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ALLY: AN INTELLIGENT VIRTUAL ASSISTANT USING AI

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Abstract - *In today's world of Artificial Intelligence, virtual assistants are becoming more and more popular. Many virtual assistants are available in the market like Amazon's Alexa, Microsoft's Cortana. Anyone can access these virtual assistants by using their wake-up word. So, security is the main issue with these virtual assistants. In this paper, we proposed a virtual assistant ALLY for laptops or computers. It has security features like face recognition, audio matching, and OTP verification via email. If the user successfully completes any of the security levels, then that user can give commands to ALLY. That means, only an authorized person has access to ALLY. Using these security features, we can prevent unauthorized access to the virtual assistant. ALLY can perform various functionalities like sending email, taking notes, telling today's news, telling weather conditions, managing calendars, and much more. We have added advanced features like data analysis and then visualize the results. ALLY uses the power of Python libraries like gTTS, speech recognition, TensorFlow, and pygame resulting in a powerful and intelligent virtual assistant.*

Key Words: Virtual Assistant, gTTS, Speech Recognition, Tkinter, Face Recognition, Voice Matching, OTP Verification

1. INTRODUCTION

Virtual assistants are in a boom in today's era of technology. Everyone wants ease in whatever work they perform. The virtual assistant (VA) is a way by which they can perform different functionalities just by giving voice commands. The virtual assistants available in the market like Amazon's Alexa, Google Assistant, Apple's Siri, and Microsoft's Cortana communicate with humans using voice commands. Everyone has at least one of the VA because of our smart phones. Different surveys found that they have some issues with security. Currently, virtual assistants available for laptops or computers are not very efficient. Also, they are having security issues as anyone can access them using their wake-up word. User's data will be at great risk if an unauthorized person gets access to his/her computer.

So, we have developed a virtual assistant, ALLY for laptops and computers. Users can use it to perform various computer activities just by giving voice commands. They can ask ALLY to tell current time, tell weather conditions, send email, make notes, play music, play movies, and much more. Only authorized persons can control ALLY. For this, we have added security features like face recognition, audio matching, and OTP verification via email. User can analyze data and visualize the results using ALLY just by giving voice commands. ALLY is a multilingual VA. It can speak in multiple Indian languages like English, Hindi, and Marathi. We have used python libraries like gTTS and mixer from pygame to give Indian accent to ALLY's voice.

2. RELATED WORK

Nowadays, the use of virtual assistants has increased drastically. The technology of virtual assistants is developing day by day. Surveys have found that available virtual assistants have issues regarding voice recognition, contextual understanding, and human interaction [1]. Authors in [2] have studied and discovered two attacks, namely voice squatting and voice masquerading. According to them, Alexa and Google Assistant are vulnerable to these types of attacks. They also have developed a technique to capture these attacks.

Many developers have developed a new version of VA to overcome the security issue from available virtual assistants. Face recognition can be used to provide security to VA. Using this feature only authorized users can access VA. If the user is unauthorized, then he/she can access VA with admin permission [3]. There were no virtual assistants which can run on Linux operating system. So, R. Sangpal and the team have developed a virtual assistant called JARVIS which is a Linux-AI. They used AIML, Google API, various python libraries like pyttsx and nltk [4].

3. SYSTEM ARCHITECTURE

When ALLY starts, it shows three options for security check to the user. These three options are face recognition, audio matching, and OTP verification. User can select anyone from these three options and proceed for a security check. If the security check succeeds, then the user can access ALLY and give voice commands. If the security check fails, then a message will be shown as an unauthorized user. The unauthorized user can contact to administrator for getting access to ALLY. The system architecture of ALLY is as shown in Fig. 1.

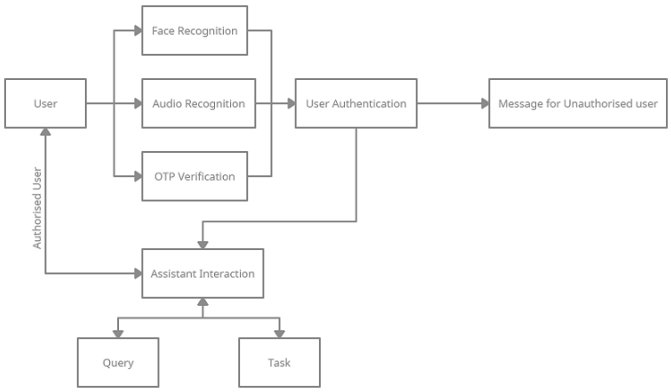

Fig -1: System Architecture

3.1 Face Recognition

If the user selects face recognition for security check, then the web camera will start. When the user comes in front of the camera, the camera detects the face using OpenCV python library. The detected face is recognized by using face_recognition library. If the face matches with previously saved faces, then ALLY gives access to the user and welcomes the user by calling him with his name.

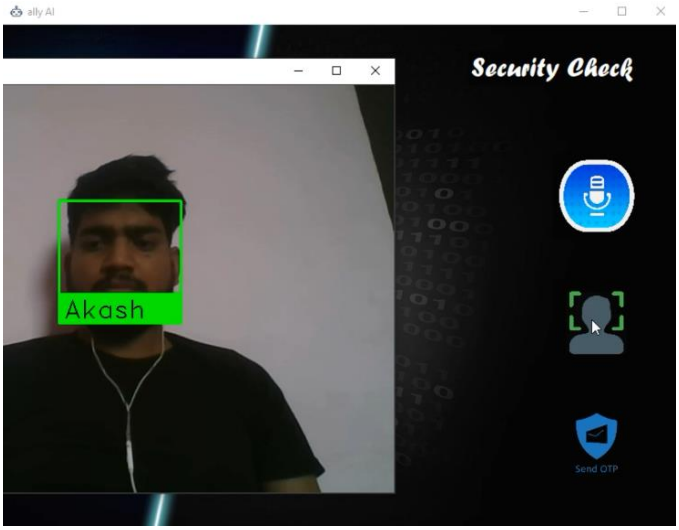

Fig -2: Face Recognition Module

3.2 Audio Matching

If the user selects audio matching for security check, then ALLY will ask the user to speak his unique words and record his audio. Here, we have already saved authenticated user's audio files in Waveform (.WAV) Audio File Format. When the user records his audio for security check, his voice matching will be done by using Resemblyzer and NumPy python libraries. In this, audio matching will be performed by converting the audio files into an array using NumPy library and then compares them. If the audio matches with previously saved audio files, then ALLY gives access to the user and welcomes the user by calling him with his name.

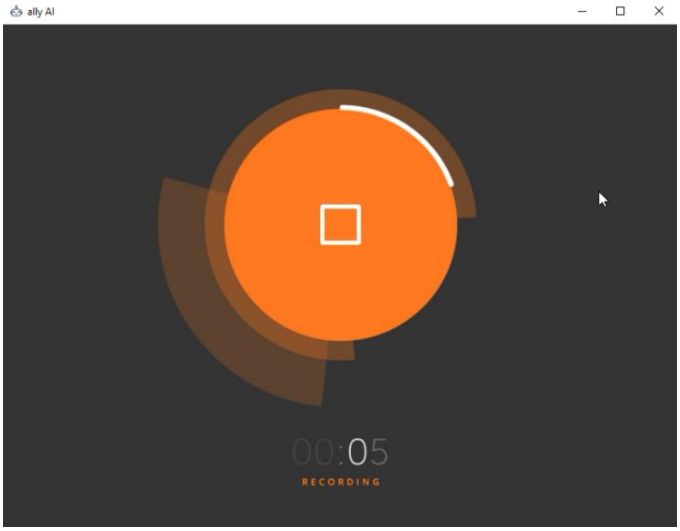

Fig -3: Voice matching Module

3.2 OTP Verification

If the user selects OTP verification for security check, then ALLY will send OTP to all the authenticated users via email. Here, we have already saved the email IDs of all the authenticated users. We have used the SMPT server to send emails. When the user enters the correct OTP, then ALLY gives access to the user and welcomes the user by calling him with his name.

Fig -4: OTP Verification Module

User needs to go through only one security check. If it succeeds, then the user can access ALLY.

4. IMPLEMENTATION OF ALLY

We have used Python for the implementation of ALLY. It gives support for different libraries using which we have implemented this system.

4.1 Training Model

For improving the interaction between user and ALLY, we have trained a model using Keras from the TensorFlow library. We have created a JSON file of various patterns and their responses. We have given a unique tag to each pattern using which we can recognize that pattern. Pattern contains the same question in different formats that the user may ask. The response contains different answers ALLY should give to any question. Firstly, we performed tokenization and lemmatization on this JSON file. After that, we trained a sequential model using this formatted data.

When the user asks a question, the query is gone through the tokenization and lemmatization process. We then passed this cleaned query to a trained model to predict the response to that query.

4.2 Basic Functions

We have added all the basic functionalities in ALLY that other virtual assistants can perform. These functionalities are telling time, telling weather conditions, sending email, playing movies, and much more.

4.3 Advanced Functions

We have added search mode and task mode in ALLY. In search mode, the user can ask any query to ALLY. Then ALLY will search that query on google and perform web scrapping to give a response to the user. We have used the BeautifulSoup library for web scrapping. We can give the next command parallelly when ALLY is giving a response to the previous query. ALLY stops speaking and processes for the next query.

In task mode, the user can ask ALLY to perform different tasks like data analysis, open/close any software using voice commands, search on specific websites like search any video on youtube, tell today's news, search any person on Facebook. We have used pandas, NumPy, and matplotlib libraries to perform data analysis and visualize the results in graph format.

Additionally, we can run ALLY on the raspberry pi to perform industry automation and home automation. We are working on automation part so that it can monitor security, temperature, staff, to-do list, and management of the industry. Also, we can do all these functions for home automation.

4.4 Language Support and Indian Accent

ALLY can speak three Indian languages. They are Hindi, English, and Marathi. By default, it uses the English language. But we can switch language by giving the command "Switch to Hindi" or "Switch to Marathi" or "Switch to English". If the user asks a question in Hindi, ALLY also responds in Hindi.

For giving Indian accent in ALLY's voice, we have used gTTS library. gTTS is a Google Text to Speech library. It generates .mp3 audio files from text. These audio files are played using a mixer module from pygame library.

4.5 User Interface

For the user interface, we have used the Tkinter Python library. This library is fast and easy to use for creating the user interface. User Interface is the efficient way using which users can communicate with ALLY. We can see options for selecting the security check method and query response using this user interface. User can select any one of the security check methods and proceed with a security check. The user interface for security check is shown in Fig. 5.

Fig -5: User Interface for security check

When user asks the query, ALLY processes that query to give a response to the user. This is displayed to the user as if he is chatting with ALLY. The query asked by the user is displayed on right side and response from the ALLY is displayed on left side of the window. Query-response is shown in Fig. 6.

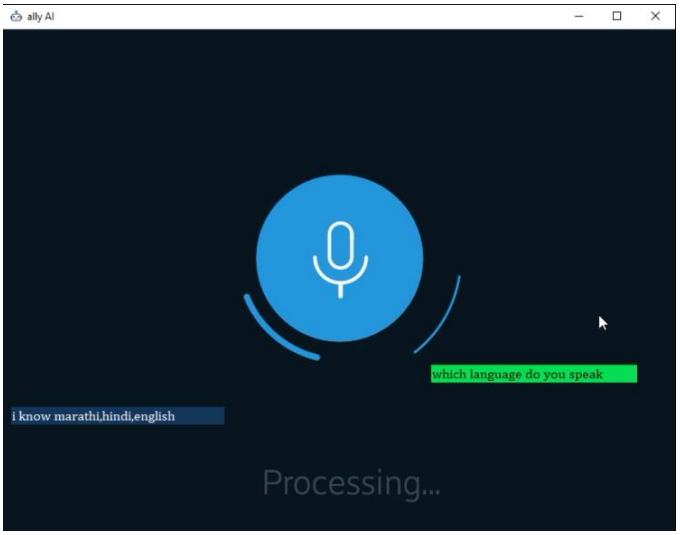

Fig -6: User Interface for Query-Response

3. CONCLUSIONS

ALLY gives security to user's data. For this, we have implemented the security features like face recognition, audio matching, and OTP verification. Only authenticated users can give commands to ALLY. Indian accent provided to ALLY gives the feel of friendliness. ALLY can give responses to questions more accurately using the trained model. Users can ask queries in Hindi and Marathi languages as well. ALLY can perform many tasks including Data Analysis. As we have used ALLY with raspberry pi, we can use it for Industry automation and home automation.

Currently, ALLY depends on an active internet connection. In the future, we can implement offline mode for ALLY. We can add fingerprint detection to increase the security level of ALLY. Also, we can make it compulsory to check all the security functions.

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