

# Smart Email System for Blind People

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## ABSTRACT

In the present scenario, effective communication technology is essential for fostering social and personal connections. The integration of various technologies with the internet has notably facilitated communication processes. However, individuals with physical disabilities encounter significant challenges in utilizing such technology due to visual and physical impairments. Despite numerous technological advancements, many of these tools remain inaccessible to them. This paper endeavors to develop an email system specifically tailored to accommodate both novice users and those with physical impairments, enabling them to communicate without prior experience. The system operates solely through mouse actions and voice commands, allowing even illiterate individuals to send emails via speech recognition and text-to-speech functionalities. By prioritizing responsive voice interaction, the system aims to simplify technology usage, ensuring a seamless experience. It is meticulously designed for swift email transmission, providing users with comprehensive options and functionalities.

**Keywords:** Screen Readers, Text-to-speech, Speech-to-text, AI-ML.

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## INTRODUCTION

The navigation system utilizes Text-to-Speech (TTS) and Speech-to-Text (STT) technologies to facilitate navigation for individuals with visual impairments through voice commands. This suggested system, operating as an independent program, remains cost-effective for blind users, ensuring easy accessibility. A growing body of research emphasizes leveraging technology to enhance the integration of blind individuals into the global community. Introducing features like instant messaging within the software fosters interaction among blind users and other network-connected individuals. Recent advancements in computer technology have significantly broadened opportunities for visually impaired individuals worldwide. Notably, approximately 60% of the global blind population resides in India among blind users and other network-connected individuals. Recent advancements in computer technology have significantly broadened opportunities for visually impaired individuals worldwide. Notably, approximately 60% of the global blind population resides in India. This paper elaborates on the voice mail architecture tailored for blind users, streamlining access to email and multimedia functionalities within the operating system. Such an architecture aims to alleviate cognitive burdens associated with keyboard-based input, benefitting not only blind individuals but also those with disabilities and low literacy levels.

## LITERATURE SURVEY

Alexandru Cazan, Radu Varbanescu, and Dan Popescu [1] introduce a system aimed at aiding visually impaired individuals by converting images captured by a camera into auditory signals. This innovative system operates in real-time, employing a specific algorithm to translate visual information into sounds while accounting for the constraints of human auditory perception.

G. Sophia Jasmine, D. Magdalin Marry, and S. Swetha Lakshmi [2] highlight the extensive global population of visually impaired individuals, numbering in the billions. Notably, a substantial portion of this demographic continues to experience blindness, even in advanced nations.

Lina Zhuang, Michael K. Ng, Xiyong Fu, and Jose M. Bioucas-Dias [3] introduce a novel approach to hyperspectral sensing, specifically designed for spaceborne sensor systems. Their strategy operates within the spectral domain, addressing the

challenges posed by limited physical space, storage resources, and communication bandwidth, which are particularly stringent and costly in space applications.

Jingyang Wang, Peng Ren, Min Huang, and Liwei Guo [4] highlight the increasing focus on voice mailbox services based on VoIP, spurred by the rapid advancements in CTI and VoIP technologies. These services are recognized as significant telecom value-added services, drawing growing attention in the telecommunications sector.

Tirthankar Dasgupta, Aakash Anuj, Manjira Sinha, Ritwika Ghose, and Anupam Basu [5] underscore the transformative impact of computer-based accessible systems on the lives of visually impaired individuals worldwide. Innovations such as screen readers, which provide audio feedback, have greatly enhanced the accessibility of internet applications for the blind, offering them substantial support in navigating virtual environments.

Sanjib Das [6] discusses the significance of human-computer interaction, specifically focusing on the concept of the human-computer interface (HCI). Highlighting speech as a potentially crucial mode of interaction with computers, the communication between humans and computers is explored within the context of HCI.

Shruthi J.1, Suma Swamy<sup>2</sup> [7] In the current digital landscape, there exists a significant gap wherein computer systems struggle to comprehend human natural language, posing a substantial barrier between humans and digital interfaces. Researchers have therefore developed advanced technologies aimed at bridging this divide, enabling digital machines to effectively provide information to users.

Shruthi J.1, Suma Swamy<sup>2</sup> [8] In the present state of digital world, computer machine do not understand the human's ordinary language. This is the great barrier between humans and digital systems. Hence, researchers found an advanced technology that provides information to the users from the digital machine B. Raghavendhar Reddy 1 and E. Mahender\*<sup>2</sup> [9] highlight the ease with which modern processes, algorithms, and methods facilitate the processing of speech signals and text recognition. They emphasize their project's focus on developing an online speech-to-text engine, leveraging contemporary techniques for efficient implementation.

Stephen J. Wright and Dimitri Kanevsky [10] underscore the longstanding application of optimization techniques in addressing computational challenges within speech and language processing. Notably, these techniques are prominently featured in algorithms such as Baum-Welch, extended Baum-Welch (EBW), Rprop, and GIS, contributing significantly to problem formulation and solution in this field.

## **FINDINGS**

### **A. Motivation**

We employ the Haar cascade Algorithm for Face Detection and Recognition, followed by the implementation of an NLP algorithm for constructing a Voice-based Email System architecture. This architecture is specifically designed to facilitate easy and efficient email access for blind individuals. The research contribution has empowered blind users to effortlessly send and receive email messages using their native language through computer-assisted voice technology.

### **B. Project Description**

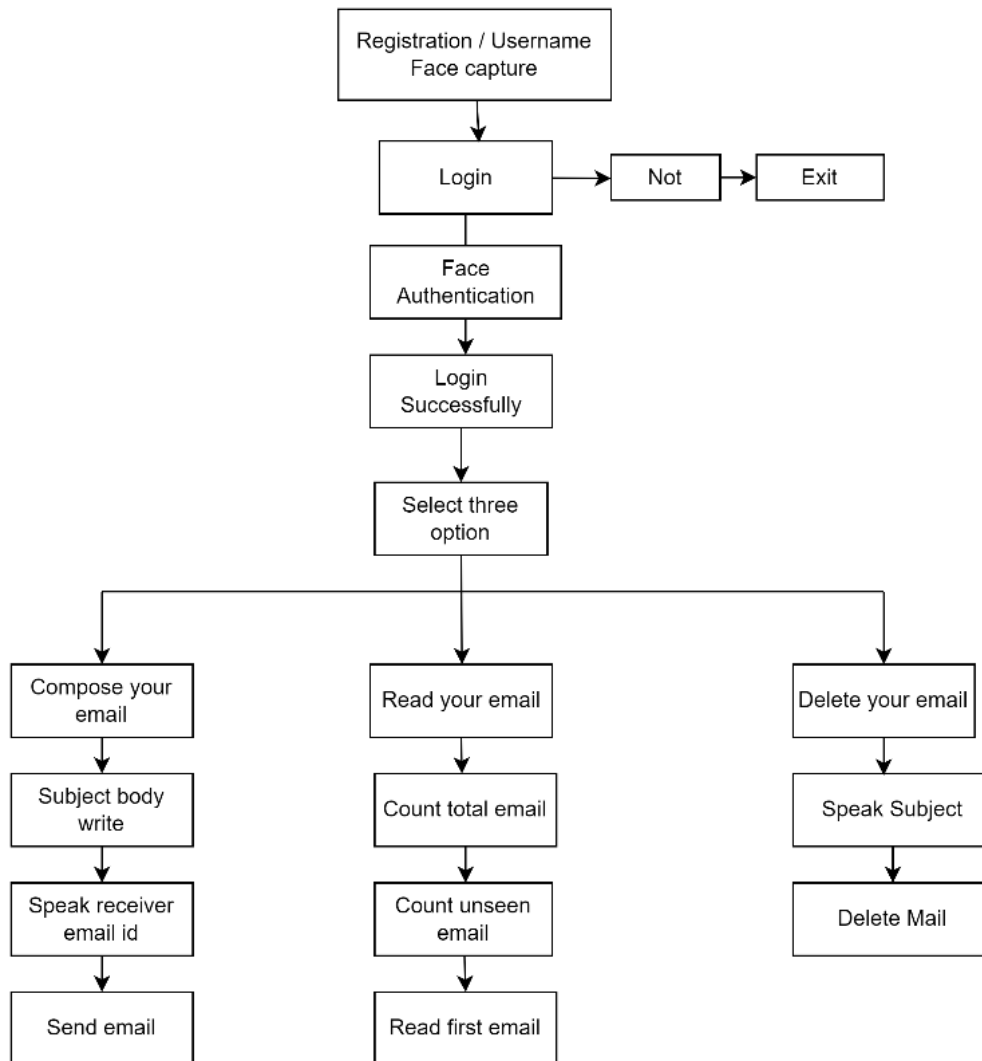
Previously, blind individuals faced limitations in using email systems. While various email types and customizable settings cater to diverse daily needs, blind individuals find conventional email systems inaccessible, relying instead on audio-based email solutions. Unfortunately, such solutions are rare, limiting their availability to blind users. This underscores the importance of accommodating physically challenged individuals, including those who are visually impaired or handicapped. A voicemail system architecture offers a user-friendly solution for visually impaired users to access emails efficiently. Its intuitive Graphical User Interface eliminates the need to memorize keyboard shortcuts, making it accessible to both normal and physically impaired users.

### **C. Technologies used**

- 3.3.1 Operating System: Windows 10
- 3.3.2 IDE: Pycharm, Spyder
- 3.3.3 Programming Language: Python

3.3.4 AI and ML

**D. System Architecture**



**System architecture**

**ALGORITHM**

Haar Cascade is an object detection algorithm rooted in machine learning, primarily utilized for identifying objects within images or video feeds. Its operation involves training a cascade classifier on an extensive dataset comprising both positive and negative samples of the target object. By extracting features from these training images, the algorithm discerns regions within an image as either containing the object of interest or not. Renowned for its efficacy, Haar Cascade finds widespread application in tasks like facial recognition in photos, video monitoring, and various computer vision endeavors.

**MODULE**

**A. Admin**

In this module, the Admin is required to log in using a valid username and password. Once logged in successfully, the Admin can perform various operations, including viewing all users and authorizing them, viewing all e-commerce websites and authorizing them, accessing product and review data, viewing early product reviews, examining keyword search details

and results, as well as reviewing product rank results based on reviews.

#### **B. View and Authorize Users**

Within this module, the admin possesses the capability to access a roster of registered users. Within this roster, the admin can review each user's details, encompassing their username, email, and address. Furthermore, the admin holds the authority to authorize users as deemed necessary.

#### **C. View Charts Result**

Browse All Product Search Ratios, Browse All Keyword Search Results, Browse All Product Review Rankings.

#### **D. Ecommerce User**

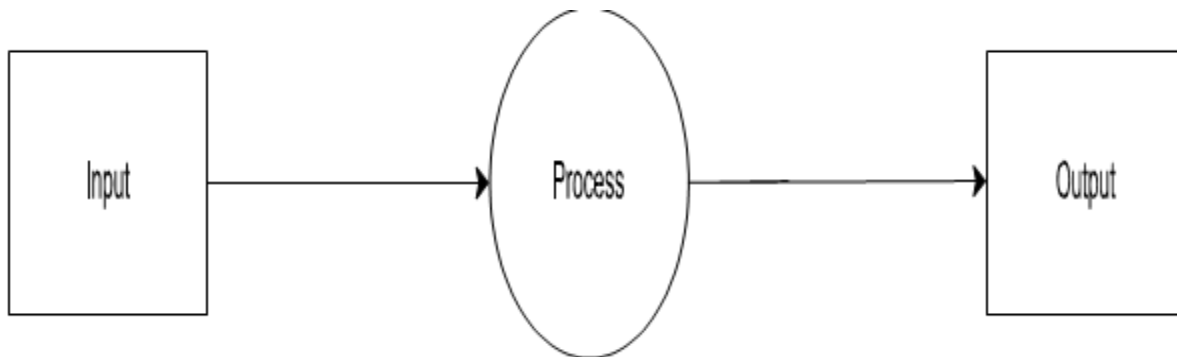
In this module, a multitude of users can register, with their details stored in the database upon registration. Subsequently, authorized users can log in using their designated username and password. Following successful login, users gain access to various operations, including adding products, viewing all products along with reviews, accessing early product reviews, and reviewing all purchased transactions.

#### **E. End User**

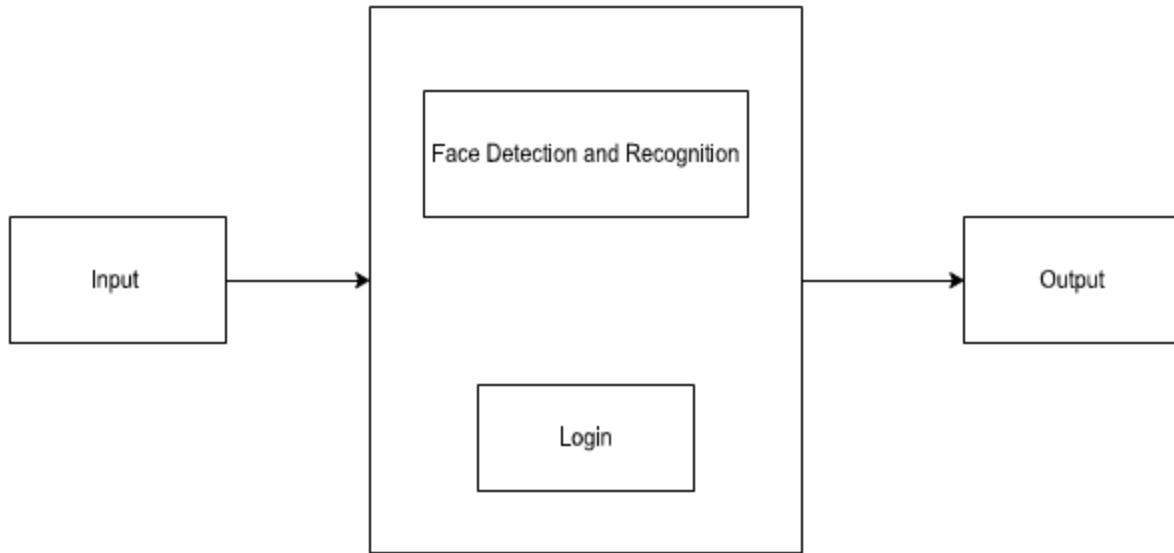
In this module, there is a provision for an indefinite number of users. Users are required to register before engaging in any activities. Upon successful registration, their details are securely stored in the database. Following registration, users must log in using their authorized username and password. Once logged in, users can perform various operations such as managing their account, searching for products by keyword and making purchases, as well as viewing their search transactions and other relevant information.

### **DATA FLOW**

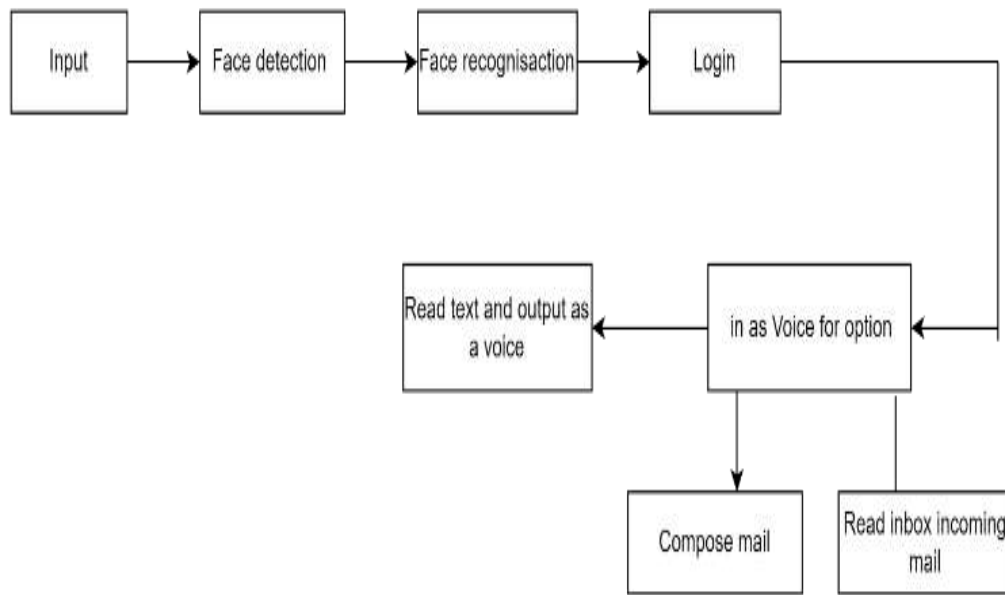
In the Data Flow Diagram (DFD), we illustrate the flow of data within our system. DFD0 depicts the foundational diagram, where rectangles represent inputs and outputs, while circles denote the system components. DFD1 showcases the specific inputs and outputs of the system; inputs can be text or images, while the output is the detection of rumors. Similarly, DFD2 delineates the operations carried out by both users and administrators within the system.



**Data Flow Diagram (a)**



**Data Flow Diagram (b)**



**Data Flow Diagram (c)**

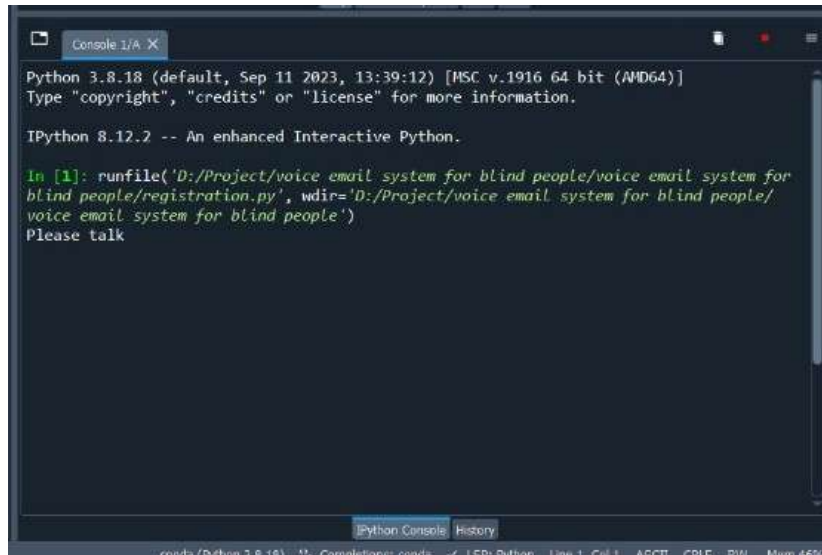
### RESULT

As the application is just a prototype of a real-time application, which can be in the future implemented with a more robust user interface and structure.

Some of the major steps or the measures that the user has to follow to use this application are mentioned below-

#### Step 1:-

Whenever a user will open the application for the very first time, he or she has to register himself first to use the application. The voice command will give each and every instruction through voice, which the user can follow them and perform the task.



```
Python 3.8.18 (default, Sep 11 2023, 13:39:12) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license()" for more information.

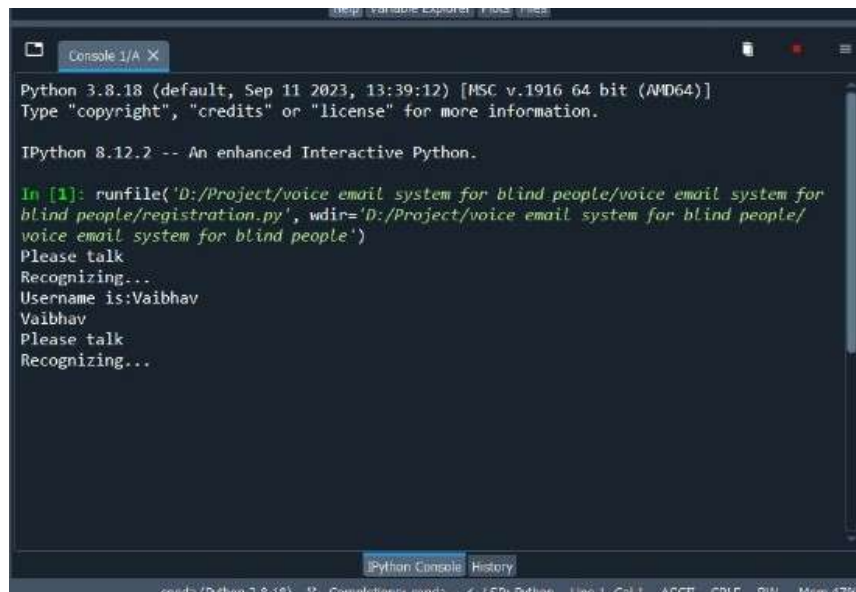
IPython 8.12.2 -- An enhanced Interactive Python.

In [1]: runfile('D:/Project/voice_email_system_for_blind_people/voice_email_system_for
blind_people/registration.py', wdir='D:/Project/voice_email_system_for_blind_people/
voice_email_system_for_blind_people')
Please talk
```

Sign up page

### Step 2:-

The first thing needed to do by the user is to signup by providing the username (firstname and lastname) this will be informed by voice only no need to use any kind of keyboard.



```
Python 3.8.18 (default, Sep 11 2023, 13:39:12) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license()" for more information.

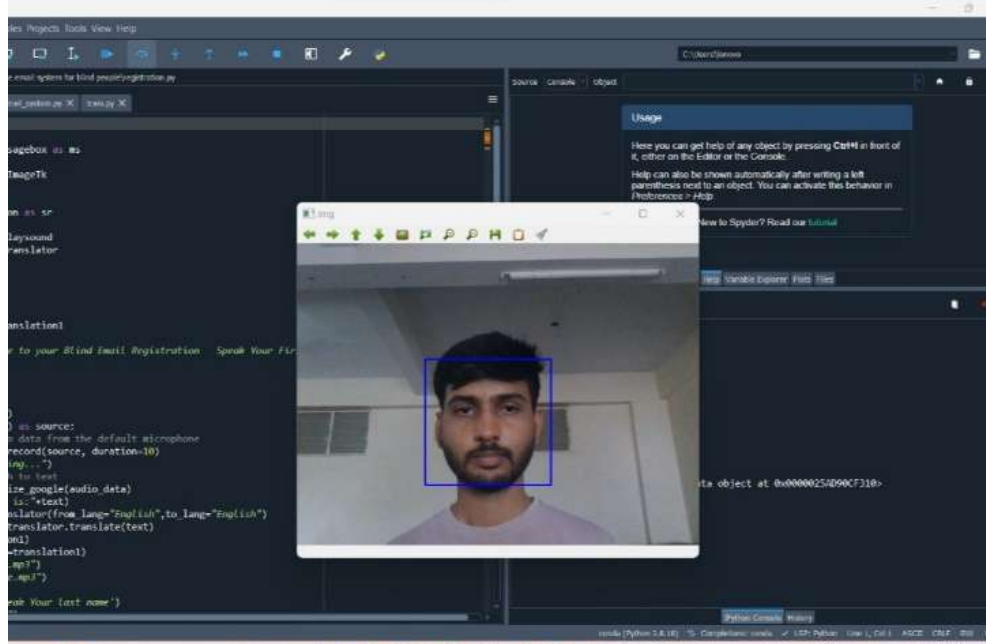
IPython 8.12.2 -- An enhanced Interactive Python.

In [1]: runfile('D:/Project/voice_email_system_for_blind_people/voice_email_system_for
blind_people/registration.py', wdir='D:/Project/voice_email_system_for_blind_people/
voice_email_system_for_blind_people')
Please talk
Recognizing...
Username is:Vaibhav
Vaibhav
Please talk
Recognizing...
```

Sign up page

### Step 3:-

Secondly, user has to set the username for his or her account. After setting the username the application will ask for the permission to capture the face by using the systems camera (the system in which user wants to run this application must have a camera, or else the user cannot be authenticated).



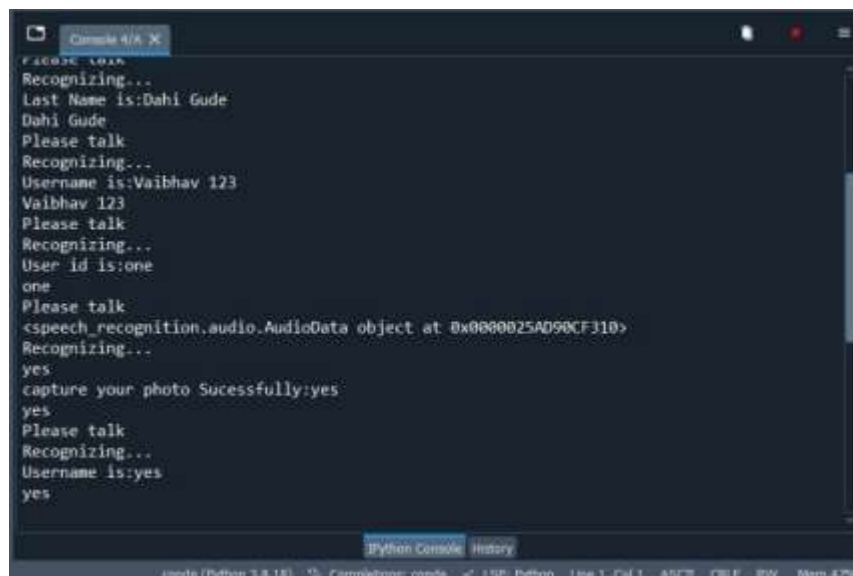
**Face Authentication**

**Step 4:-**

After asking for permission to capture the face, the user has to answer it in either yes or no.

Once user says “yes”, the application will start clicking pictures of face. Maximum 40 impressions will be captured.

After the registration and face recognition, the application will ask user to “whether to train the captured images or not” so that whenever the user again opens the application after exiting, then system will first open camera and recognize whether the user which is trying to access the application is authenticated or not.

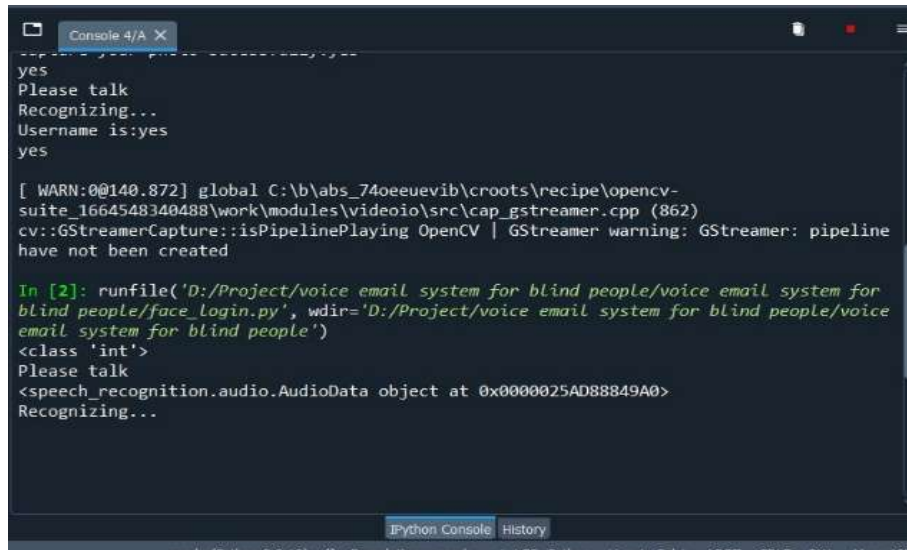


**Face Authentication Successful**

### Step 5:-

Once the trained images and users new impressions gets matched, then and only then the application will allow user to move front.

The application will inform user in voice command that either he or she is authenticated user or not.



```
yes
Please talk
Recognizing...
Username is:yes
yes

[ WARN:0@140.872] global C:\b\abs_74oeuevib\croots\recipe\opencv-
suite_1664548340488\work\modules\videoio\src\cap_gstreamer.cpp (862)
cv::GStreamerCapture::isPipelinePlaying OpenCV | GStreamer warning: GStreamer: pipeline
have not been created

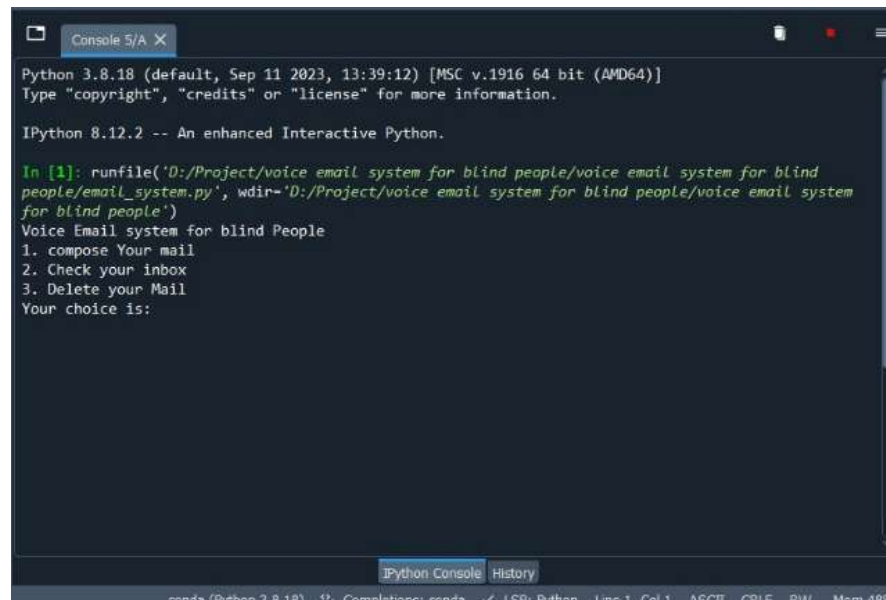
In [2]: runfile('D:/Project/voice email system for blind people/voice email system for
blind people/face_login.py', wdir='D:/Project/voice email system for blind people/voice
email system for blind people')
<class 'int'>
Please talk
<speech_recognition.audio.AudioData object at 0x0000025AD88849A0>
Recognizing...
```

**Login successful**

### Step 6:-

After the face authentication next page will open up, where the actual process begins.

Voice assistant will speak the options like compose email, read email and delete email and ask for the choice.



```
Python 3.8.18 (default, Sep 11 2023, 13:39:12) [MSC v.1916 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 8.12.2 -- An enhanced Interactive Python.

In [1]: runfile('D:/Project/voice email system for blind people/voice email system for blind
people/email_system.py', wdir='D:/Project/voice email system for blind people/voice email system
for blind people')
Voice Email system for blind People
1. compose Your mail
2. Check your inbox
3. Delete your Mail
Your choice is:
```

**Options**



### Step 7:-

When user says ‘1’, ‘one’, etc. The application will recognize it and perform compose operation.

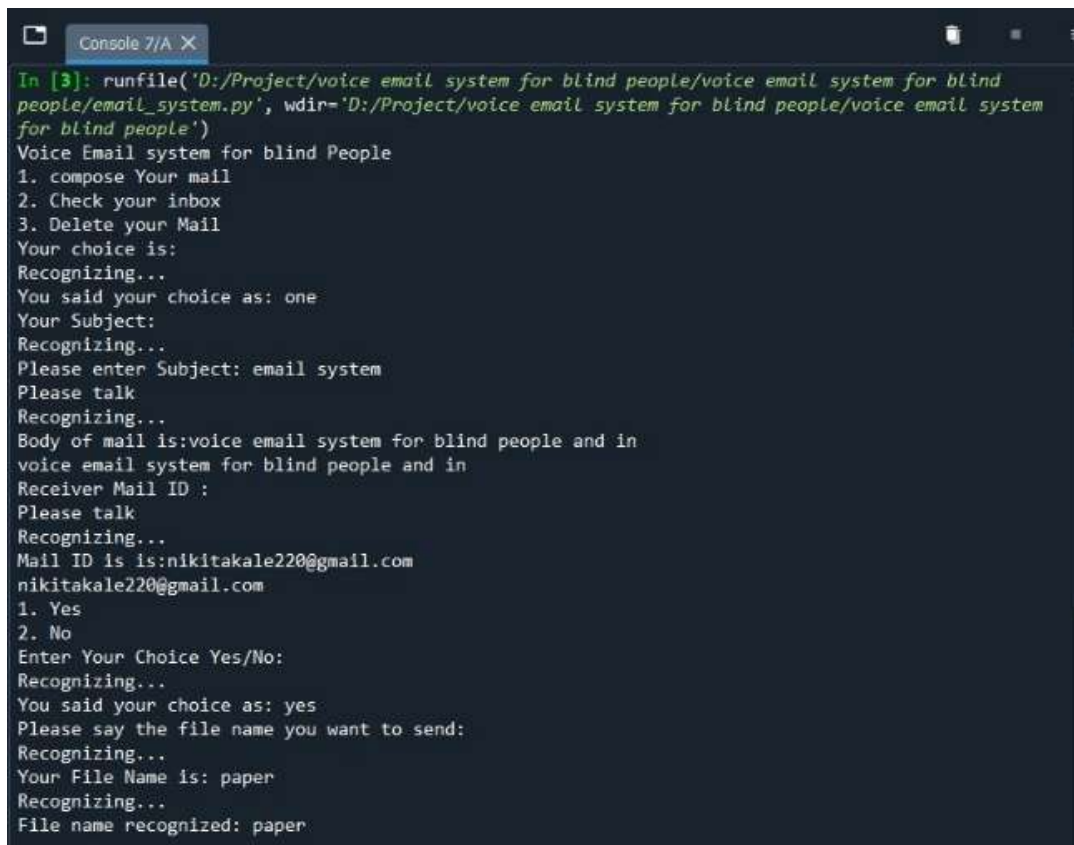
In this, users has to first say the subject of email, then body of email and then the receiver’s email Id to which he wants to send the email.

Now, there will be one more option while composing the mail, that will be to attach any extra attachment to the mail.

If yes then user has to say yes and if no that means user do not want to attach any attachments. User has to reply this when voice assistant will ask for attachment.

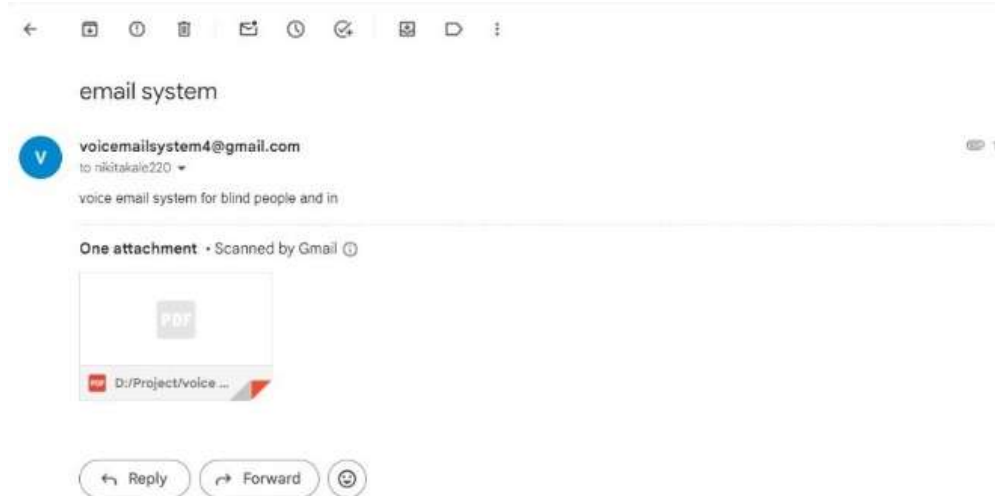
If user says yes then again voice assistant will ask for the file name and then the application will search for that file in the specific location.

If the file is found then the work is done and email is sent.



```
In [3]: runfile('D:/Project/voice email system for blind people/voice email system for blind
people/email_system.py', wdir='D:/Project/voice email system for blind people/voice email system
for blind people')
Voice Email system for blind People
1. compose Your mail
2. Check your inbox
3. Delete your Mail
Your choice is:
Recognizing...
You said your choice as: one
Your Subject:
Recognizing...
Please enter Subject: email system
Please talk
Recognizing...
Body of mail is:voice email system for blind people and in
voice email system for blind people and in
Receiver Mail ID :
Please talk
Recognizing...
Mail ID is is:nikitakale220@gmail.com
nikitakale220@gmail.com
1. Yes
2. No
Enter Your Choice Yes/No:
Recognizing...
You said your choice as: yes
Please say the file name you want to send:
Recognizing...
Your File Name is: paper
Recognizing...
File name recognized: paper
```

Compose mail



Mail send successfully

#### Step 8:-

Now, second option is to check your inbox.

User has to select this option by saying '2', 'two' and then option will be selected.

When user ask for this option, the voice assistant will tell how many mails are present in the inbox and read the body.

It will also tell the count of unseen mails.

```
Console 5/A X
Recognizing...
Your File Name is: paper
Recognizing...
File name recognized: paper

In [4]: runfile('D:/Project/voice email system for blind people/voice email system for blind
people/email_system.py', wdir='D:/Project/voice email system for blind people/voice email system
for blind people')
Voice Email system for blind People
1. compose Your mail
2. Check your inbox
3. Delete your Mail
Your choice is:
Recognizing...
You said your choice as: two
Number of mails in your inbox :[b'8']
Number of UnSeen mails :('OK', [b'1 2 3 8'])
```

Check inbox

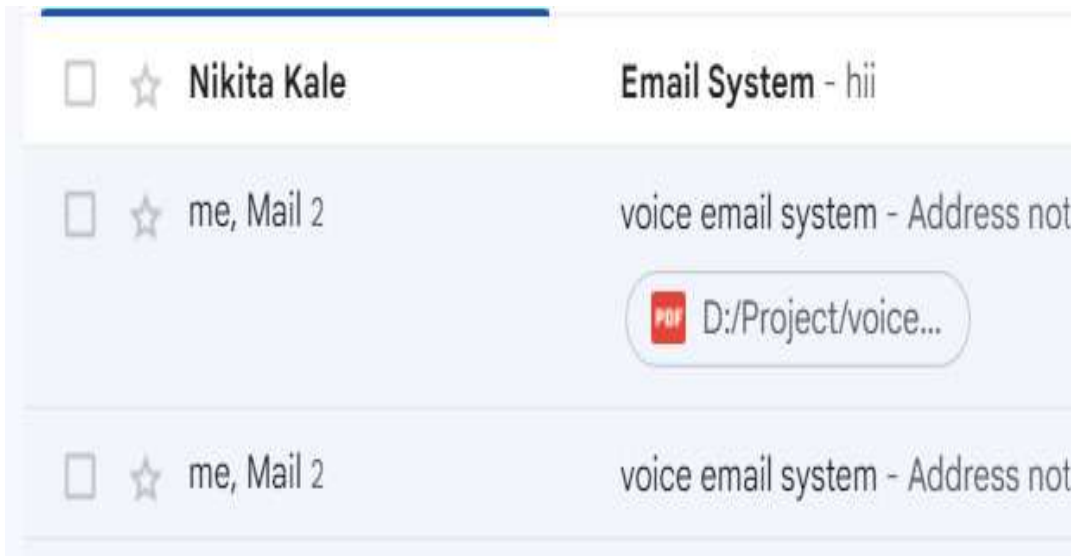
#### Step 9:-

And last option, third option that is delete a mail.

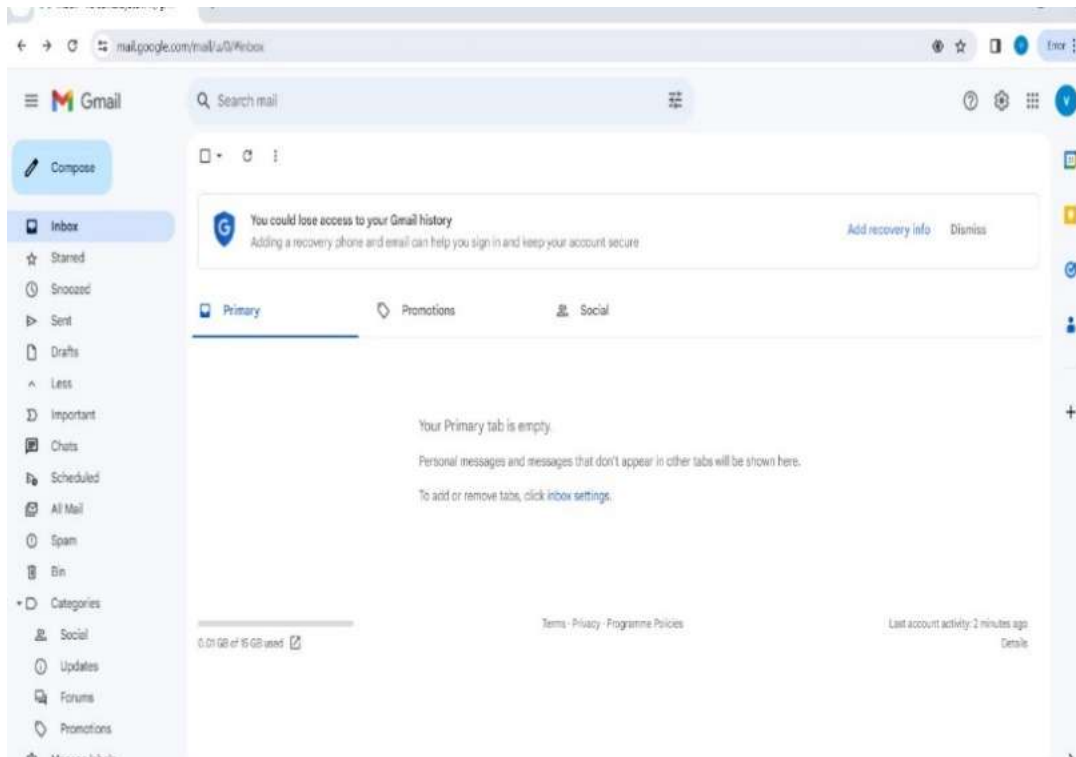
User has to select this option by saying ‘3’, ‘three’ and then option will be selected.  
Then he or she need to provide the subject of the mail which he or she wants to delete.  
Once the application matches the subject from user and the already present mail, then and then only that mail will get deleted.

```
In [1]: runfile('D:/Project/voice email system for blind people/voice email system for blind
people/email_system.py', wdir='D:/Project/voice email system for blind people/voice email system
for blind people')
Voice Email system for blind People
1. compose Your mail
2. Check your inbox
3. Delete your Mail
Your choice is:
Recognizing...
You said your choice as: three
Your Subject:
Recognizing...
You said your Subject: email system
Deleting Email system
```

Delete mail



Mail before deleting



### Mail after delete

### CONCLUSION

We propose a project aimed at facilitating blind individuals' access to their emails in an interactive manner. Our project employs speech-to-text and text-to-speech methods to enable seamless communication. By utilizing these technologies, our project assists blind individuals in managing and accessing their emails with ease.

### REFERENCES

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- [6] P. Merkle et al. conducted a study titled "The effects of multiview depth video compression on multiview rendering," which was published in Signal Processing: Image Communication in January 2009 (Vol. 24, Nos. 1–2, pp. 73–88).
- [7] P. Merkle, C. Bartnik, K. Muller, D. Marpe, and T. Wiegand, in their work "3D video: Depth coding based on inter-component prediction of block partitions," presented at the Picture Coding Symposium (PCS) in May 2012, explored depth coding techniques relying on inter-component prediction of block partitions.