

An
Industry Oriented Mini Project Report On

VOICE BASED VIRTUAL ASSISTANT FOR WINDOWS

Submitted in partial fulfillment of the requirements for the award of degree

BACHELOR OF TECHNOLOGY

IN

**COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)**

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CERTIFICATE

This is to certify that the project report titled **“VOICE BASED VIRTUAL ASSISTANT FOR WINDOWS”** is being submitted by **T. Srikanth (217Z1A6756)**, **K. Srija Reddy (217Z1A6732)**, and **D. Abhiram (217Z1A6701)** in Partial fulfillment for the award of **Bachelor of Technology in Computer Science And Engineering(data science)** is a record bonafide work carried out by them. The results embodied in this report have not been submitted to any other University for the award of any degree.

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ABSTRACT

The goal of this project is to develop a voice-based virtual assistant for Windows, designed to enhance user interaction through natural language processing and voice recognition technologies. This assistant aims to facilitate various tasks, providing an intuitive and hands-free user experience for managing applications, scheduling, and information retrieval. The system leverages advanced neural network models for speech recognition and natural language understanding. Key components of the assistant include a speech-to-text engine, natural language processing module, and a command execution interface. The speech-to-text engine converts spoken language into text, which is then processed by the natural language processing module to understand and interpret user commands. Finally, the command execution interface interacts with the Windows operating system to perform the desired actions. Key functionalities of the assistant include opening and closing applications, managing files, setting reminders, sending emails, and retrieving information from the web. Techniques such as voice activity detection, intent recognition, and context management were implemented to ensure accurate and efficient performance. The system also supports customization and learning from user interactions to improve accuracy and user experience over time.

Keywords: Voice Assistant, Natural Language Processing, Speech Recognition, Human-Computer Interaction

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LIST OF ABBREVIATIONS

S. NO.	ABBREVIATION	DEFINITION
1	NLP	Natural Language Processing
2	TTS	Text-to-Speech
3	OS	Operating System
4	AI	Artificial Intelligence
5	API	Application Programming Interface

1. INTRODUCTION

In today's digital age, almost all tasks are automated. With smartphones in our hands, it feels like the entire world is at our fingertips. However, we have moved beyond even using our fingers—now, we simply speak, and the task is completed. Virtual assistants have made this possible by allowing us to perform tasks with just our voice. For instance, you can say, “Text Dad, ‘I’ll be late today,’” and the message is sent instantly. These virtual assistants are designed to make our lives easier, and I had this very idea in mind when I started developing my own virtual assistant. While it may not be as advanced as Amazon’s Alexa, Google Assistant, Apple’s Siri, or JARVIS from *Iron Man*, it is a step towards simplifying day-to-day tasks.

1.1 BACKGROUND OF STUDY

In this era, voice-based virtual assistants are becoming increasingly popular for their convenience and ability to streamline tasks. A voice-based virtual assistant for Windows is a software application that recognizes and processes voice commands, providing responses or performing actions based on user input. These assistants leverage advancements in natural language processing (NLP) and artificial intelligence (AI) to interpret spoken commands and execute tasks such as opening applications, searching the web, setting reminders, or controlling smart home devices.

Voice-based virtual assistants have evolved significantly in recent years. They are now capable of understanding context, handling complex queries, and even engaging in more conversational interactions. This progress is largely driven by advancements in machine learning, where large datasets of human speech are used to train models to improve accuracy in speech recognition and interpretation.

Google Assistant offers voice-activated assistance for managing tasks, setting reminders, and accessing information. It is widely available across various devices, including smartphones, smart speakers, and smart displays. While primarily consumer-focused, Google Assistant is also integrated with Google’s productivity tools, enhancing both personal and professional experiences.

1.2 PROJECT OBJECTIVE

The primary objective of this project is to develop a comprehensive voice-based virtual assistant for Windows that empowers users to efficiently manage their daily tasks. This assistant will integrate advanced voice recognition technology with semantic data sources, user-generated content, and knowledge databases to deliver accurate and timely responses. By offering a hands-free experience, the assistant will streamline a variety of tasks, including online research, social media management, email handling, calendar scheduling, travel planning, and more.

The assistant will serve as a shared resource, capable of handling multiple tasks across different domains simultaneously, thus saving users valuable time. Users can delegate mundane and repetitive activities such as online research, setting reminders, managing inboxes, and coordinating schedules. Additionally, it will assist with personal tasks, such as making travel arrangements and organizing social media content.

1.3 MOTIVATION

In a world where virtual assistants like Siri, and Google Assistant are prevalent across various platforms, there remains a need for a personalized and customizable desktop assistant. With this in mind, I aim to develop a Python-based virtual assistant named Jarvis. Jarvis is inspired by established virtual assistants and Siri for iOS but focuses specifically on desktop environments.

The main motivation behind Jarvis is to create a virtual assistant that can handle a wide range of user tasks through both speech and text commands. By leveraging Python's versatility and simplicity, Jarvis will enable users to perform complex actions with a single command, thereby simplifying and streamlining their daily routines. Whether users need to manage their schedules, execute commands, or access information, Jarvis will provide a seamless and efficient solution, tailored to individual needs and preferences.

1.4 PURPOSE SCOPE AND APPLICABILITY

The purpose of a virtual assistant is to facilitate seamless and hands-free interaction through natural language voice commands, enabling users to manage tasks, control smart devices, access real-time information, and streamline daily activities with convenience and efficiency. Virtual assistants are increasingly integrating into various aspects of daily life, reducing reliance on screen-based interactions and enhancing user experiences in smart homes, workplaces, and beyond. As technology evolves, virtual assistants are expected to offer even more personalized services, becoming essential tools in the connected, AI-driven ecosystem of the future.

1.5 PROBLEM STATEMENT

We are all well aware about Siri, Google Assistant and many other virtual assistants which are designed to aid the tasks of users in Windows, Android and iOS platforms. But to our surprise, there's no such virtual assistant available for the paradise of Developers i.e. Linux platform.

2.LITERATURE SURVEY

2.1 INTRODUCTION

A literature survey provides a comprehensive review of existing research and developments related to a particular field of study. In the context of virtual assistants, this survey will explore the evolution, functionalities, and impact of voice-controlled technologies across various platforms. Virtual assistants, such as Siri, Alexa, and Google Assistant, have significantly transformed user interactions with technology by enabling voice commands to perform tasks, access information, and manage smart devices.

This introduction sets the stage for understanding the advancements in virtual assistant technologies, the challenges faced during their development, and the diverse applications they support. By examining academic papers, industry reports, and technological innovations, this survey aims to highlight key trends, identify gaps in the current research, and provide insights into the future directions of virtual assistant development. The goal is to establish a foundational understanding of the field, guiding further research and development efforts in creating more effective and user-friendly virtual assistant systems.

2.2 EXISTING SYSTEM

Siri: Developed by Apple, Siri is integrated into iOS and macOS devices. It provides voice-activated assistance for tasks such as setting reminders, sending messages, and controlling smart home devices. Siri is known for its deep integration with Apple's ecosystem, enabling users to interact with various Apple services seamlessly.

Amazon Alexa: Amazon's Alexa powers a range of smart devices, including Echo speakers and Fire TV. Alexa supports a wide array of voice commands for tasks like playing music, setting alarms, providing weather updates, and controlling compatible smart home devices. Alexa also offers third-party skills that extend its functionality.

Google Assistant: Launched as part of Google's ecosystem, Google Assistant offers voice-activated assistance for managing tasks, setting reminders, and accessing information. It is widely available across various devices, including smartphones, smart speakers, and smart displays. While primarily consumer-focused, Google Assistant is also integrated with Google's productivity tools, enhancing both personal and professional experiences.

2.3 PROPOSED SYSTEM

The proposed system is an offline virtual assistant designed specifically for the Windows desktop environment. This assistant aims to provide a range of functionalities similar to those of existing commercial virtual assistants but with a focus on offline capabilities and seamless integration with Windows applications. Key features of the proposed system include:

- I. **Voice Interaction:** The virtual assistant will allow users to perform tasks and access information through natural language voice commands, enabling hands-free operation of the Windows desktop.
- II. **Whatsapp Message:** The assistant will send the WhatsApp message to the provided contact
- III. **Internet Speed:** The assistant will provide the download speed, upload speed, and ping of the connected network.
- IV. **IP Address Check:** The assistant will check and display the current IP address of the connected network..
- V. **Screenshot Capture:** The assistant will be able to take screenshots of the desktop or active windows.
- VI. **Offline Capability:** Unlike many commercial virtual assistants, this system will operate fully offline, ensuring that user queries and commands do not depend on Internet connectivity.
- VII. **Image generation:** The assistant will generate images based on the provided image description

3.SYSTEM ANALYSIS

3.1 FUNCTIONAL REQUIREMENTS

Time-Based Greetings and Reminders:

- The virtual assistant should greet the user according to the time of day, such as "Good morning," "Good afternoon," or "Good evening."

Instruction Response:

- The virtual assistant should accurately respond to specific user instructions, executing commands as given and providing appropriate feedback.

Status Indication:

- The system should display 'listening' when it is waiting for user input. After receiving an instruction, the assistant should display 'recognizing' to indicate that it is processing the command.

Retry Mechanism:

- If the assistant does not recognize the user's instruction, it should automatically respond with 'say that again please' to prompt the user to repeat the command.

Email Sending Configuration:

- For email functionalities, users must disable the 'less secure apps' feature in Gmail to allow the virtual assistant to send emails on their behalf.

Enhanced Python Environment:

- The project requires an enhanced interactive Python environment to support the development and execution of the virtual assistant, ensuring smooth operation and integration with various components.

3.2 NON FUNCTIONAL REQUIREMENTS

Performance

- The virtual assistant shall handle large datasets efficiently, such as managing extensive user commands and processing complex queries, to ensure timely responses and accurate outputs.
- The response time for generating spoken responses and executing commands shall be within acceptable limits to maintain a smooth and efficient user experience.

Security

- The system shall protect user data by ensuring confidentiality and integrity, adhering to relevant data protection regulations and standards.
- It shall implement user authentication and authorization mechanisms to prevent unauthorized access to sensitive functions and personal information.

Usability

- The virtual assistant shall provide a user-friendly interface, with intuitive voice commands and clear audio feedback, ensuring ease of use for users of all experience levels.
- The assistant should be accessible and functional on Windows desktop environments, integrating seamlessly with various applications and system functions.

Reliability

- The virtual assistant shall be available and operational with minimal downtime, ensuring consistent performance and reliability.
- The voice recognition and processing algorithms shall be regularly updated and validated to ensure accuracy and effectiveness in understanding and responding to user commands.

Scalability

- The system shall be designed to handle an increasing number of user commands and interactions, with the capability to expand its features and functionalities as needed.
- It should be able to accommodate additional languages or command sets without significant performance degradation.

Maintainability

- The virtual assistant shall be built using modular and well-documented code to facilitate easy maintenance and future enhancements.
- The system should be adaptable to changes in external APIs or data sources, allowing for updates and integrations with minimal impact on overall functionality.

3.3 SOFTWARE REQUIREMENTS

Operating System : Windows 10 or Linux (Ubuntu, Fedora)
Coding Language : Python 3.12
Development Environment : Visual Studio Code (VS Code)
Web Browsers : Google Chrome or Edge

3.3 HARDWARE REQUIREMENTS

Processor : Intel Core i3 or equivalent
Memory (RAM) : 4 GB or Higher
Storage : 256 GB or more
Input Devices : Microphone and Speakers or Headphones
Network : Stable Internet connection

4.SYSTEM DESIGN

4.1 UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group. The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

Goals:

- The Primary goals in the design of the UML are as follows:
- Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
- Provide extendibility and specialization mechanisms to extend the core concepts. Be independent of particular programming languages and development process. Provide a formal basis for understanding the modeling language.
- Encourage the growth of OO tools market.
- Support higher level development concepts such as collaborations, frameworks, patterns and components.

4.1.1 Data Flow Diagram

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. There are 2 levels in the below diagram.

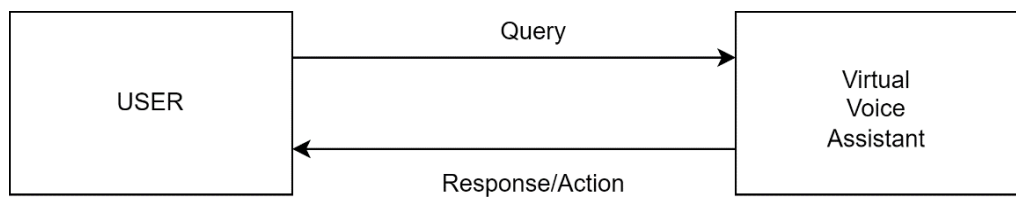


Fig :4.1.1.1 Data Flow Diagram : Level 0

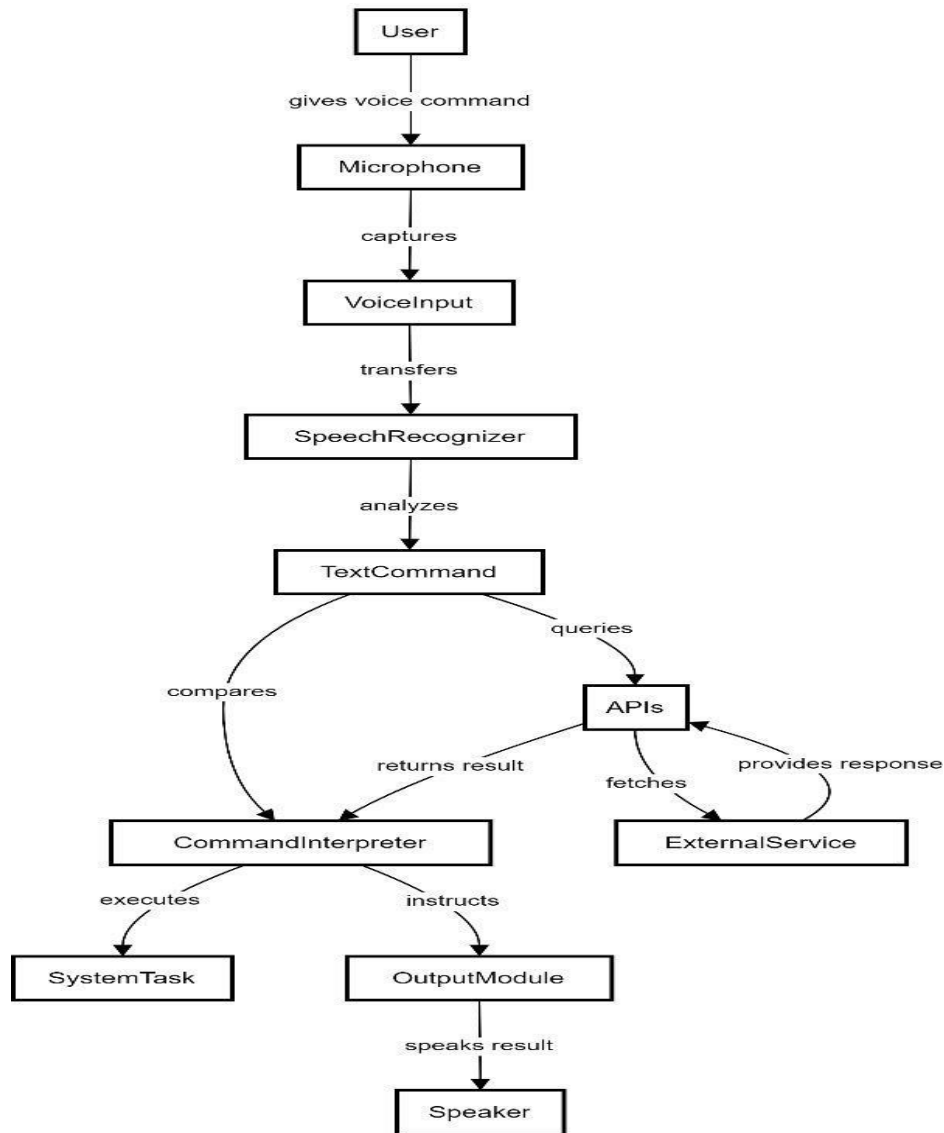


Fig :4.1.1.2 Data Flow Diagram : Level 1

4.1.2 Use Case Diagram:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted

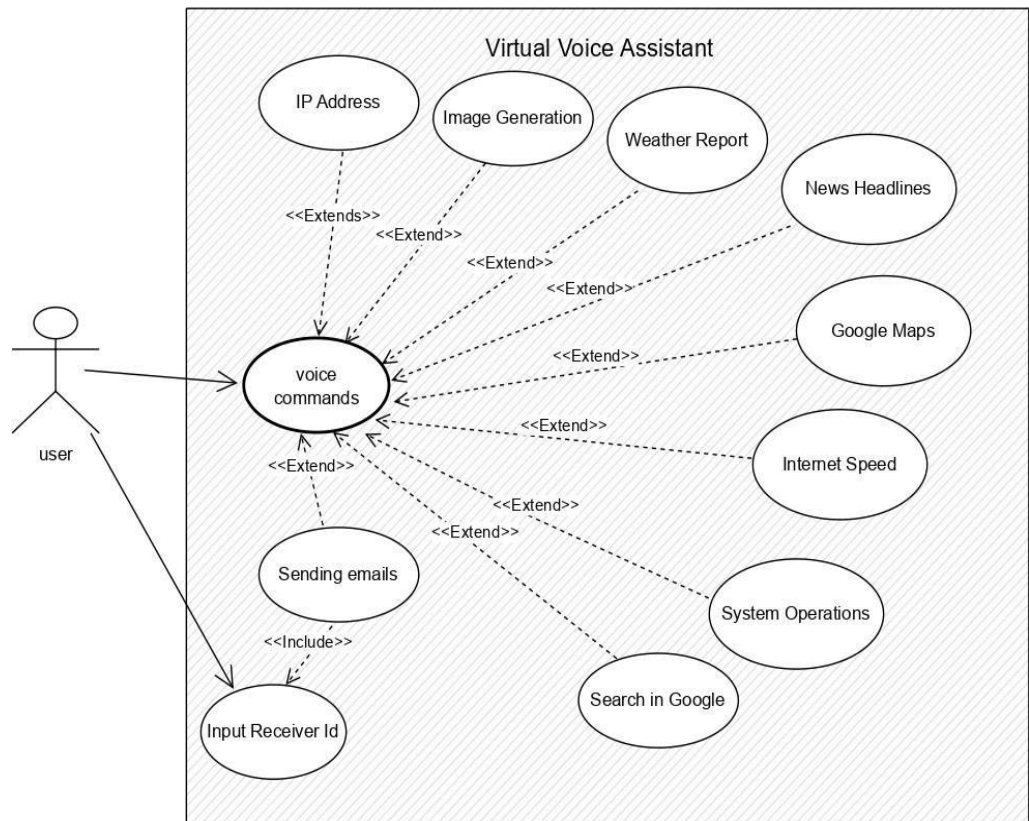


Fig :4.1.2.1 Usecase Diagram

4.1.3 Class Diagram:

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.

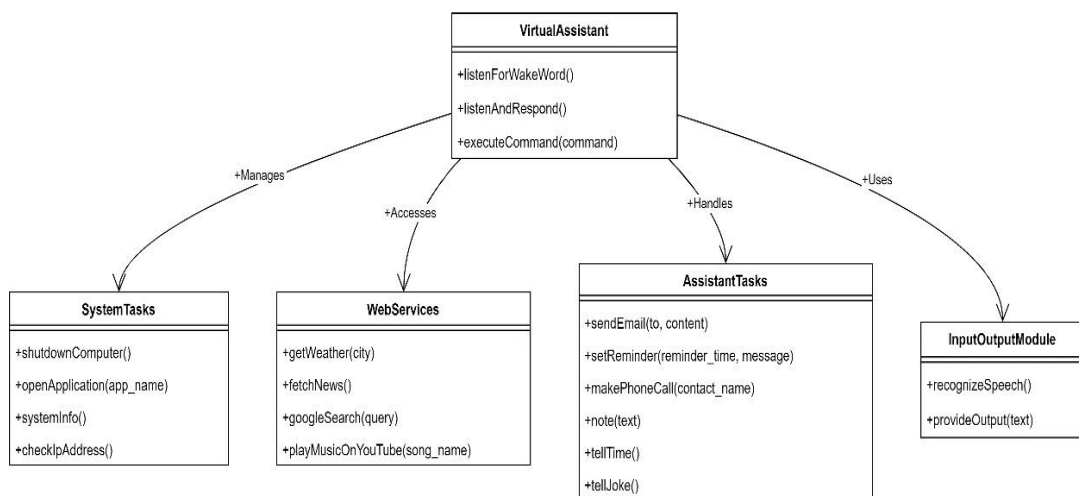


Fig :4.1.3.1 Class Diagram

4.1.4 Sequence Diagram:

A sequence diagram in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams

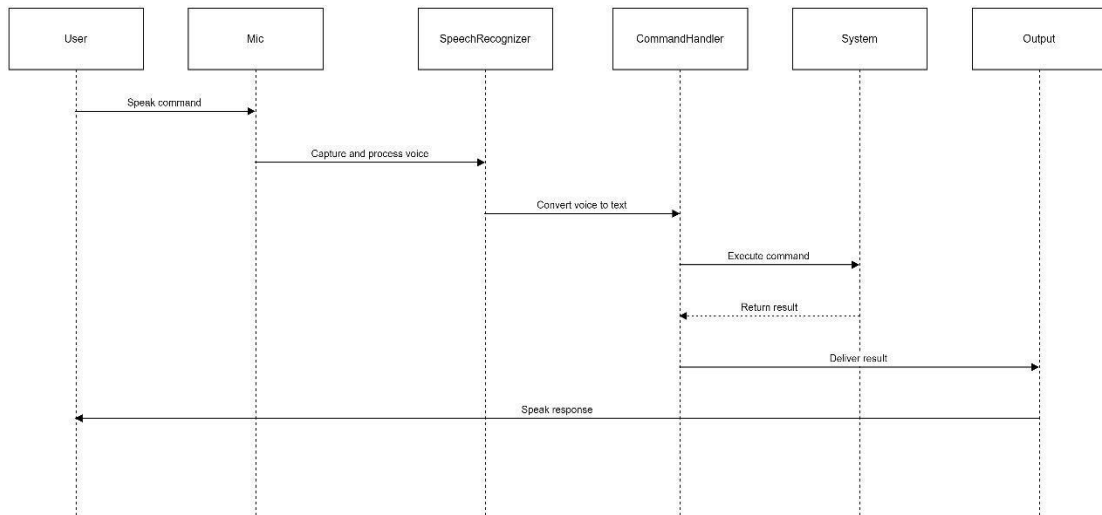


Fig :4.1.4.1 Sequence Diagram

4.1.5 Activity Diagram:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

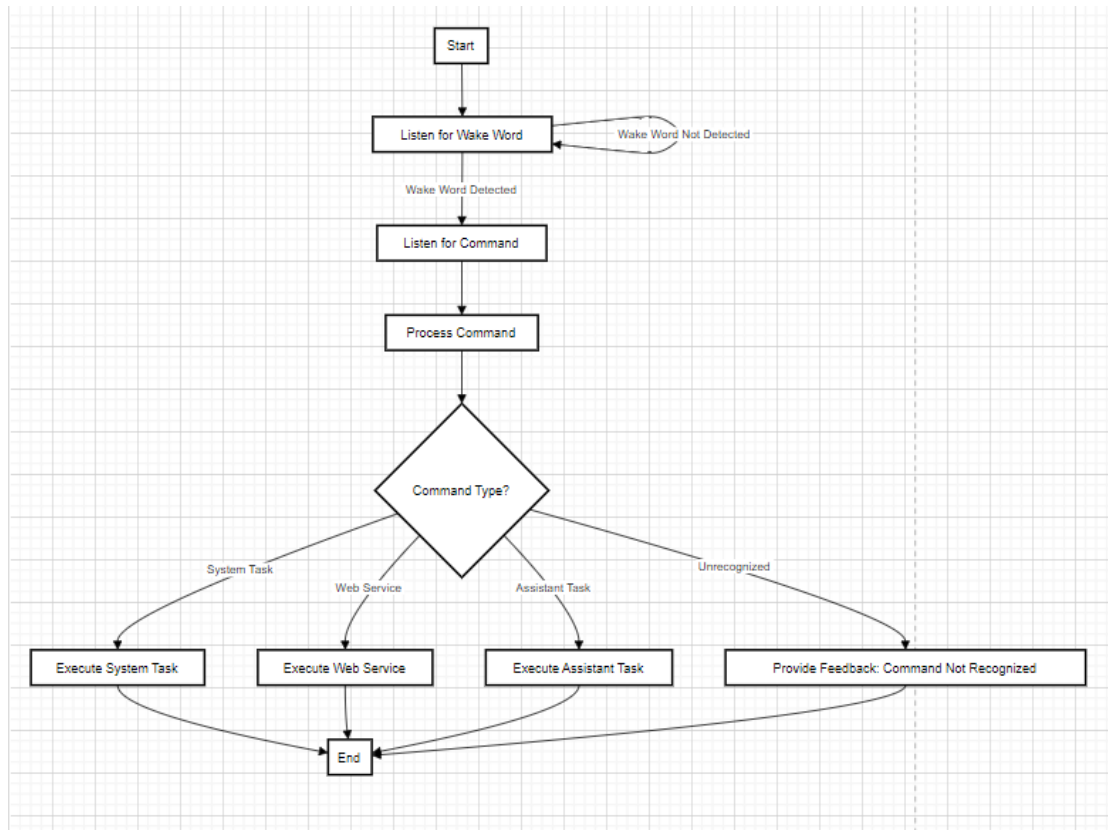


Fig :4.1.5.1 Activity Diagram

4.2 Modules Used in Project :-

Speech_Recognition

- The speech_recognition module allows Python applications to convert spoken language into text for processing and interpretation.
- It supports various speech recognition engines and APIs, such as Google Web Speech API, CMU Sphinx, Microsoft Bing, IBM Speech to Text, and more.
- This module is essential for developing voice-controlled applications, enabling users to interact via spoken commands or queries.

Subprocess

- The subprocess module in Python enables the creation and management of new processes, including connecting to their input/output/error streams and retrieving their return codes.

- It allows for interaction with the operating system, enabling Python scripts to execute system commands and external scripts.
- Using subprocess, you can run shell commands, execute external applications, and handle their outputs programmatically..

pyttsx3

- pyttsx3 is a text-to-speech (TTS) conversion library for Python that functions offline, without needing an internet connection.
- It converts text into speech using speech synthesis engines available on the system (e.g., SAPI5 on Windows, NSSpeechSynthesizer on macOS).

Webbrowser

- The webbrowser module provides a high-level interface for opening web pages in the default web browser from Python programs.
- It allows Python scripts to open URLs, perform web searches, and navigate to specific web pages or resources.

Os

- The os module in Python allows interaction with the operating system's underlying functionality.
- It provides functions for file and directory operations, such as creating, deleting, or renaming files and folders.
- Enables process management, including running system commands and managing system processes programmatically.

Time

- The time module in Python handles various time-related tasks, such as retrieving the current time and measuring elapsed time.
- It provides functions like sleep(), which pauses the execution of a program for a specified amount of time.

Datetime

- The datetime module handles date and time manipulation, including formatting and calculating time intervals. It's essential for managing and performing operations on date and time data.

Smtplib

- The smtplib module sends emails using SMTP. It enables programmatic email composition and delivery, essential for automating email notifications and communications.

Requests

- The requests module simplifies making HTTP requests and handling responses. It's used for interacting with web APIs and retrieving web content easily.

Socket

- The socket module enables network communication, including creating network connections and retrieving IP addresses. It's vital for network-related functionalities in Python.

Re

- The re module provides regular expression support for text pattern matching and manipulation. It's used for advanced text processing tasks involving patterns.

Cv2

- Part of OpenCV library, used for computer vision tasks. It provides functions for image processing and handling camera operations.

Dotenv

- Loads environment variables from a .env file into the environment. It's used to manage configuration variables securely.

Io

- Provides core tools for working with streams, including reading and writing operations on byte streams.

Speedtest

- A library for measuring internet speed. It tests download and upload speeds, and latency of your network connection.

stability_sdk

- Client library for Stability AI's API. It's used to generate images based on text prompts.

Psutil

- Provides functions for retrieving information on system utilization (CPU, memory, disks, network, sensors) and system processes.

Socket

- Provides low-level networking interfaces for communication between computers. Useful for implementing network-based communication

5.IMPLEMENTATION AND RESULTS

5.1 METHOD OF IMPLEMENTATION

5.1.1 What is Python :-

Python is currently the most widely used multi-purpose, high-level programming language. Python allows programming in Object-Oriented and Procedural paradigms. Python programs generally are smaller than other programming languages like Java. Programmers have to type relatively less and indentation requirement of the language, makes them readable all the time. Python language is being used by almost all tech-giant companies like – Google, Amazon, Facebook, Instagram, Dropbox, Uber... etc. The biggest strength of Python is huge collection of standard library which can be used for the following – Machine Learning GUI Applications (like Kivy, Tkinter, PyQt etc. Web frameworks like Django (used by YouTube, Instagram, Dropbox) Image processing (like Opencv, Pillow) Web scraping (like Scrapy, BeautifulSoup, Selenium) Test frameworks Multimedia

Python

Python is an interpreted high-level programming language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace. Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural, and has a large and comprehensive standard library.

Python is Interpreted – Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.

Python is Interactive – you can actually sit at a Python prompt and interact with the interpreter directly to write your programs.

Python also acknowledges that speed of development is important. Readable and terse code is part of this, and so is access to powerful constructs that avoid tedious repetition of code. Maintainability also ties into this may be an all but useless metric, but it does say something about how much code you have to scan, read and/or the ease with which a programmer of other languages can pick up basic Python skills and the

huge standard library is key to another area where Python excels. All its tools have been quick to implement, saved a lot of time, and several of them have later been patched and updated by people with no Python background - without breaking.

Install Python Step-by-Step in Windows and Mac :

Python a versatile programming language doesn't come pre-installed on your computer devices. Python was first released in the year 1991 and until today it is a very popular high- level programming language. Its style philosophy emphasizes code readability with its notable use of great whitespace.

The object-oriented approach and language construct provided by Python enables programmers to write both clear and logical code for projects. This software does not come pre-packaged with Windows.

How to Install Python on Windows and Mac :

There have been several updates in the Python version over the years. The question is how to install Python? It might be confusing for the beginner who is willing to start learning Python but this tutorial will solve your query. The latest or the newest version of Python is version 3.12.6 or in other words, it is Python 3.

Note: The python version 3.12.6 cannot be used on Windows XP or earlier devices. Before you start with the installation process of Python. First, you need to know about your **System Requirements**. Based on your system type i.e. operating system and based processor, you must download the python version. My system type is a **Windows 64-bit Operating system**.

So the steps below are to install python version 3.12.6 on Windows 7 device or to install Python 3. Download the Python Cheatsheet [here](#). The steps on how to install Python on Windows 10, 8 and 7 are **divided into 4 parts** to help understand better.

Step 1: Go to the official site to download and install python using Google Chrome or any other web browser. OR Click on the following link: <https://www.python.org>

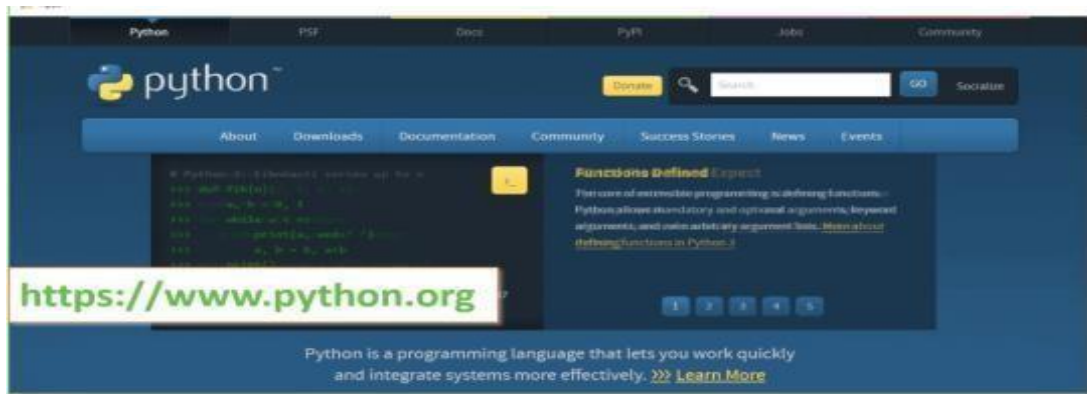


Fig 5.1.1.1: Download Python

Now, check for the latest and the correct version for your operating system.

Step 2: Click on the Download Tab.



Fig 5.1.1.2: Python 3.12.6

Step 3: You can either select the Download Python for windows 3.12.6 button in Yellow Color or you can scroll further down and click on download with respect to their version. Here, we are downloading the most recent python version for windows 3.12.6

Looking for a specific release?

Python releases by version number:

Release version	Release date		Click for more
Python 3.11.10	Sept. 7, 2024	Download	Release Notes
Python 3.10.15	Sept. 7, 2024	Download	Release Notes
Python 3.12.6	Sept. 6, 2024	Download	Release Notes
Python 3.9.20	Sept. 6, 2024	Download	Release Notes
Python 3.8.20	Sept. 6, 2024	Download	Release Notes
Python 3.12.5	Aug. 6, 2024	Download	Release Notes
Python 3.12.4	June 6, 2024	Download	Release Notes
Python 3.12.3	June 6, 2024	Download	Release Notes

[View older releases](#)

Fig 5.1.1.3: Specific Release

Step 4: Scroll down the page until you find the Files option.

Step 5: Here you see a different version of python along with the operating system.

Files					
Version	Operating System	Description	MD5 Sum	File Size	SPG
Striped source tarball	Source release		68111671a5b2db4ae77b9ab01b7079be	23017663	54G
XZ compressed source tarball	Source release		d33e4aae6d97051c3mca45ee3604803	17131432	54G
macOS 64-bit installer	Mac OS X	for Mac OS X 10.6 and later	6428b4fa75b3daf71a442cbalce08e6	34898416	54G
macOS 64-bit installer	Mac OS X	for OS X 10.9 and later	5dd605c38217a45773b75e4a93b2a1f	28082845	54G
Windows temp file	Windows		46399957342c96b2ac58cade0b4f7c02	8131761	54G
Windows x86-64 embeddable zip file	Windows	for AMD64/EM64/x64	9800c3b76d3ec0b4abe0215a4e0725a2	7504291	54G
Windows x86-64 executable installer	Windows	for AMD64/EM64/x64	a702b4b0ad70d4bdc0543a1a03e563400	26882948	54G
Windows x86-64 web-based installer	Windows	for AMD64/EM64/x64	28c31c008b6d73ae0e53a3b0351b4b02	1362904	54G
Windows x86 embeddable zip file	Windows		9fab3bd15b41879fda0412574139d0	6741626	54G
Windows x86 executable installer	Windows		33c002942254446a3b0451476394789	25663848	54G
Windows x86 web-based installer	Windows		1b670cfa0d117d002c30963ea371d07c	1324608	54G

Fig 5.1.1.4: Files

To download Windows 32-bit python, you can select any one from the three options: Windows x86 embeddable zip file, Windows x86 executable installer or Windows x86 web-based installer. To download Windows 64-bit python, you can select any one from the three options: Windows x86-64 embeddable zip file, Windows x86-64 executable installer or Windows x86-64 web-based installer.

we will install Windows x86-64 web-based installer. Here your first part regarding which version of python is to be downloaded is completed. Now we move ahead with the second part in installing python i.e. Installation

Note: To know the changes or updates that are made in the version you can click on the Release Note Option.

Installation of Python

Step 1: Go to Download and Open the downloaded python version to carry out

the installation process.

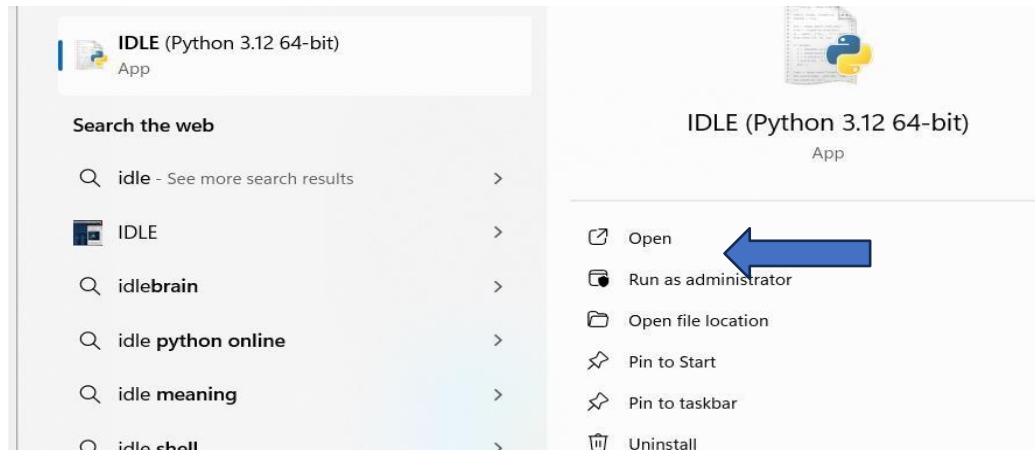


Fig 5.1.1.5: Open Python 3.12.6

Step 2: Before you click on Install Now, Make sure to put a tick on Add Python 3.12.6 to PATH.

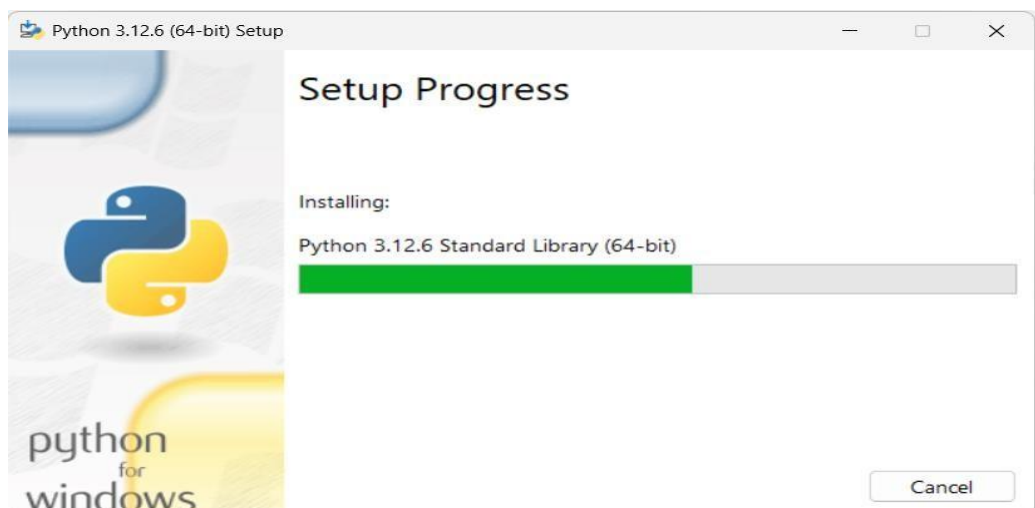


Fig 5.1.1.6: Install Python 3.12.6

Step 3: Click on Install NOW After the installation is successful. Click on Close.

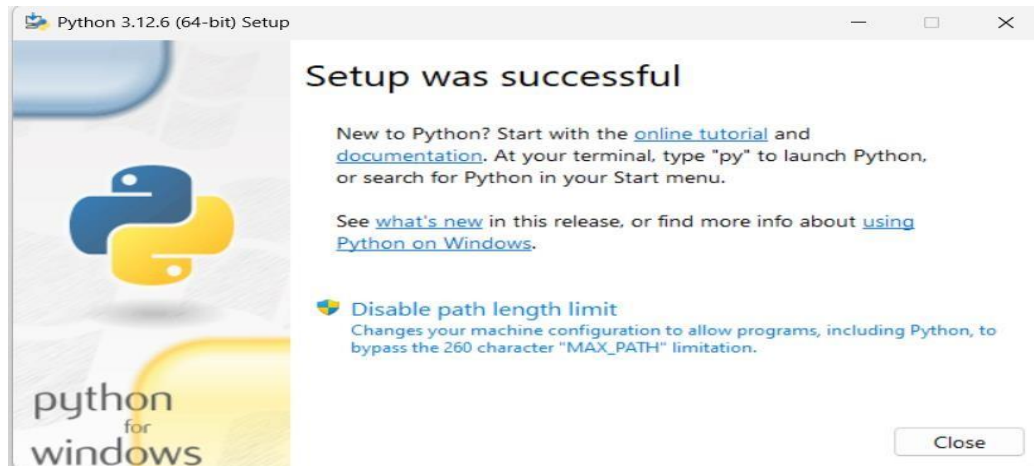


Fig 5.1.1.7: Installed Successfully

With these above three steps on python installation, you have successfully and correctly installed Python. Now is the time to verify the installation.

Note: The installation process might take a couple of minutes.

Verify the Python Installation

Step 1: Click on Start

Step 2: In the Windows Run Command, type “cmd”.

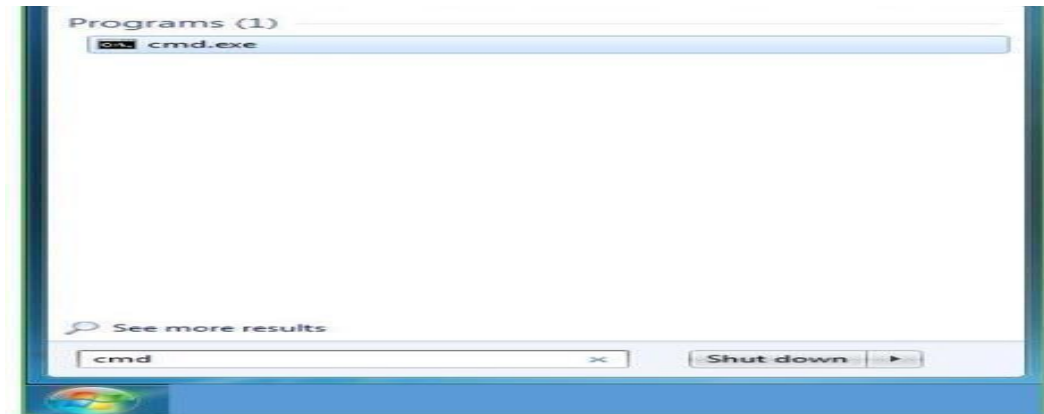
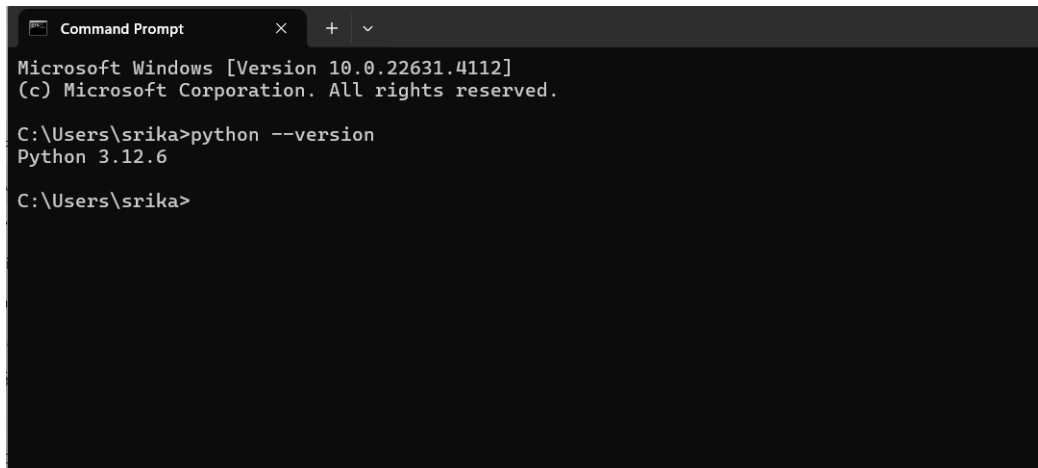


Fig 5.1.1.8: Select Command Prompt

Step 3: Open the Command prompt option.

Step 4: Let us test whether the python is correctly installed. Type **python -V** and pressEnter.



```
Microsoft Windows [Version 10.0.22631.4112]
(c) Microsoft Corporation. All rights reserved.

C:\Users\srika>python --version
Python 3.12.6

C:\Users\srika>
```

Fig 5.1.1.9: Search Python Version

Step 5: You will get the answer as 3.12.6

Note: If you have any of the earlier versions of Python already installed. You must first uninstall the earlier version and then install the new one.

Check how the Python IDLE works

Step 1: Click on Start

Step 2: In the Windows Run command, type “python idle”.

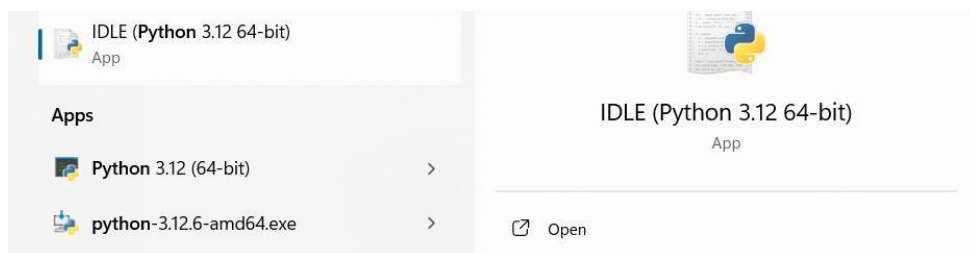
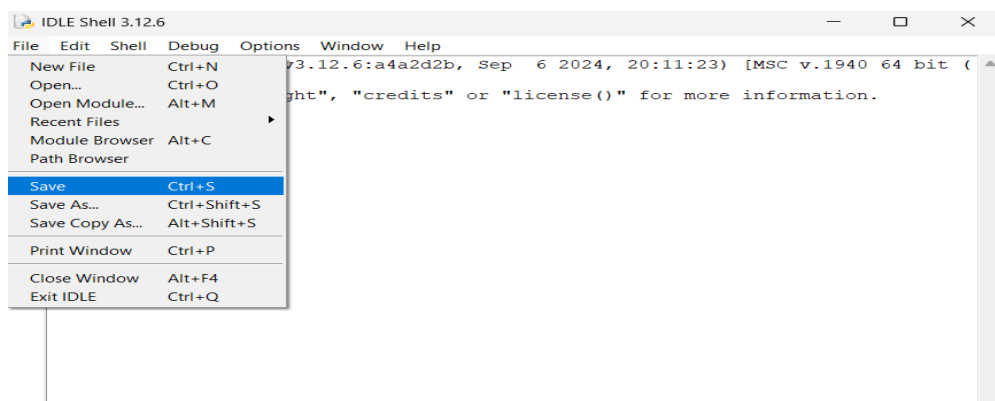


Fig 5.1.1.10: Idle Python 3.12.64



Fig

5.1.1.11: Save The File

Step 5: Name the file and save as type should be Python files. Click on SAVE. Here I have named the files as Hey World.

Step 6: Now for e.g. **enter print**.

5.2 EXTENSION OF KEY FUNCTION:

5.2.1 Initialization Functions

These functions handle the setup and initialization of components, such as the text-to-speech engine and the speech recognizer.

```
import pyttsx3
import speech_recognition as sr

# Initialize text-to-speech engine
engine = pyttsx3.init()

def speak(text):
    """
    Convert the given text to speech using the pyttsx3 engine.
    """
    engine.say(text)
    engine.runAndWait()

# Initialize speech recognizer and microphone
recognizer = sr.Recognizer()
mic = sr.Microphone()
```

engine: Creates an instance of the text-to-speech engine.

speak(text): Converts the text to speech and plays it. This is essential for providing auditory feedback to the user.

5.2.2 Initialization of Speech Recognizer

```
import speech_recognition as sr

# Initialize speech recognizer and microphone
recognizer = sr.Recognizer()
mic = sr.Microphone()
```

The **recognizer** initializes the speech recognition system, which processes and converts spoken language into text. The **mic** sets up the microphone to capture the user's audio input clearly. Together, they allow the voice assistant to listen, understand, and interpret spoken commands, enabling interaction through natural language. These components are crucial for accurate voice command recognition and execution.

5.2.3 Listening and Recognizing Speech

```
def listen_and_respond():
    """
    ...Listens to the user's voice command and converts it to text.
    ...Handles errors such as unknown speech or request errors.
    ...Returns the recognized command in lowercase, or an empty string if an error occurs.
    """
    with mic as source:
        print("Adjusting for ambient noise...")
        recognizer.adjust_for_ambient_noise(source, duration=1)
        print("Listening for your command...")
        audio = recognizer.listen(source)
        print("Recording complete.")

    try:
        print("Recognizing speech...")
        command = recognizer.recognize_google(audio, language='en-IN')
        print(f"Recognized command: {command}")
        speak(f"You said: {command}")
        return command.lower()
    except sr.UnknownValueError:
        error_message = "I didn't quite catch that. Please repeat."
        print(error_message)
        speak(error_message)
        return ""
    except sr.RequestError as e:
        error_message = f"Request error: {e}"
        print(error_message)
        speak(error_message)
        return ""
```

The `listen_and_respond()` function captures user audio input, adjusts for background noise, and listens for commands. It then converts the speech to text using Google Speech Recognition and handles potential errors. This function is essential for accurately interpreting and processing user commands, enabling effective interaction with the voice assistant.

5.2.4 Command Execution

```
def main():
    """
    ...Main loop for the voice assistant. Continuously listens for commands and executes corresponding actions.
    """
    while True:
        command = listen_and_respond()

        # Example commands
        if 'shutdown' in command:
            shutdown_computer()
        elif 'system info' in command:
            system_info()
        elif 'search' in command:
            query = command.split('search ')[-1]
            google_search(query)
        elif 'exit' in command or 'quit' in command:
            speak("Goodbye!")
            break
        else:
            speak("Sorry, I didn't understand that command.")
```

main(): This is the central loop of the assistant. It continuously listens for commands and invokes the corresponding functions based on the recognized text. This function keeps the assistant active and responsive.

5.2.5 Application Management

Open Applications

os.system(command): Executes a system command to open applications.

webbrowser.open(url): Opens a URL in the default web browser.

This function is essential for launching various applications or websites based on user commands, enhancing the assistant's functionality.

```
import os
import webbrowser

def open_application(app_name):
    """
    Opens specified applications based on the app name.
    """
    try:
        if app_name == 'chrome':
            os.system('start chrome')
        elif app_name == 'edge':
            os.system('start msedge')
        elif app_name == 'store':
            os.system('start ms-windows-store:')
        elif app_name == 'file manager':
            os.system('explorer')
        elif app_name == 'vs code':
            os.system('code')
        elif app_name == 'youtube':
            webbrowser.open('https://www.youtube.com')
        else:
            speak("Application not recognized.")
    except Exception as e:
        speak(f"Failed to open {app_name}: {e}")
```

5.3 OUTPUT SCREENS :

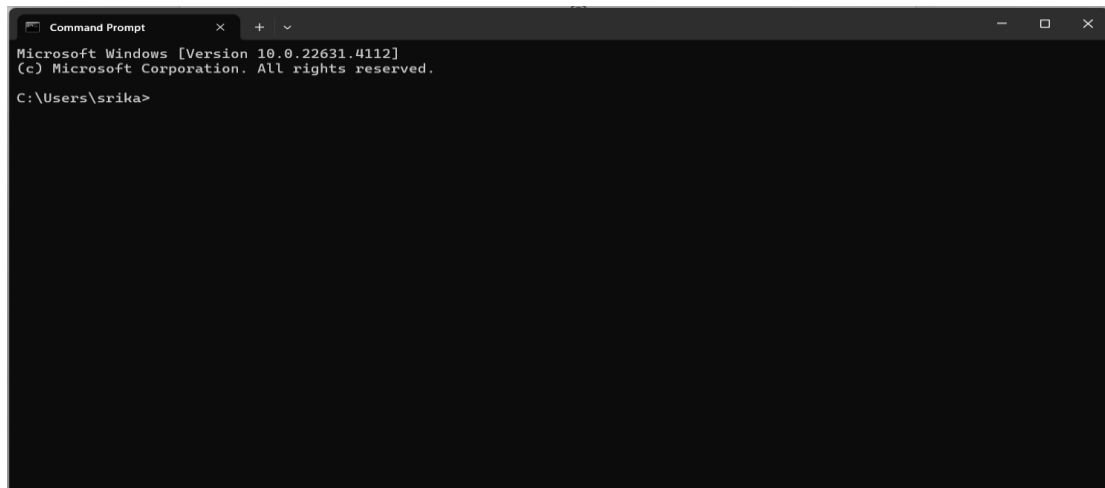


Fig 5.3.1 Open Command Prompt

```
C:\Windows\System32\cmd.e x + v
Microsoft Windows [Version 10.0.22631.4112]
(c) Microsoft Corporation. All rights reserved.

C:\Users\srika\OneDrive\Desktop\Documents\mini project>python assistant.py
Listening for wake word...
Recognized wake word: hello windows
Adjusting for ambient noise...
Listening for your command...
Recording complete.
Recognizing speech...
Recognized command: check the weather in Hyderabad
Executing command: check the weather in hyderabad
Command words: ['check', 'the', 'weather', 'in', 'hyderabad']
The weather in hyderabad is currently light intensity drizzle with a temperature of 24.23 degrees Celsius.
```

Fig 5.3.2 Checking Weather

The assistant will announce the weather information, which it retrieves using the OpenWeather API key

```
C:\Windows\System32\cmd.e x + v
Microsoft Windows [Version 10.0.22631.4169]
(c) Microsoft Corporation. All rights reserved.

C:\Users\srika\OneDrive\Desktop\Documents\mini project>tk.py
Listening for wake word...
Recognized wake word: hello windows
Adjusting for ambient noise...
Listening for your command...
Recording complete.
Recognizing speech...
Recognized command: generate image
Adjusting for ambient noise...
Listening for your command...
Recording complete.
Recognizing speech...
Recognized command: Indian culture Temple
|
```

Fig 5.3.3 image description

The assistant will generate image by taking image description or image name, which it retrieves using the

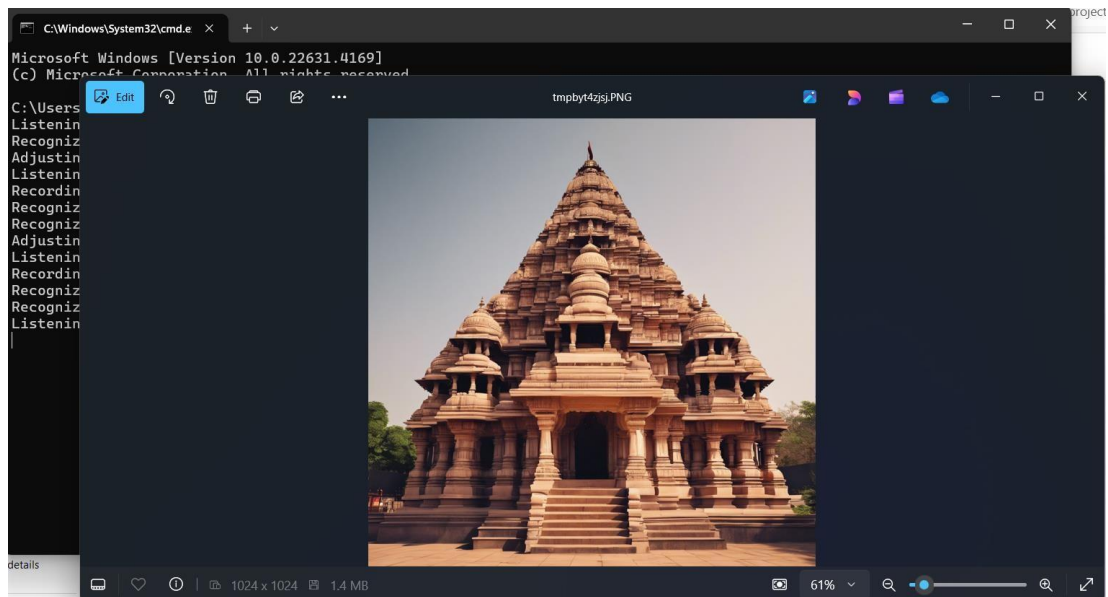


Fig 5.3.4 Generated Image

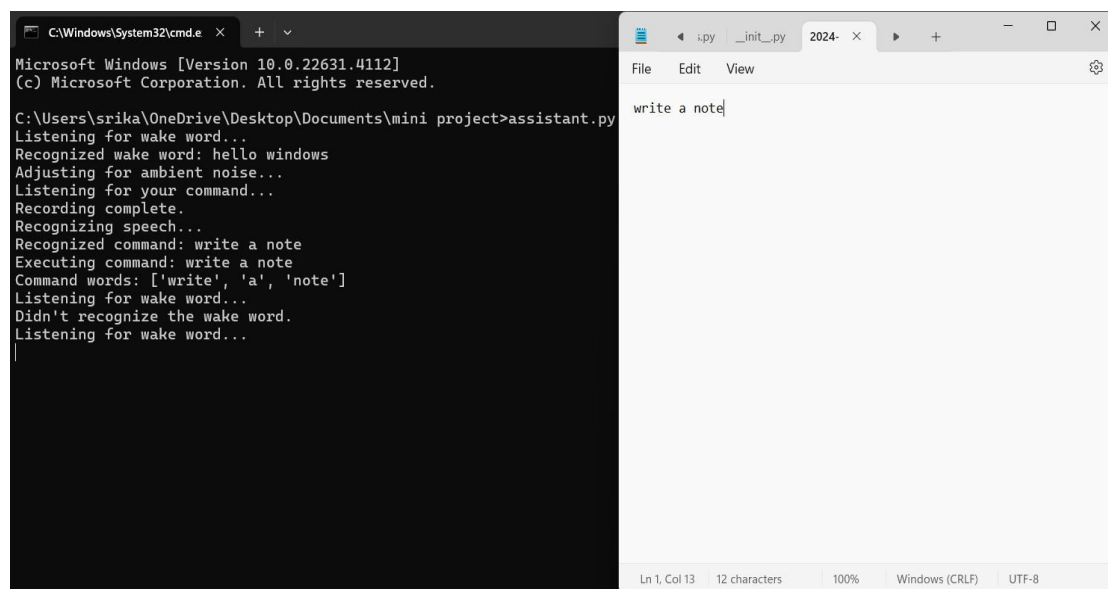


Fig 5.3.5 making a note

The "Write a Note" feature allows the user to create and save notes by speaking directly to the voice assistant. This feature utilizes speech recognition to convert spoken words into text, which is then saved into a text file for future reference. The user can trigger this feature by saying a specific command such as "take a note" or "note down."

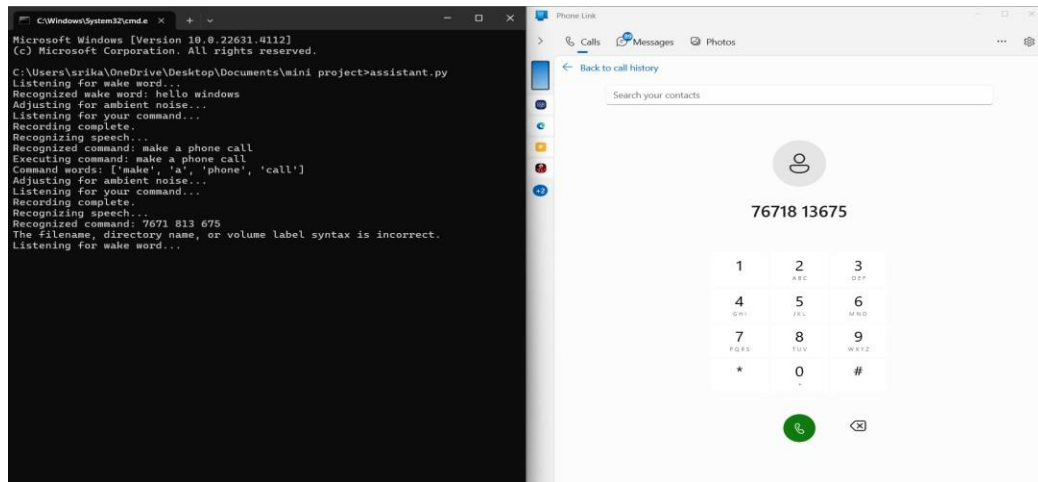


Fig 5.3.6 Making a Phone Call

The "Phone Call" feature allows the user to make phone calls directly through the voice assistant. This feature is designed to simplify the process of dialing a phone number by allowing users to speak the contact name or phone number. The assistant recognizes the input, processes the command, and initiates the phone call using an appropriate platform, such as phone-dialing service on the user's device.

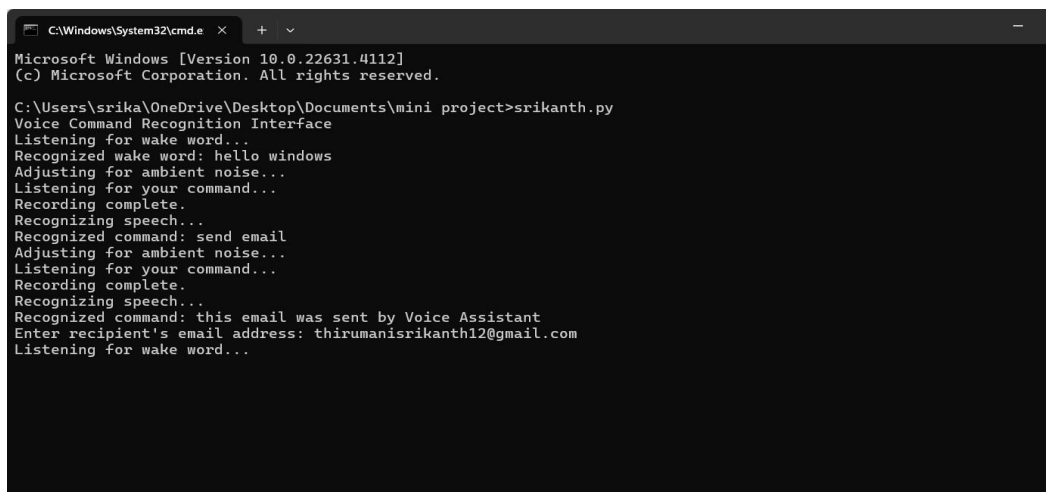


Fig 5.3.7 Sending Email

An email was successfully sent by using voice commands to provide the subject and by obtaining the recipient's email address through user input.

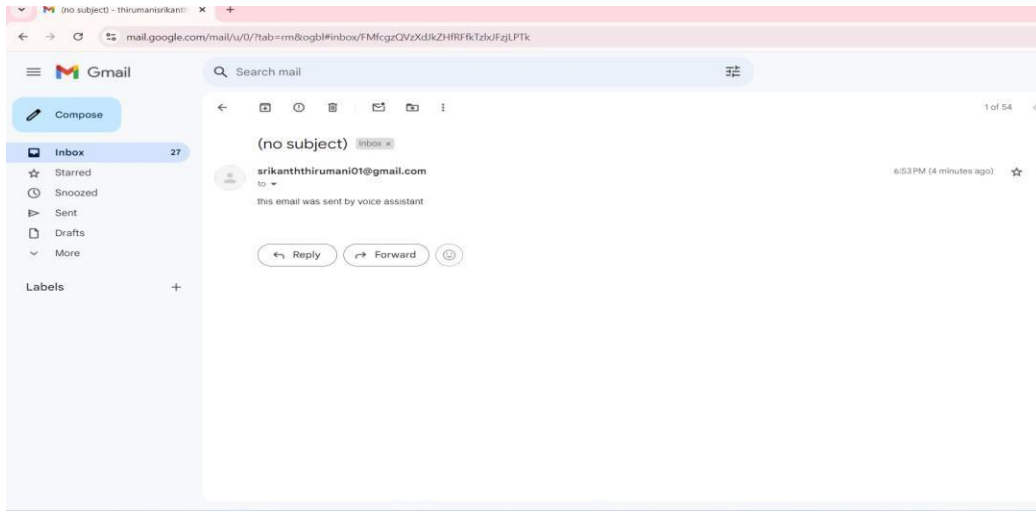


Fig 5.3.8 Email

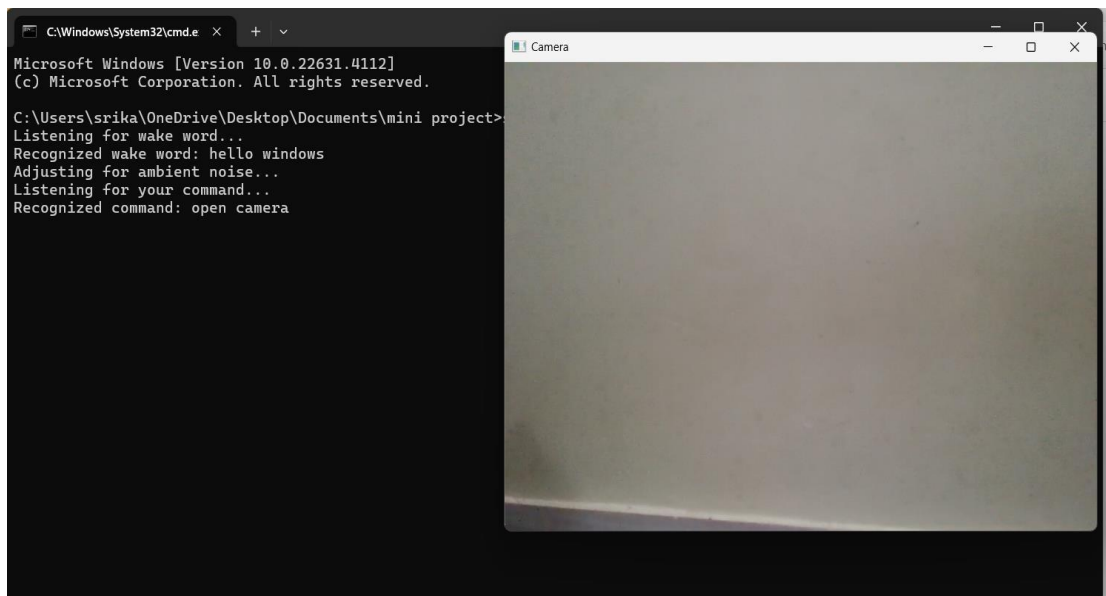


Fig 5.3.9 Opening Camera

Camera Functionality: Added the open_camera function to access and display the camera feed.

Command Integration: Updated the execute_command function to handle the open camera command.

6.SYSTEM TEST

System testing ensures that the entire integrated software system functions as intended and meets the specified requirements. For the Voice-Based Virtual Assistant (Jarvis) project, system testing will involve verifying that the integrated system components work together seamlessly and that the assistant performs all intended functionalities correctly. This section outlines the various testing methods and test cases relevant to the system.

6.1 Test Objectives

The primary objectives of system testing for the Voice-Based Virtual Assistant are to:

- Ensure all voice commands are recognized and executed accurately.
- Verify that the assistant can perform all specified tasks, such as opening applications, sending emails, and providing weather updates.
- Test the integration of voice recognition, text-to-speech, and application functionalities.
- Confirm that the system meets user expectations and handles errors gracefully.

6.2 Types of Tests

6.2.1 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.

6.2.2 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 successful 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.

6.2.3 Functional Testing

Functional testing ensures that all features of the voice-based virtual assistant perform as specified. For example, when testing the command "Open VS Code," the expected result was that Visual Studio Code would open successfully, which was confirmed. Similarly, the command "Weather in New York" was expected to announce current weather conditions, which it did accurately. Both tests passed. Results are visualized using a bar chart to show pass/fail status and a table detailing inputs, expected outputs, and actual results. If errors occur, a pie chart summarizes the distribution of pass and fail outcome

6.2.4 System Test

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.

6.2.5 White Box Testing

White Box Testing is a testing in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is used to test areas that cannot be reached from a black box level.

6.2.6 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

6.2 VARIOUS TESTCASE SCENARIOS

Testcases	ID Test case Description	Test case steps	Test data	Expectedresult	Actual result	Status
TC01	Check Wake Word Recognition	1. Speak the wake word (e.g., "Hi Windows"). 2. Observe if the assistant acknowledges the wake word.	"Hi Windows"	Assistant should acknowledge the wake word.	Assistant acknowledged "Hi Windows".	Success
TC02	Open Chrome Browser	1. Speak the command to open Chrome. 2. Verify if Google Chrome opens successfully.	"Open Chrome"	Google Chrome should open successfully.	Google Chrome opened successfully.	Success
TC03	Send Email	1. Speak the command to send an email. 2. Provide email address and content. 3. Verify if email is sent	To: recipient@example.com Content: "Test email."	Email should be sent successfully.	Email sent successfully.	Success

TC04	Fetch Weather Information	1. Speak the command to fetch weather. 2. Provide a city name. 3. Verify if the weather information is provided.	"Weather in Hyderabad"	Weather information for Hyderabad should be provided.	Weather information for Hyderabad provided.	Success
TC05	Make a Phone Call	1. Speak the command to make a phone call. 2. Provide phone number. 3. Verify if the call is initiated or if prompted for number.	"Call 1234567890"	Phone call should be initiated or prompt for number.	Phone call initiated.	Success

7.CONCLUSION AND FUTURE ENHANCEMENT

7.1 Project Conclusion

The virtual assistant project has successfully met its primary goals by implementing a range of functionalities through voice commands, such as opening applications, sending emails, and fetching weather information. The system demonstrates stable performance and effective integration with external services, offering a reliable tool for users. The voice command recognition is functional, though there is potential for improvement in accuracy and handling diverse speech patterns. The comprehensive documentation supports the project's use and development, and the initial testing confirms that core functionalities are operating as expected. Overall, the project provides a solid foundation for further refinement and enhancement.

7.2 Future Enhancements

To advance the virtual assistant, future enhancements should focus on expanding language support to accommodate diverse user bases and regional accents. Improving voice recognition accuracy and implementing a continuous listening mode can further enhance user interaction. Integration with smart home devices, social media, and calendar functions will broaden the assistant's capabilities. Personalization features, detailed error handling, and security improvements are essential for a better user experience. Additionally, developing a graphical user interface and optimizing performance will contribute to a more intuitive and responsive tool. Exploring advanced features like context-aware responses and machine learning integration will provide a more sophisticated and adaptable assistant.

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Revised Selected Papers

8.1 WEBSITES

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<https://nevonprojects.com/voice-based-intelligent-virtual-assistance-for-windows/>

