A PROJECT REPORT

On

"Personal Voice Assistant using Artificial Intelligence"

Submitted to

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)

Deemed to be University U/S 3 of UGC Act, 1956

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN

INFORMATION TECHNOLOGY

BY

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KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY

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CERTIFICATE

This is certify that the project entitled

"Personal Voice Assistant using Artificial Intelligence"

Submitted By

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is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Science & Engineering OR Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during year 2022-2023, under our guidance.

Date: 21^{th} April, 2023

Mr. MADHABANANDA DAS

Project Guide

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)

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ABSTRACT

Artificial intelligence (AI)-powered voice assistants are virtual assistants that use speech recognition, machine learning, and natural language processing to comprehend and carry out voice requests. The components, skills, and uses of voice assistant technology using AI are covered in this paper's overview.

It draws attention to the underlying AI methods, such deep learning and recurrent neural networks,that provide voice assistants the ability to understand human requests. Accuracy and privacy issues with voice assistants are just two of its drawbacks that are mentioned.

It is investigated how voice assistants might affect sectors including healthcare and customer service. Future research directions are identified, such as multimodal interaction and improved user privacy. In general, AI-powered voice assistants have the potential to revolutionize how people interact with computers.

Furthermore, we investigate the possible influence of voice assistants in a variety of areas, such as healthcare, customer service, and smart homes. We also highlight future research directions, such as multi-modal interaction, personalized recommendations, and increased user privacy, in order to progress the field of AI-powered voice assistants.

Overall, this study sheds insight on the current status of voice assistant technology and its future prospects, emphasizing its critical role in determining the future of human-computer interaction.

Keywords*-Artificial Intelligence,Voice assistant,Speech Recognition,Python,Analyzing.*

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Chapter 1: INTRODUCTION

Recent years have seen significant advancements in user experience and user interaction only in Virtual Assistants. We already use them for a variety of tasks, such as turning on and off lights and playing music through streaming services like Wynk Music and Spotify.

This new way of dealing with technology makes lexical communication a new ally for it. Previously, the phrase "virtual assistant" was used to describe professionals who provide auxiliary services online. It can be divided into three stages: Text-to-speech, text-to-intention, intention-to-action, and voice assistant will all be fully improved to enhance the current range.

Artificial intelligence (AI)-powered voice assistants have exploded in popularity in recent years, revolutionizing the way we interact with technology. These virtual assistants, such as Amazon's Alexa, Apple's Siri, and Google Assistant, interpret voice instructions and offer intelligent responses using effective artificial intelligence techniques.

Voice assistants are not to be confused with virtual assistants, who are real people that work ad hoc hours and can do a variety of tasks. They anticipate our demands and take necessary action thanks to AI-based voice assistants.

AI-based voice assistants can be useful in various domains such as IT helpdesk, home automation, HR related activities, speech based search, and so on, and voice based search will be the future for next generation people, with users becoming increasingly reliant on voice assistants for all of their needs. In this proposal, we created an AI-based voice assistant that can perform all of these functions without causing any inconvenience.

CHAPTER 2: LITERATURE REVIEW

Bassam A, Raja N., have written on the most important statements and speeches. Human-machine communication was arranged using analog signals, which were converted to digital waves by speech signals. This technology is widely used; it has numerous applications and allows machines to respond accurately and consistently to user voices; it also provides valuable and appreciated services. Speech Recognition System (SRS) is gaining popularity and has numerous uses. The investigation has shown the procedure's summary; it is a straightforward model. **[1]**.

Speech analysis, as indicated by B. S. Atal and L. R. Rabiner et al, is routinely conducted in conjunction with pitch analysis. The study developed a pattern recognition technique for deciding whether a specific slice of a speech signal should be classified as voiced speech, unvoiced speech, or silence based on signal dimensions. The fundamental limitation of the technique is the requirement to run the algorithm on a specified set of dimensions and under specific recording conditions. **[2]**.

Speech is the most common means of communication among humans, according to V. Radha and C. Vimala et al. Because this is the best method, humans would prefer to interact with machines through speech as well. As a result, autonomous speech recognition has a high reputation. Most voice recognition techniques use Dynamic Time Warping (DTW) or HMM. Mel Frequency Cepstrum Coefficients (MFCC) have been used for speech feature mining, which provides a group of distinctive vectors of speech waveform. Prior research has shown that MFCC is more precise and real than other characteristic mining algorithms in voice recognition. The work on MATLAB has been done, and preliminary results show that the system is capable of recognising words at a satisfactory level accuracy. **[3]**.

T. Schultz and A. Waiel et al. highlighted that when speech technology products proliferate over the world, the inability to move to new destination languages becomes a useful worry. As a result, the research focuses on the question of how to quickly and efficiently port large vocabulary continuous speech recognition (LVCSR) systems. More specifically, the research requires evaluating acoustic models for a novel destination language using speech information from various source languages, but only limited data from the destination language identification

outcomes using language-dependent, independent, and language-adaptive acoustic models are described and debated in the framework of the Global Phone project, which examines LVCSR methods in 15 languages. **[4]**

J. B. Allen et al described language as the most important form of communication, with speech serving as its primary interface. As a machine understood the human-machine interface, the speech signal was converted into analog and digital wave shapes. **[5]**

A technology that is widely used and has many potential applications. Speech technologies enable robots to respond to human speech in an appropriate and consistent manner, providing useful and appreciated services. The study summarises the voice recognition procedure, its basic model, and its application strategies, and it also describes reasonable research of numerous techniques used in speech recognition systems. SRS is improving gradually and has limitless applications. **[6]**

Chapter 3: BACKGROUND

HISTORY OF VOICE ASSISTANTS

Voice assistants have been around since the 20th century, when researchers and scientists began investigating the possibility of using voice recognition technologies for human-computer interaction. Let's take a quick look at the major turning points in the history of voice assistants. :

1960s-1970s: Early Research

The early advances in speech recognition technology concentrated on isolated word identification and a limited vocabulary. Researchers made substantial advances in speech recognition technology in the 1960s and 1970s, but it was mostly used in limited areas such as the military and aerospace industries.

1980s-1990s: Voice Response Systems

Voice response systems evolved in the 1980s and 1990s, allowing people to connect with computers using voice instructions. These systems were mostly utilized in contact centers and automated phone systems for duties such as customer support and data retrieval. They did, however, have limited capabilities and were based on rule-based systems with limited language comprehension.

2000s: Intelligent Personal Assistants

In the early 2000s, more sophisticated voice assistants with advanced natural language processing (NLP) capabilities emerged. Microsoft released the "Microsoft Speech Platform" in 2001, which included speech recognition and text-to-speech features. Apple introduced Siri, a voice-based intelligent personal assistant for iPhones, in 2007, marking a significant advancement in voice assistant technology. Following this, Google Assistant debuted in 2012, and Amazon's Alexa debuted in 2014.

2010s-Present: Advancements in AI and Voice Assistant Ecosystem

Voice assistants have gotten increasingly capable and pervasive as artificial intelligence (AI) and machine learning have advanced. They can now do a variety of things, such as make calls, send messages, set reminders, play music, provide directions, and operate smart home gadgets. To provide more personalized and context-aware experiences, voice assistants have been merged with other technologies like as natural language processing, computer vision, and the internet of things (IoT).

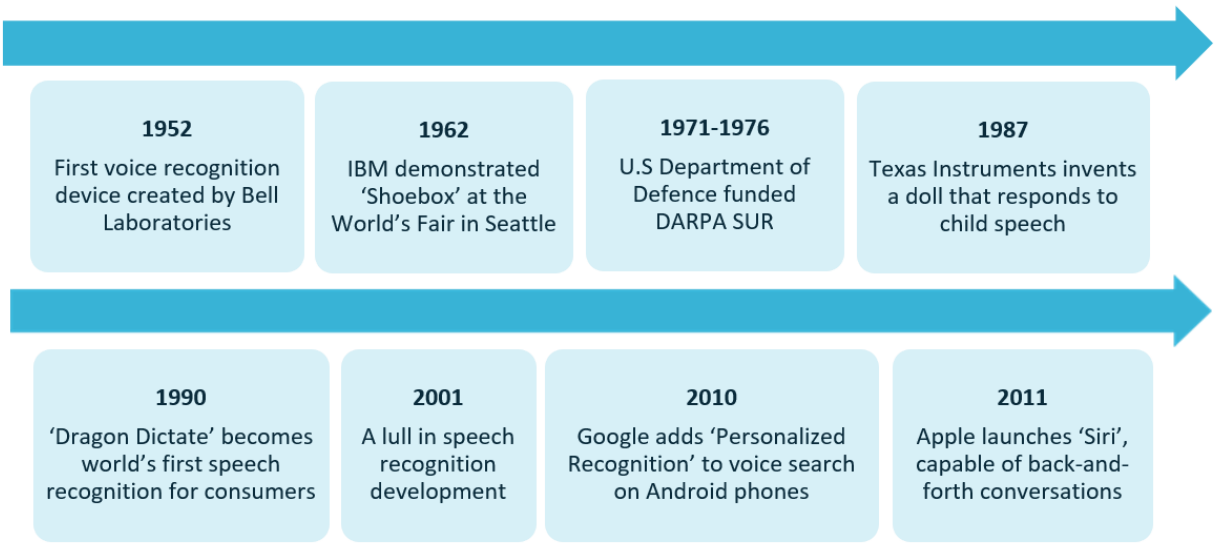


Figure 3.1

Chapter 4: PROBLEM STATEMENT

This section contains a description of the problem formulation. As we all know, each person has unique qualities, and each developer employs his or her own strategy and approach to product creation.

One assistant can synthesize speech more qualitatively, another can execute activities more accurately and without further explanations and corrections, while others can perform a smaller set of jobs more accurately and as the user desires. As a result, there is no such assistant who can do all of the job and tasks equally well.

The set of traits that an assistant possesses is determined by the area of development that received the most attention.

Because all systems are based on machine learning and use massive amounts of data collected from various sources and then trained on them, the source of this data plays an important role.

Regardless of how multiple methodologies are used to learn different algorithms, the basic premise of creating a voice assistant stays the same. Speech recognition, Teach-To-Speech, voice biometrics, dialogue management, natural language comprehension, and named entity recognition are the technologies used to create a voice assistant that can communicate with humans.

Chapter 5: PEAS FRAMEWORK

The PEAS framework is a model for designing intelligent agents that takes into account four components:

- Performance measure:

This component specifies how the success of the agent will be measured. It defines the criteria that the agent should optimize or maximize in order to attain its objectives.

- Environment:

The external context in which the agent acts is defined by this component. It encompasses everything the agent perceives and interacts with, including sensors, actuators, and other agents.

- Actuators:

The activities that the agent can take to alter the environment are specified in this component. The actuators in the case of a voice assistant could be speakers, screens, or other devices that can produce audio or visual outputs.

- Sensors:

This component specifies the inputs that the agent receives from the environment. In the case of a voice assistant, the sensors could be microphones or other devices that can capture audio inputs.

With these components in mind, we can design an agent for a voice assistant as follows:

Performance measure:

- The success of the voice assistant can be judged by how well it understands and responds to the user's voice instructions.

Environment:

- The voice assistant's environment is the physical location in which it operates, such as a home, office, or car.

- The environment also comprises devices and systems with which the voice assistant communicates, such as smart home devices, calendars, email accounts, and other apps.

Actuators:

- To provide audio or visual outputs, the voice assistant can make use of speakers, displays, and other devices.

- It can also interface with other devices and systems via various APIs and protocols.

Sensors:

- The voice assistant can use microphones and other sensors to capture the user's voice commands and other inputs.

- It can also use various APIs and protocols to receive data from other devices and systems.

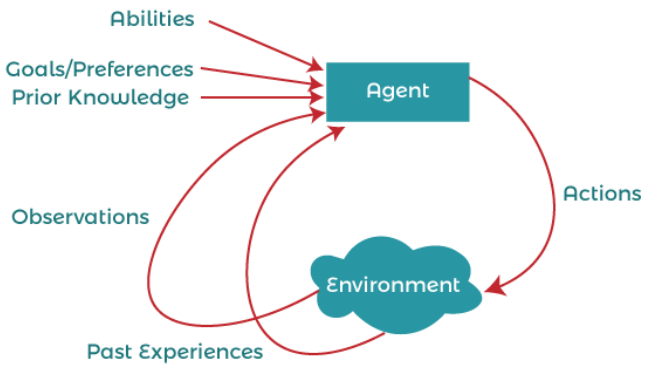


Figure 5.1

Chapter 6: TECHNOLOGY

Voice assistants rely on a variety of AI technologies to understand and respond to user requests. Here are some of the most common AI technologies used in voice assistants:

1. Natural Language Processing (NLP):

NLP is a branch of AI that deals with the interaction of humans and computers through the use of natural language. NLP is used in voice assistants to transform spoken language into text that the machine can understand, allowing it to process the user's request and respond appropriately.

2. Speech Recognition:

Speech recognition is the process of converting spoken words into written text. It is used in voice assistants to accurately transcribe the user's speech and understand their intentions.

3. Machine Learning (ML):

Machine learning (ML) is an AI discipline that includes teaching machines to learn from data without being explicitly programmed. ML algorithms are used by voice assistants to learn from user interactions and enhance their performance over time.

4. Natural Language Generation (NLG):

Natural language generation (NLG) is the process of producing natural language text from structured data. NLG is used by voice assistants to develop responses to user requests depending on the data they have access to.

5. Sentiment Analysis:

Sentiment analysis is the process of analyzing text to determine the emotional tone behind it. Voice assistants can use sentiment analysis to understand the user's mood and respond accordingly.

6. Contextual Understanding:

Contextual understanding is used by voice assistants to deliver more relevant responses to user requests. This entails considering the user's location, previous interactions, and other contextual information into consideration in order to give more personalized and useful responses.

7. Knowledge Graphs:

Knowledge graphs are a way of organizing data into a graph structure that represents the relationships between different entities. Voice assistants can use knowledge graphs to understand the relationships between different concepts and provide more accurate responses to user requests.

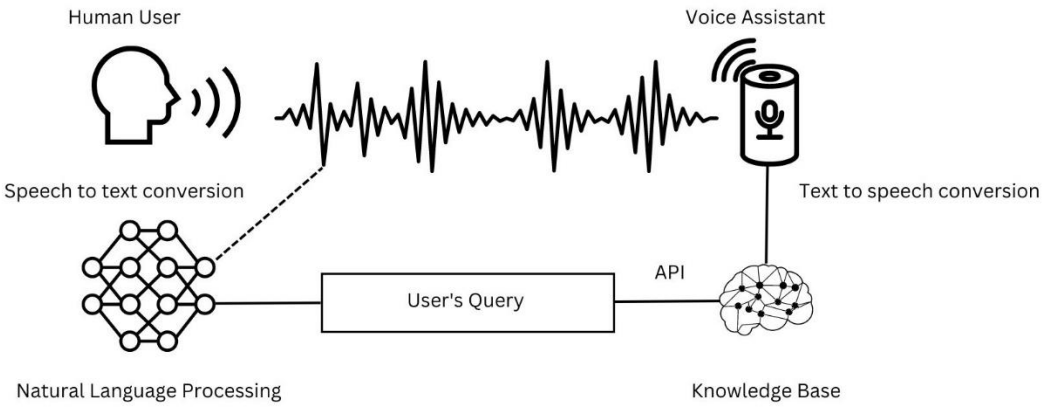


Figure 6.1

Chapter 7: ARCHITECTURE

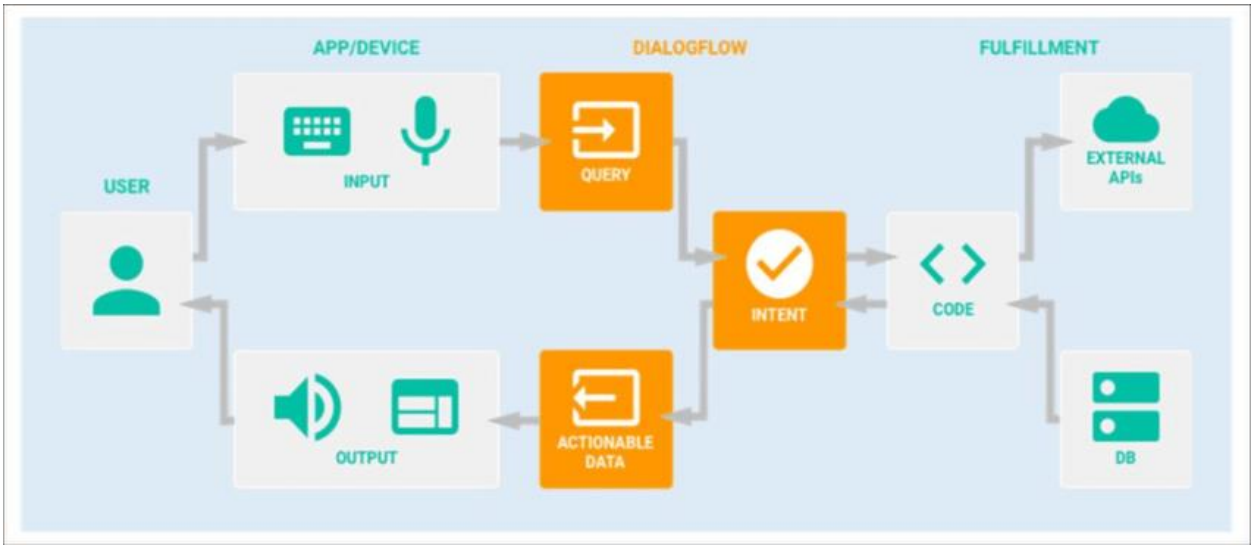


Figure 7.1

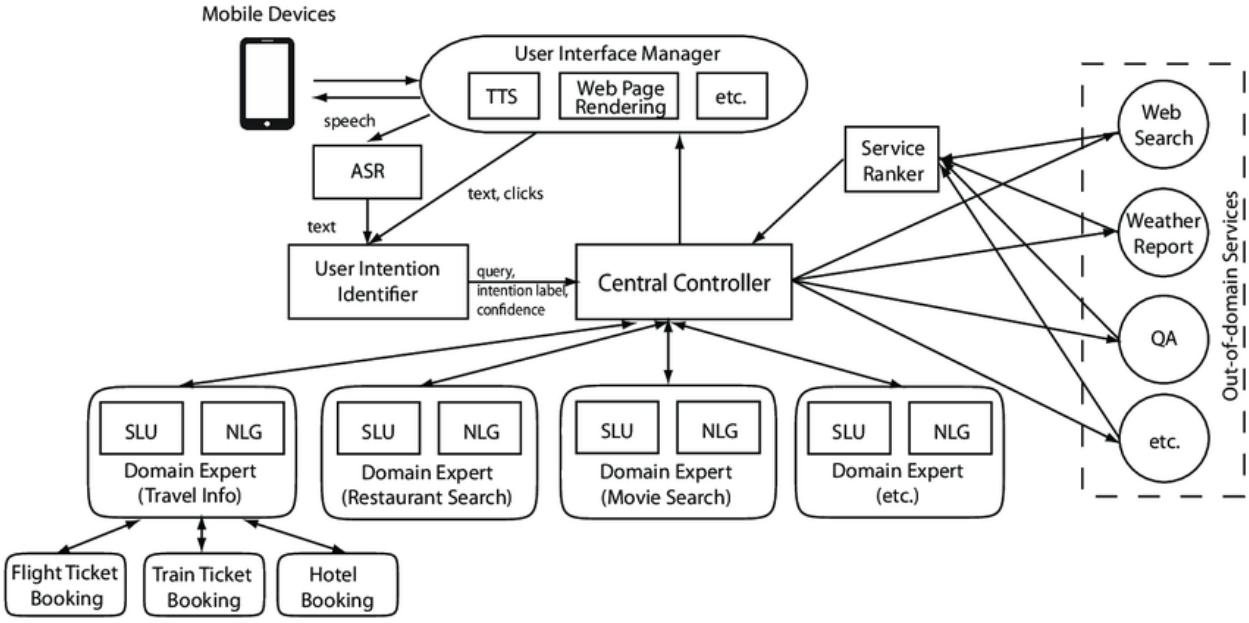


Figure 7.2

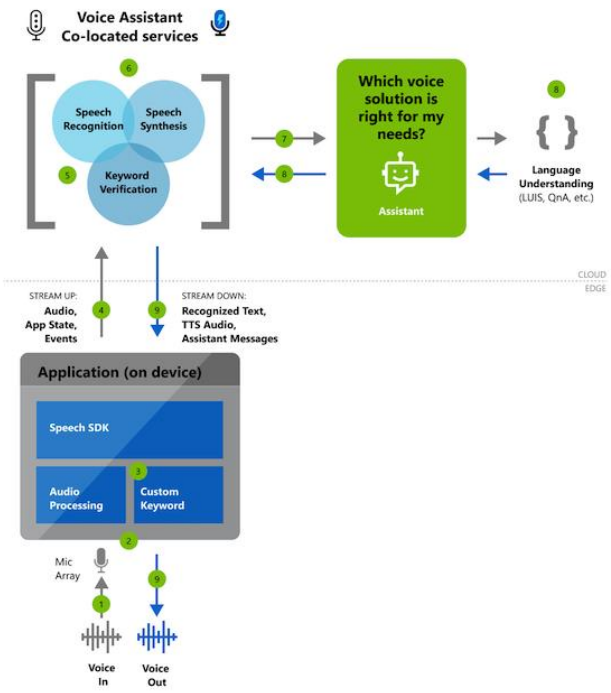


Figure 7.3

Conversational artificial intelligence (AI) refers to technology that consumers may converse with, such as chatbots or virtual agents. They use massive amounts of data, machine learning, and natural language processing to mimic human interactions, such as recognising speech and text inputs and interpreting their meanings across several languages.

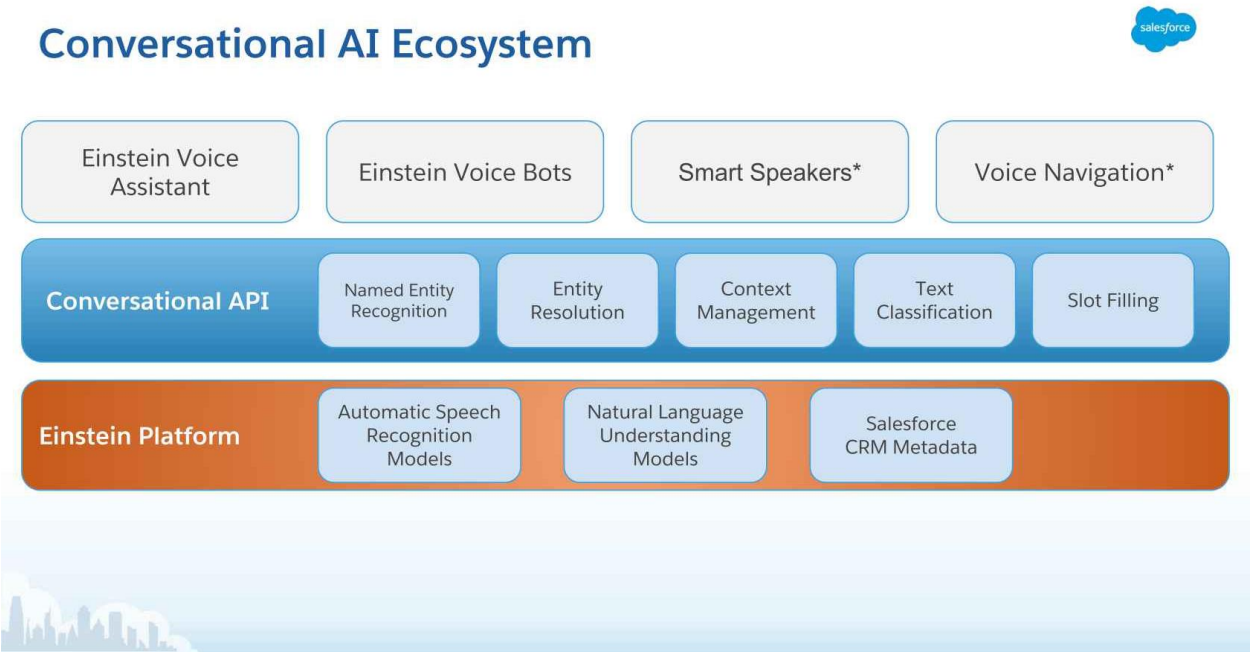


Figure 7.4

Chapter 8: ENVIRONMENT

* VS CODE/JUPYTER NOTEBOOK was used to develop the application.

Import Libraries :-

```
import speech_recognition as sr
import pyttsx3
import datetime
import wikipedia
import webbrowser
import os
import smtplib
import random
import requests
from newsapi import NewsApiClient
import spotify.sync as spotify
import time
from spotipy.oauth2 import SpotifyClientCredentials
```

Installation:

pip install pyttsx3

pip install speechRecognition

pip install Wikipedia

pip install PyAudio

pip install spotipy

Chapter 9: IMPLEMENTATION

BASIC METHODOLOGY

Defining a speak function:

An A.I. voice assistant's principal function is to speak. To make our bot speak, we'll create a **speak()** method that accepts audio input and returns a pronunciation.

def speak(audio): pass

To enable proper communication between the user and the help, we now demand audio. So, we are going to install a module named **pyttsx3.**

Creating our main function:

We'll now create a **main()** method and construct our own custom chat function within it. Whatever you enter into the **talk()** function will be completely converted to speech. Congratulations! Our voice assistant now has a voice of its own and is ready to speak!

Coding the wishme() function:

Now we'll code a **wishme()** function that will allow our voice assistant to wish or greet us based on the time on the computer.

To supply the current time to our assistant, we must import the **datetime** module.

Defining takeCommand() function:

The next most critical feature for our voice assistant is that it should be able to take commands using our system's microphone. So, let's get started with our **takeCommand()** function.

Our A.I. voice assistant will be able to return a string output by taking input from us via our microphone using our **takeCommand()** function.

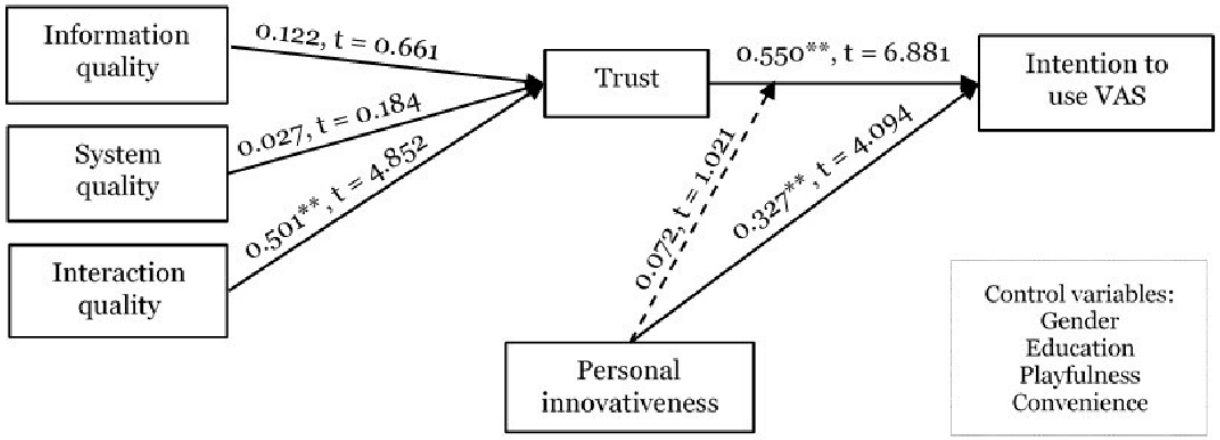


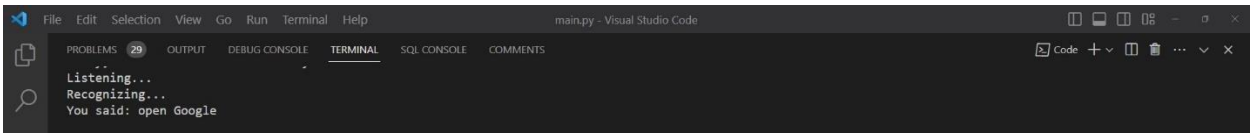
Figure 9.1

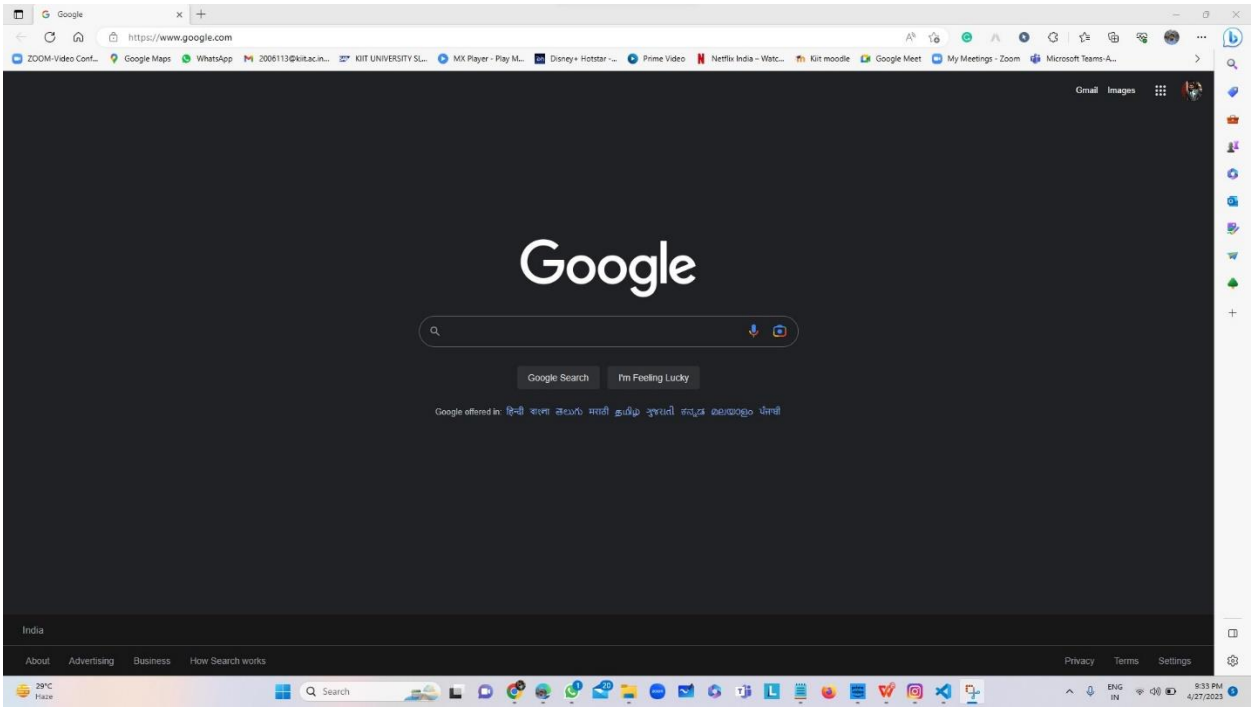
RESULT ANALYSIS

TASK 1: To search something on *Google*.

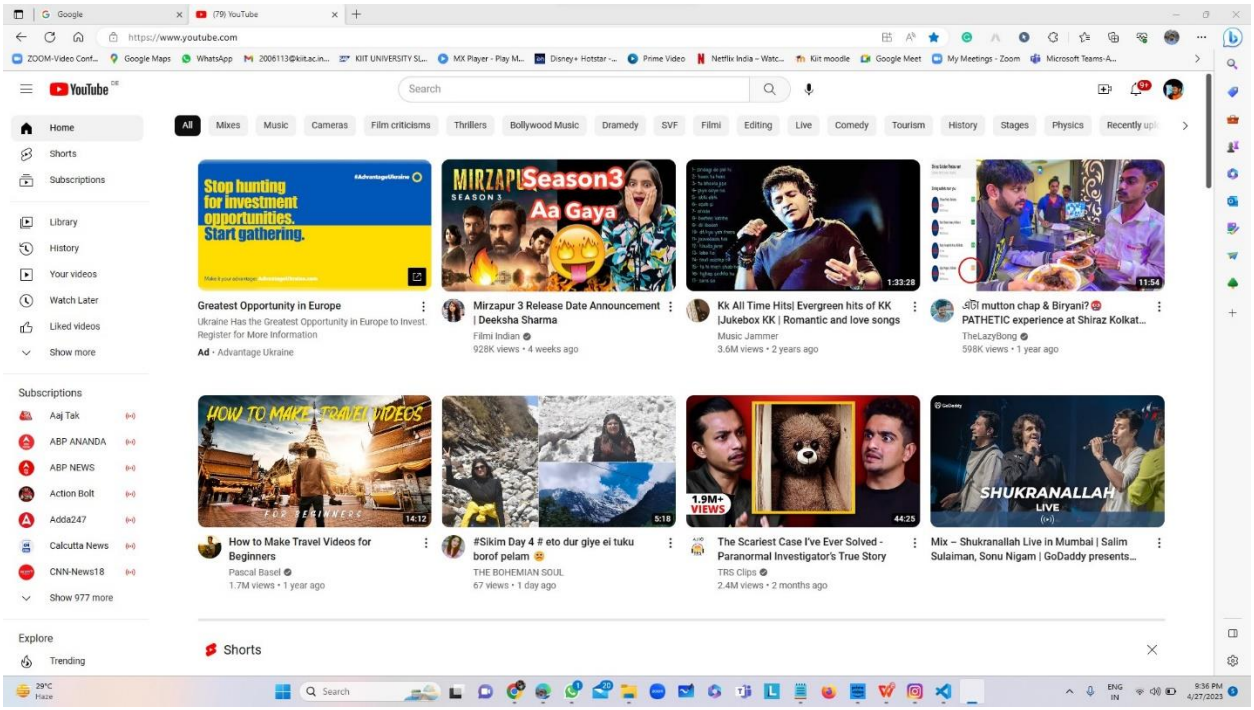
Data is extracted from the web by the web browser. The URL parameter is accepted by the open_new_tab function that must be accessed.

The Python time sleep function is used to delay programme execution. We can use this function to suspend the program's execution for a specified number of seconds.

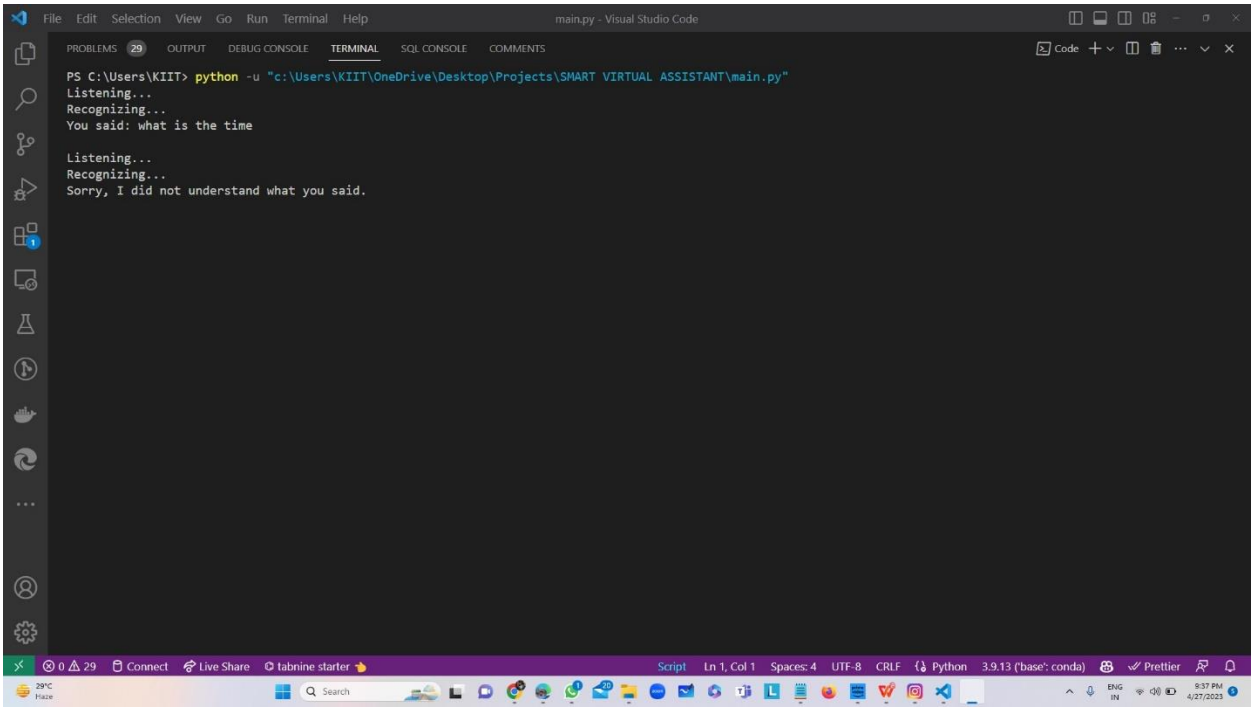




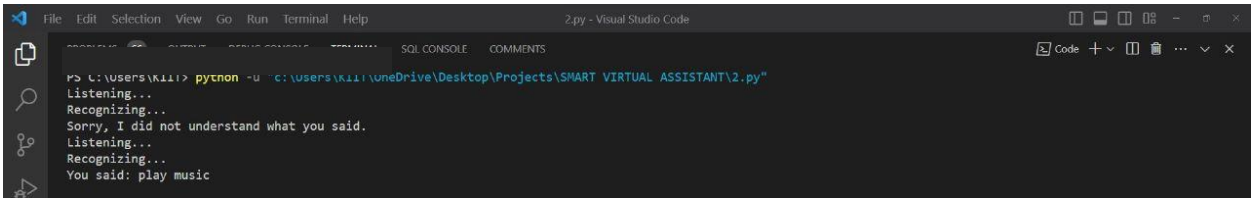
TASK 2: To open *YouTube* on browser.

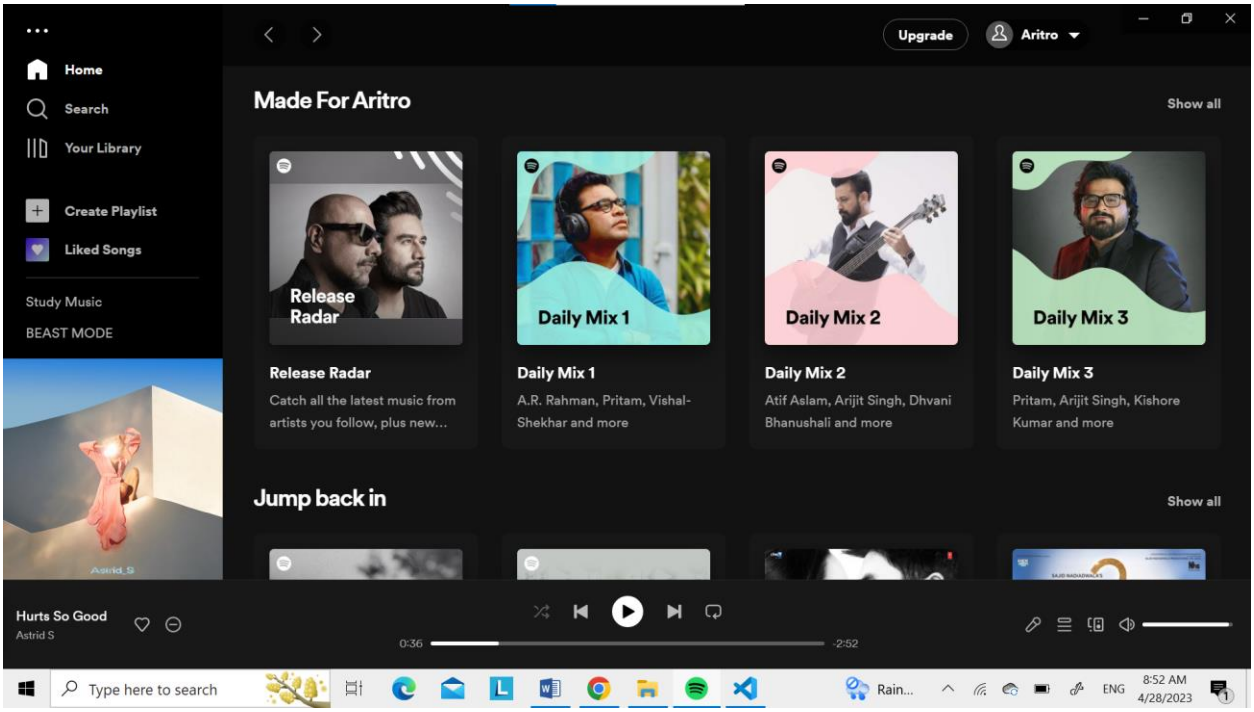


TASK 3: To know the *Current Time*.

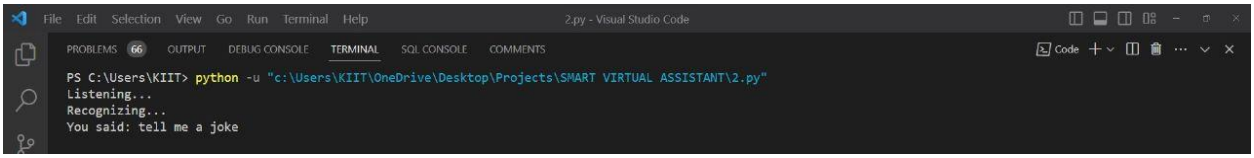


TASK 4: To Play *Music*.

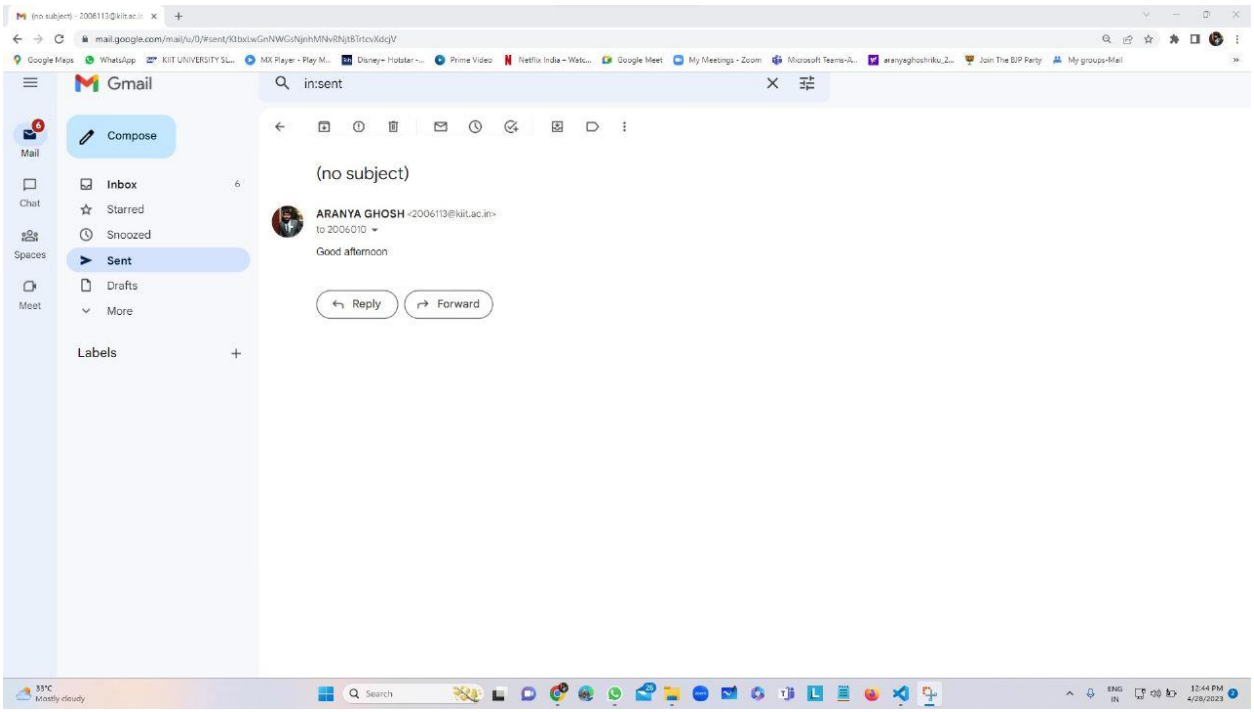




TASK 5: To Tell us a *Joke*.



TASK 6: To send an *e-mail*.



Chapter 10: STANDARD ADOPTED

DESIGN STANDARDS

1. **Modularity:**
   Modular design involves breaking it down into smaller, independent components that can be readily adjusted, tested, and maintained.

2. **Abstraction:**
   Design should be abstract, which implies it should focus on the system's fundamental properties while concealing extraneous details.

3. **Encapsulation:**
   Encapsulated design means that each module has a well-defined interface that hides its internal implementation details.

4. **Cohesion:**
   High coherence in design means that each module should have a single, well-defined responsibility.

5. **Loose Coupling:**
   Design should have low coupling, which means that modules should be loosely connected to each other, minimizing dependencies and improving scalability.

6. **Reusability:**
   Design should be reusable, which means that it should be easy to reuse existing code or components in new projects.

7. **Scalability:**
   Design should be scalable, which means that it should be able to handle increased demand without requiring significant changes to the system.

8. **Maintainability:**
   Design should be maintainable, which means that it should be easy to modify, fix, and update the system over time.

9. **Testability:**
   Design should be testable, which means that it should be easy to test the system's functionality and performance.

CODING STANDARDS

1. **Naming Conventions:**
   Variables, functions, classes, and other identifiers should have meaningful names that accurately describe their purpose.

2. **Indentation and Formatting:**
   Code should be properly indented and formatted to make it more readable and easier to understand.

3. **Comments:**
   Comments should be added to the code to explain its purpose, algorithmic complexity, and any special considerations.

4. **Modularity:**
   Code should be modularized to reduce complexity and improve maintainability.

5. **Error Handling:**
   Proper error handling should be implemented to ensure robustness of the code.

6. **Code Reusability:**
   Code should be designed to be reusable to reduce duplication and improve efficiency.

7. **Security:**
   Code should be designed with security in mind to prevent malicious attacks.

8. **Performance:**
   Code should be optimized for performance, taking into account any resource constraints.

TESTING STANDARDS

1. **Test Planning:**
   Before testing begins, a test strategy should be prepared that specifies the objectives, scope, and approach of the testing process.

2. **Test Case Design:**
   Test cases should be written to cover all potential scenarios and to test the functionality and performance of the product.

3. **Test Execution:**
   Tests should be executed according to the test plan and test cases.

4. **Regression Testing:**
   Regression testing should be performed after each defect fix or software update to ensure that no new defects have been introduced.

Chapter 11: CONCLUSION

The personal voice assistant system presented in this paper is a very basic system with few features; however, more advanced features may be introduced as future work on this project.

The project is constructed with open source software modules that are freely available, and it has the support of the Jupyter community, so it can be updated in the future.

The modular architecture utilized in this project makes it more adaptable and simple to integrate new modules and features without interfering with existing system functions. It not only responds to human commands, but it is also meant to respond to the user based on the question being asked or the words said by the user, such as opening tasks and operations. In the future, this Intelligent Voice Assistant has immense and endless potential.

Most popular personal voice assistants include Siri, Google Now, and Cortana.In the near future, the project will be readily integrated with gadgets for a Connected Home using Internet of Things, voice command system, and computer vision.

Finally, Python-powered voice assistants have emerged as a game-changing technology, altering the way humans engage with technology through voice commands.Voice assistants have found significant uses in a variety of fields, ranging from smart homes to healthcare, customer service, and beyond, thanks to improvements in AI and Python.

However, difficulties such as accuracy, privacy, and ethical concerns must yet be solved in the realm of Python-based voice assistants. More research and development are required to increase their accuracy, privacy safeguards, and address ethical concerns such as bias and fairness in voice assistant interactions.

FUTURE PROSPECTS

The future prospects of voice assistants using AI are very promising. As AI technology continues to advance, we can expect voice assistants to become even more intelligent and capable of performing a wider range of tasks. Here are some of the potential future developments we may see in voice assistants using AI:

1. **Improved Natural Language Understanding**:

   Although voice assistants are currently relatively capable of interpreting basic commands, there is still potential for advancement in terms of recognising more sophisticated language and context. As NLP and ML technology advance, voice assistants will become more competent at interpreting natural language and context, making them more helpful in a broader range of applications.

2. **Increased Personalization:**

   Voice assistants will become increasingly personalised, adapting their responses and recommendations to each user's individual needs and preferences. Voice assistants will be able to learn from previous interactions and adapt to each user's individual personality and behaviour by utilising data analysis and ML algorithms.

3. **Integration with IoT Devices**:

   We should expect voice assistants to become more integrated with IoT devices as they grow more prevalent, allowing consumers to control and monitor their smart home gadgets, autos, and other IoT devices via voice commands.

4. **Improved Contextual Awareness:**

   As voice assistants evolve, they will be able to better grasp the context of a user's request, taking into consideration aspects such as the user's location, time of day, and previous interactions. This will enable voice assistants to provide users with more relevant and helpful responses.

5. **Multilingual Capabilities:**

   With the increasing globalization of business and communication, multilingual voice assistants will become more important. We can expect voice assistants to become more proficient in multiple languages, allowing them to communicate seamlessly with people around the world.

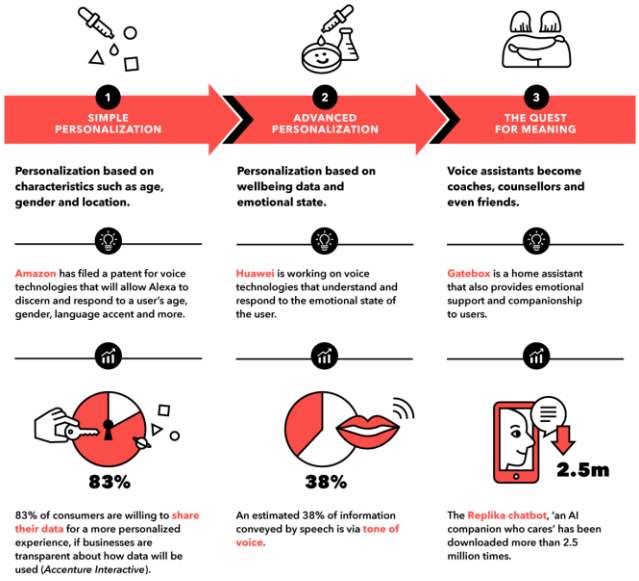


Fig 11.1

Overall, the future prospects of voice assistants using AI are very exciting. With continued advances in AI technology, we can expect voice assistants to become even more intelligent, personalized, and useful in a wide range of applications.

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[10] https://towardsdatascience.com/how-to-build-your-own-ai-personal-assistant-using-python-f57247b4494b

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[12] https://www.ijraset.com/research-paper/ai-based-voice-assistant

INDIVIDUAL CONTRIBUTION REPORT

“Personal Voice Assistant using Artificial Intelligence”

ARITRO ACHARYA

2006010

Abstract:

AI-powered voice assistants have grown in popularity in recent years. Natural language processing techniques are used by virtual assistants such as Amazon's Alexa and Apple's Siri to understand and interpret voice commands from consumers. They can do a variety of activities, including playing music, offering weather forecasts, and creating reminders. Voice assistants are likely to become even more interwoven into daily life as technology improves, with the ability to automate more complicated tasks and increase overall productivity.

Individual contribution and findings:

I kicked off the project with a literature review, subsequently outlining the problem statement. I developed the Peas framework and evaluated the technology used here. The architecture and execution procedures were then planned for my team. In addition, I took the necessary procedures to maintain the code, design, and testing standards.

Individual contribution to project report preparation:

The Report is designed,written and complied by me. Also took initiative for plagiarism check.

Individual contribution for project presentation and demonstration:

The Presentation is designed by me and demonstrated the execution part followed by taking all the doubts and questions by the committee.

Full Signature of Supervisor: Full signature of the student:

……. ……..

“Personal Voice Assistant using Artificial Intelligence”

ARANYA GHOSH

2006113

Abstract:

AI-powered voice assistants have grown in popularity in recent years. Natural language processing techniques are used by virtual assistants such as Amazon's Alexa and Apple's Siri to understand and interpret voice commands from consumers. They can do a variety of activities, including playing music, offering weather forecasts, and creating reminders. Voice assistants are likely to become even more interwoven into daily life as technology improves, with the ability to automate more complicated tasks and increase overall productivity.

Individual contribution and findings:

I researched the technologies to be employed after receiving direction from our project lead.I took the features, coded the project, and implemented it with Aritro Acharya.

Individual contribution to project report preparation:

I did the testing of the project with my team mates and provided the information of code and testing result for smooth process of report. Reviewed after plagiarism check.

Individual contribution for project presentation and demonstration:

The main function and features is explained by me in the presentation and demonstration.

Full Signature of Supervisor: Full signature of the student:

……. ……..

“Personal Voice Assistant using Artificial Intelligence”

SOUVIK HAZRA

2006045

Abstract:

AI-powered voice assistants have grown in popularity in recent years. Natural language processing techniques are used by virtual assistants such as Amazon's Alexa and Apple's Siri to understand and interpret voice commands from consumers. They can do a variety of activities, including playing music, offering weather forecasts, and creating reminders. Voice assistants are likely to become even more interwoven into daily life as technology improves, with the ability to automate more complicated tasks and increase overall productivity.

Individual contribution and findings:

Provided the abstract of the report to the team and took part in the discussion of the project.

Also provided suitable resources for references

Individual contribution to project report preparation:

I suggested the abstract for our report.

Individual contribution for project presentation and demonstration:

Explained my part in the presentation and supported in the demonstration in committee .

Full Signature of Supervisor: Full signature of the student:

……. ……..

“Personal Voice Assistant using Artificial Intelligence”

RAJDEEP GHOSH

2006278

Abstract: AI-powered voice assistants have grown in popularity in recent years. Natural language processing techniques are used by virtual assistants such as Amazon's Alexa and Apple's Siri to understand and interpret voice commands from consumers. They can do a variety of activities, including playing music, offering weather forecasts, and creating reminders. Voice assistants are likely to become even more interwoven into daily life as technology improves, with the ability to automate more complicated tasks and increase overall productivity.

Individual contribution and findings:

Provided few research paper for reference for the minor project work.

Individual contribution to project report preparation:

Downloaded some papers and submitted to our project lead for preparation of report.

Individual contribution for project presentation and demonstration:

Explained the presentation and took down the issues for further improvement and elaboration of project. .

Full Signature of Supervisor: Full signature of the student:

……. ……..

PLAGIARISM