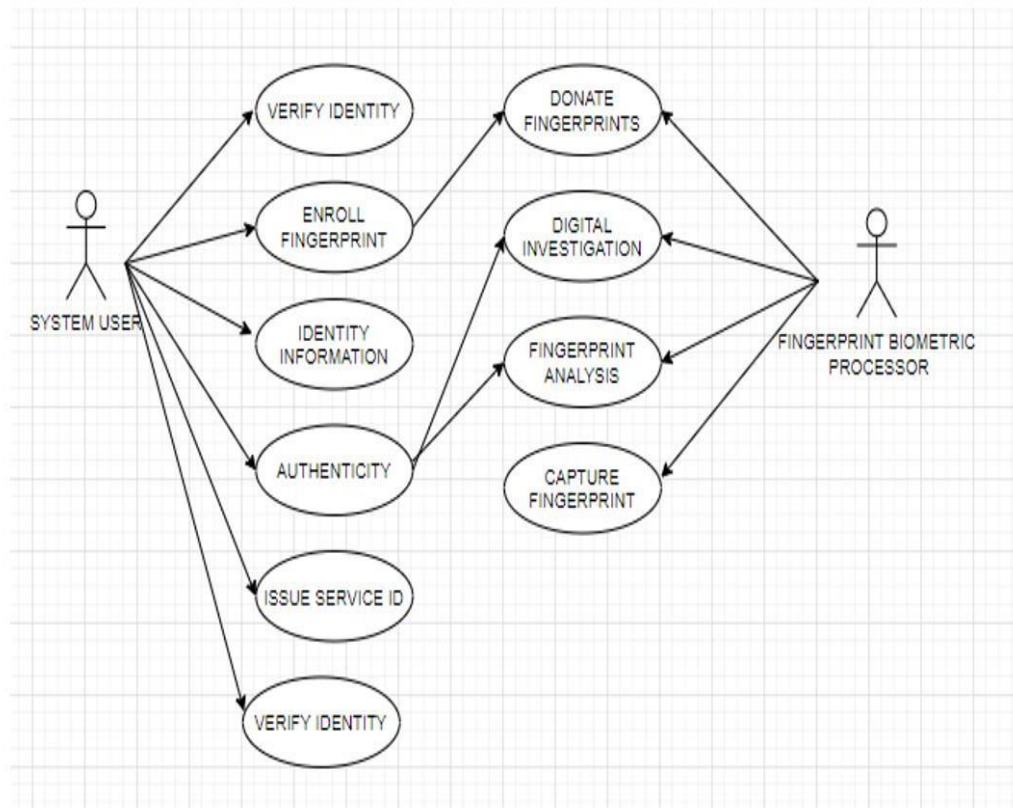
### □ Class Diagram



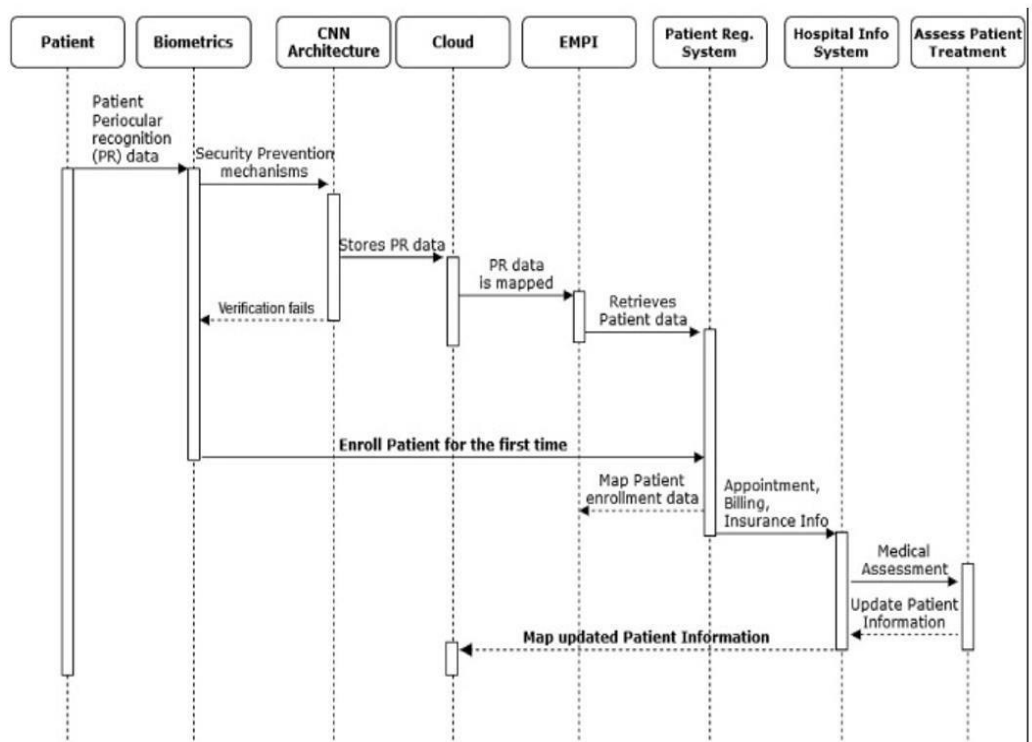
### □ Activity Diagram



## □ Usecase Diagram



## □ Sequence Diagram



## 6. IMPLEMENTATION

### 6.1. Sample code

```
main = tkinter.Tk() main.title("Iris Recognition using Machine Learning Technique")
#designing main screen main.geometry("1300x1200") global filename global model def
getIrisFeatures(image): global count img = cv2.imread(image,0) img =
cv2.medianBlur(img,5) cimg = cv2.cvtColor(img,cv2.COLOR_GRAY2BGR)
circles=cv2.HoughCircles(img,cv2.HOUGH_GRADIENT,1,10,param1=63,param2=70,minR
adius=0,maxRadius=0) if circles is not None: height,width = img.shape r = 0 mask =
np.zeros((height,width), np.uint8) for i in circles[0,:]:
cv2.circle(cimg,(i[0],i[1]),int(i[2]),(0,0,0))
cv2.circle(mask,(i[0],i[1]),int(i[2]),(255,255,255),thickness=0) blank_image
= cimg[:int(i[1]),:int(i[1])]
masked_data = cv2.bitwise_and(cimg, cimg, mask=mask) _,thresh
= cv2.threshold(mask,1,255,cv2.THRESH_BINARY)
contours=cv2.findContours(thresh,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)
E)
x,y,w,h = cv2.boundingRect(contours[0][0]) crop
= img[y:y+h,x:x+w]
r = i[2]
cv2.imwrite ("test.png",crop) else:
count = count + 1
```



```

miss.append(image) return
cv2.imread("test.png") def
uploadDataset():
global filename filename =
filedialog.askdirectory(initialdir=".")
text.delete('1.0', END)
text.insert(END,filename" loaded\n\n"); def
loadModel():
global model
text.delete('1.0', END)
X_train = np.load('model/X.txt.npy') Y_train =
np.load('model/Y.txt.npy') print(X_train.shape) print(Y_train.shape)
text.insert(END,'Dataset contains total
'+str(X_train.shape[0])+
'+str(Y_train.shape[1])+"\n") if
os.path.exists('model/model.json'): with
open('model/model.json', "r") as json_file:
loaded_model_json = json_file.read() model = iris
model_from_json(loaded_model_json)
model.load_weights("model/model_weights.h5")
model._make_predict_function()
print(model.summary()) f=
open('model/history.pkl', 'rb') data =
pickle.load(f) f.close()
acc = data['accuracy'] accuracy = acc[59] * 100 text.insert(END,"CNN
Model Prediction Accuracy = "+str(accuracy)+"\n text.insert(END,"See
Black Console to view CNN layers\n")

```



## **7. SYSTEM TESTING**

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

### **TYPES OF TESTS**

#### **7.1 Unit testing:**

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

#### **7.2 Integration testing:**

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the

combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

### **Functional testing:**

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures : interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

### **System Testing:**

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points. **White Box Testing:**

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the



software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

### **Black Box Testing:**

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

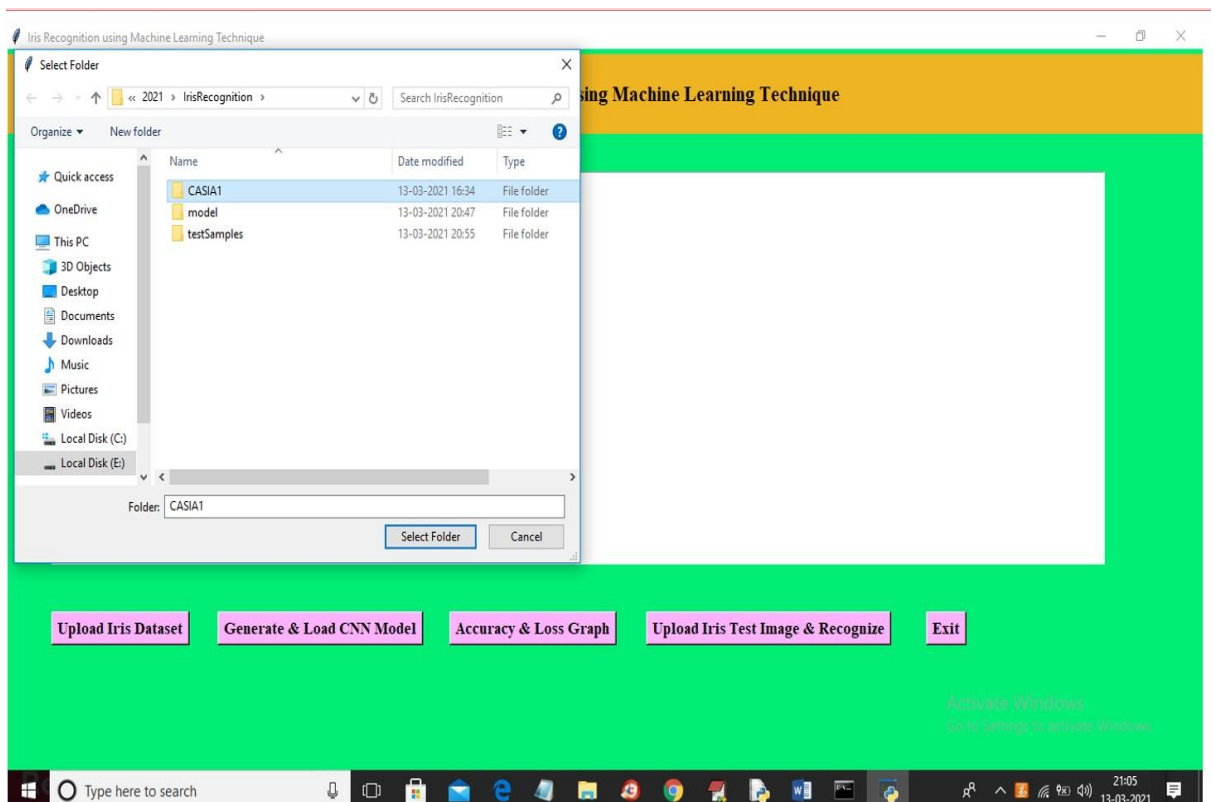
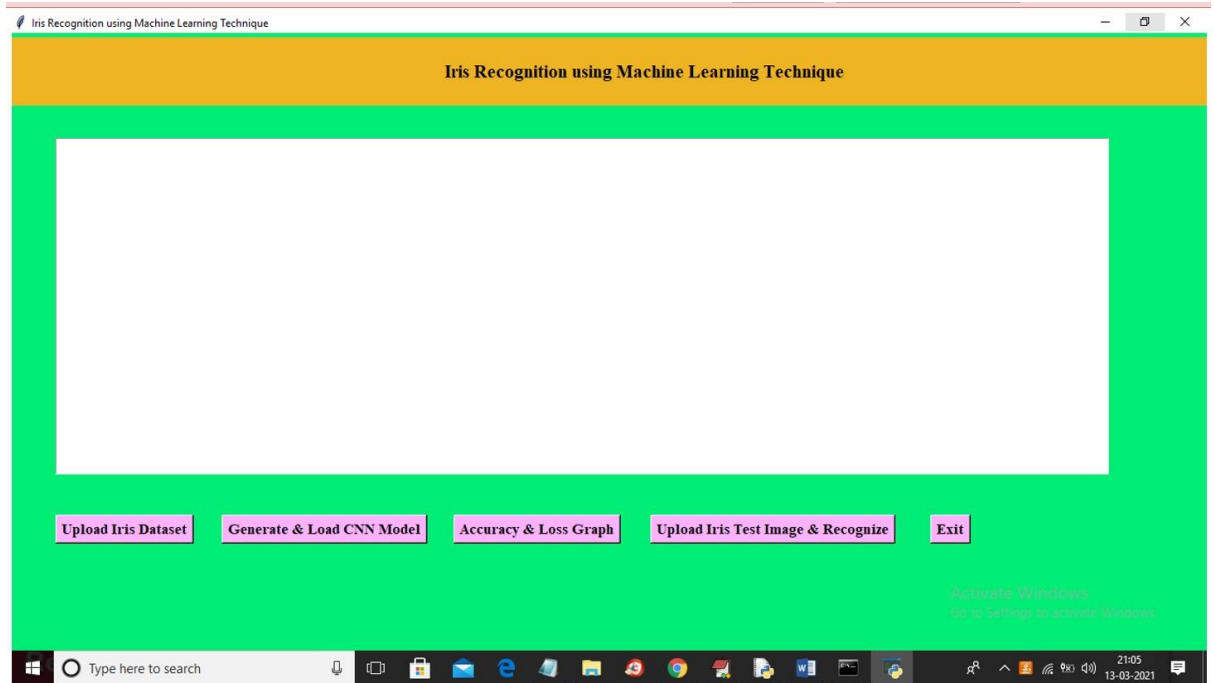
### **Unit Testing:**

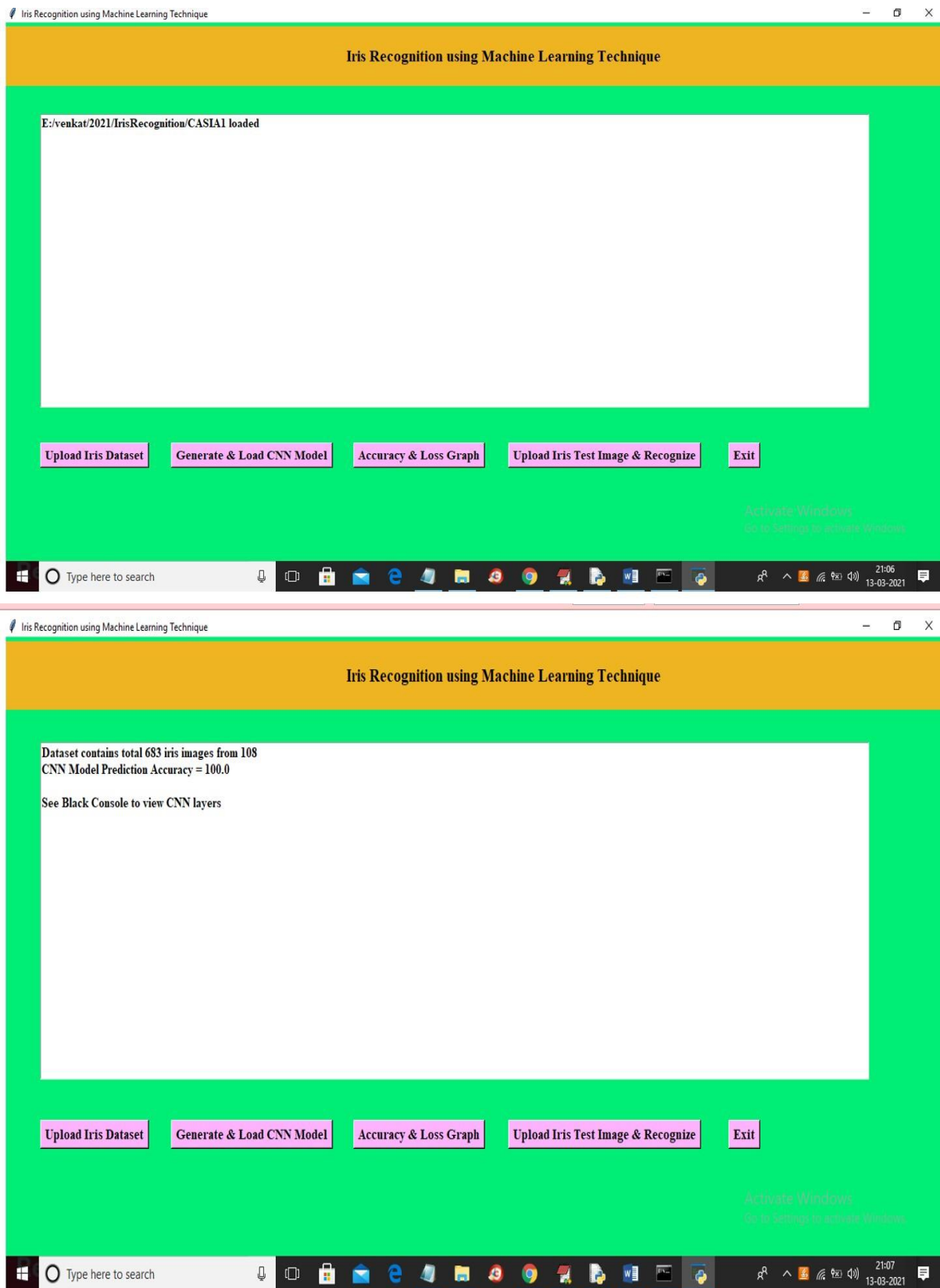
Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

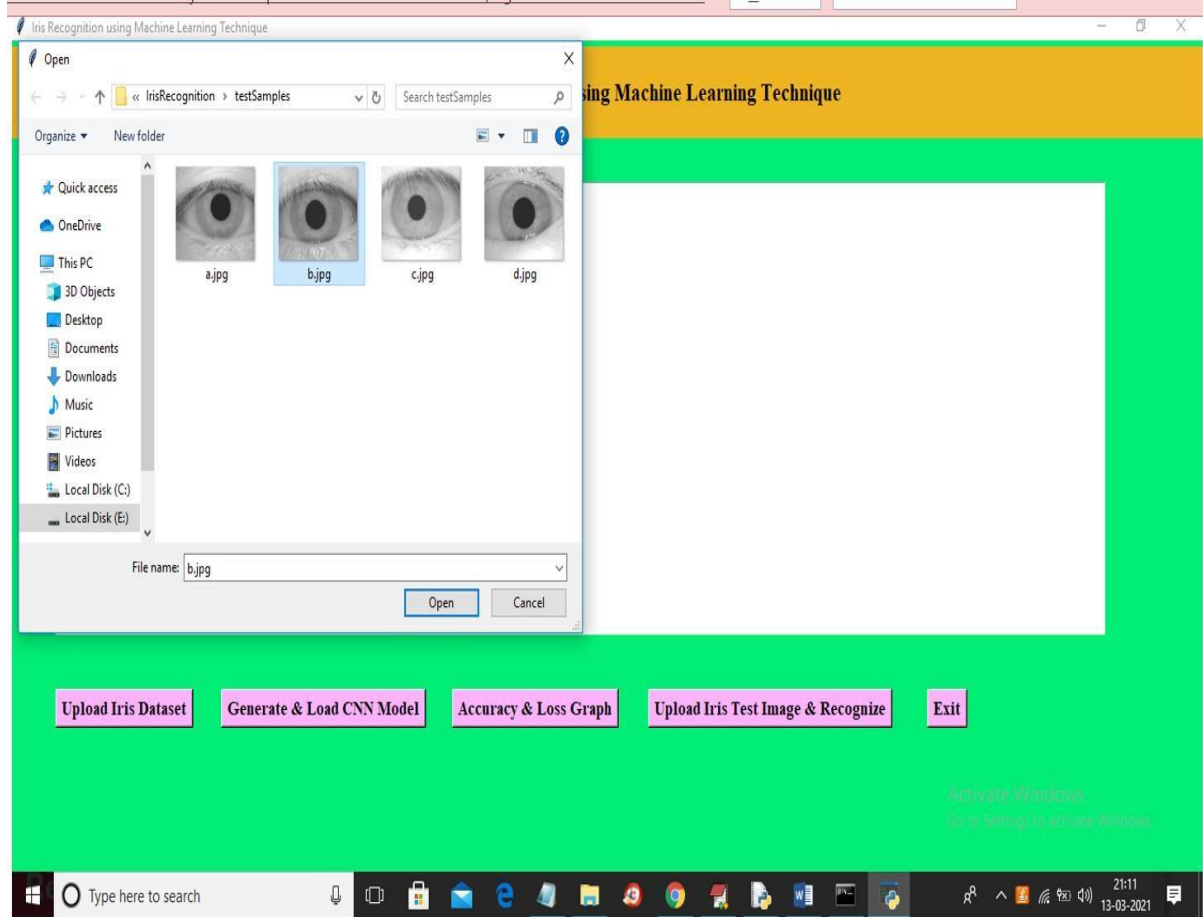
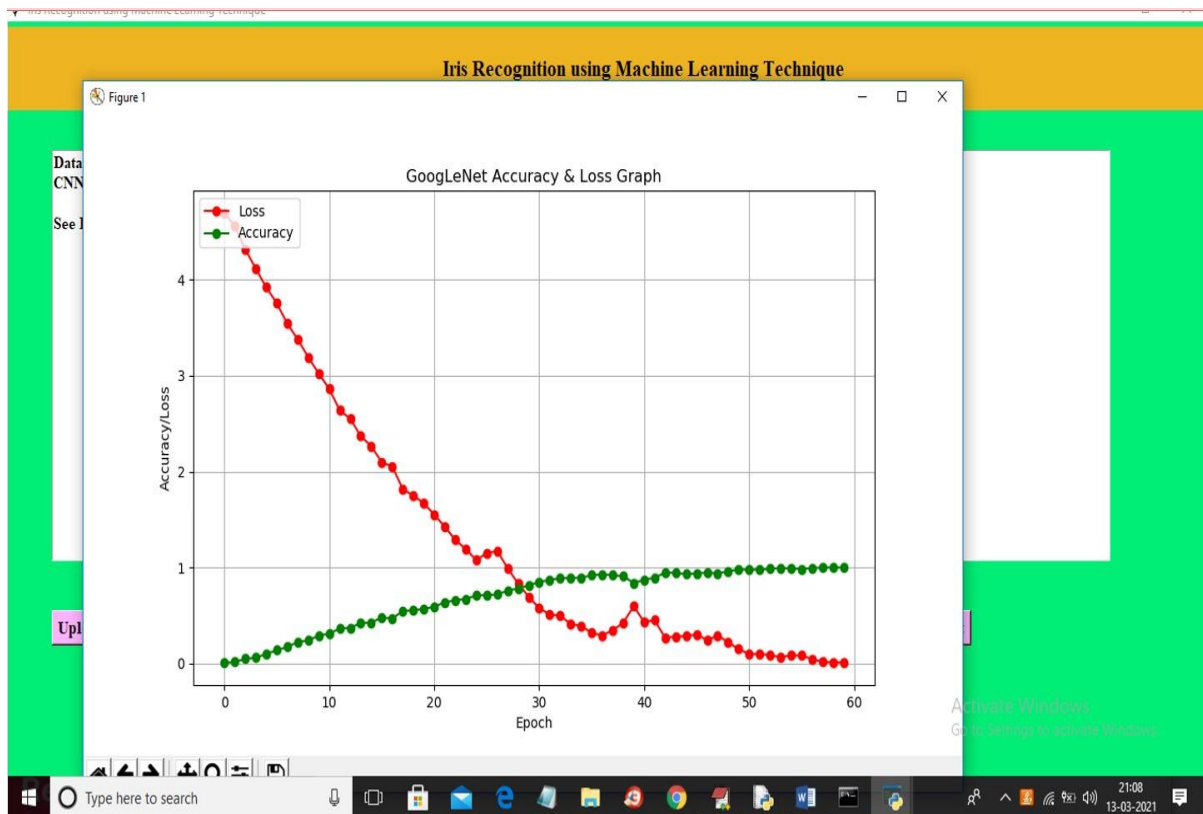
## **7.3 Acceptance Testing**

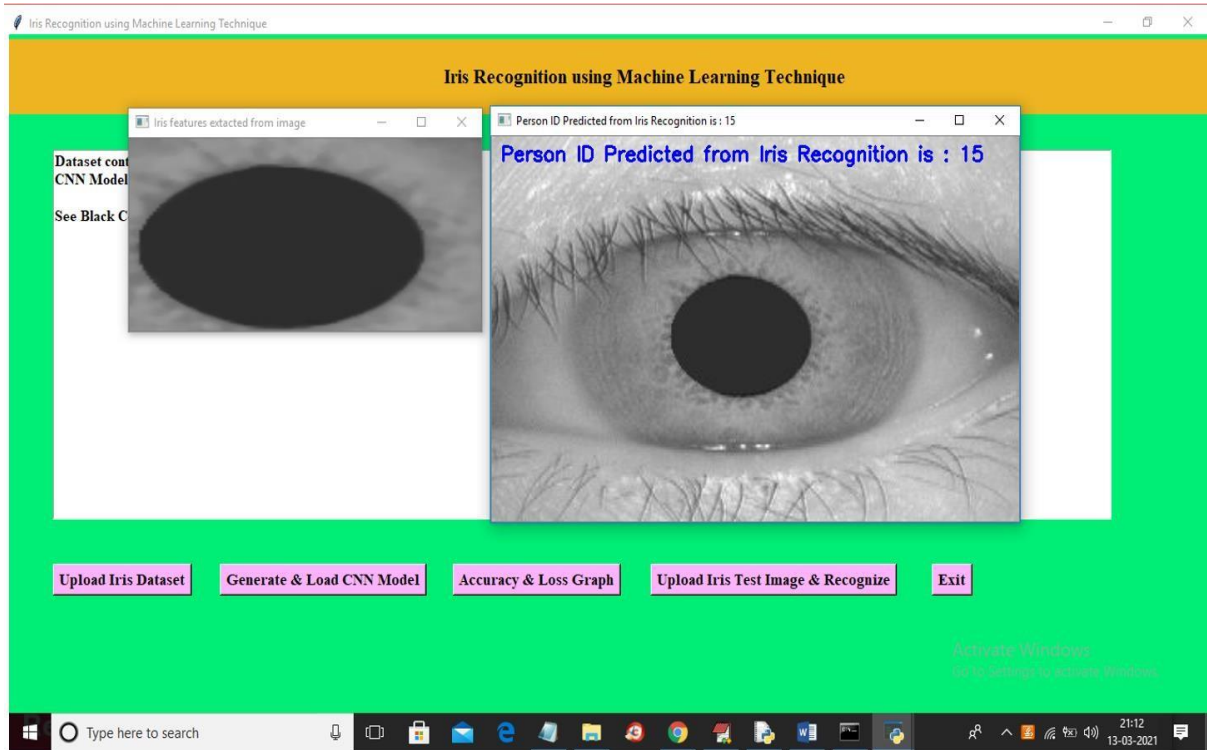
User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

## 8. SCREENSHOTS









## 9. CONCLUSION

This is the final chapter in the assignment that discusses the entire research work and also analyses the software work that has been conducted for obtaining the expected outcomes. This chapter mainly focuses on the expected outcomes, findings and analysis, which will be compared with the actual outcomes. This chapter compares both the actual and expected outcomes. This chapter also discusses the limitations that were faced while conducting the research, as well as. It also provides how this research work can be extended in future. In order to determine the effects of the research and the software study, it is essential to know the fundamental objectives and aims of the study. For conducting the software work, more emphasis has been given on how the implications of different kinds of software and technology will be carried out so that the actual results are achieved. In this particular chapter, the connections between the prime objectives and the results have been built. Future recommendations on the software work will be made so that this research work can be expanded further.

## 10. FUTURE WORK

The entire work has been mainly used for the purpose of attempting various strategies for creating the fingerprint-based iris recognition system. This particular system has been proposed various types of derivation quality with respect to the different types of features and aspects of

the iris patterns. This process can be easily modified and developed by the renowned "convolution neural networking (CNN)" model with the actual numbers of few layers (Hava *et al.*, 2019). The operational performance can be easily verified by the accuracy plots and the loads' case plot. The best effectiveness of the entire proposed approach should be easily tested with the help of the two types of challenging databases, such as the site databases and the CASIA database. The particular "convolution neural networking (CNN)" model has generally been ready to quickly developed and improved to measure all values of the challenges and problematic iris recognition based datasets (Hofer, 2020). For this purpose, various types of datasets and experiments have been conducted within two types of categories. All the categories are basically used for the actual purpose of evaluation of the different types of training frameworks like the relevant learning factors and rates, proper filters with respect to the various layers, the quantity of the layers that are mainly used for building the appropriate "convolution neural networking (CNN)" model to show the correct types of the recognition system of all the individual person.

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