

Intelligenie-A Voice based Desktop Assistant

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Abstract—In the era of digital transformation, personal assistant technologies have evolved to become integral parts of daily life. This project aims to develop a voice-based personal desktop assistant, leveraging machine learning and natural language processing (NLP) techniques. This abstract explores the key features and functionalities of these assistants, including speech recognition for accurate voice-to-text conversion, natural language understanding (NLU) for interpreting user commands, task automation for executing various tasks, information retrieval for providing real-time updates and personalized recommendations, and multi-platform integration for ubiquitous accessibility across devices. The assistant will be designed to perform a variety of tasks, including the voice Command Recognition in the implementing of a robust speech recognition system to accurately understand and interpret user commands. Task Automation for the Integration with various applications and services to automate tasks such as scheduling meetings, setting reminders, sending emails, and managing to-do lists. Information Retrieval: Utilizing web scraping and API integration to retrieve real-time information such as weather updates, news headlines, and stock market data based on user queries. Personalization: Incorporating machine learning algorithms to learn user preferences and tailor responses and recommendations accordingly. Security and Privacy: Implementing encryption and secure authentication mechanisms to protect user data and ensure privacy. The project aims to provide a seamless and intuitive user experience, enhancing productivity and convenience in daily tasks through the power of voice interaction with the desktop assistant.

Index Terms— NLP, NLU, AI-Artificial Intelligence, Machine Learning, API.

I. INTRODUCTION

As of the latest available data, the percentage of people using desktop personal assistants varies depending on the region and demographic factors. In general, the adoption of desktop personal assistants has been increasing steadily but may not be as widespread as mobile personal assistants or smart speakers. In recent years, the field of artificial intelligence (AI) has witnessed remarkable advancements, particularly in the realm of virtual personal assistants. These assistants, powered by machine learning and natural language processing algorithms, have become ubiquitous on mobile devices and smart speakers. However, there remains a significant opportunity to extend this functionality to desktop environments through a voice-based personal desktop assistant. The goal of this project is to create a sophisticated personal assistant akin to fictional depictions like Google Assistant,

Apple Assistant Siri or Jarvis from Iron Man(fictional). This assistant will be designed to operate seamlessly within the desktop environment, offering users a hands-free and intuitive way to interact with their computers and perform various tasks. Voice interaction has become increasingly popular due to its convenience and accessibility. By leveraging voice commands, users can execute tasks, retrieve information, and control applications without the need for manual input. This project seeks to harness the power of voice technology to enhance productivity, streamline workflow processes, and provide a personalized computing experience. Key objectives of the project include developing robust speech recognition capabilities, integrating with relevant applications and services for task automation, implementing intelligent algorithms for personalized responses, and ensuring security and privacy in data handling. By creating a voice-based personal desktop assistant, this project aims to bridge the gap between human-computer interaction and AI capabilities, ushering in a new era of intuitive and efficient computing experiences. The Fig. 1 gives the overall block diagram of the project work.

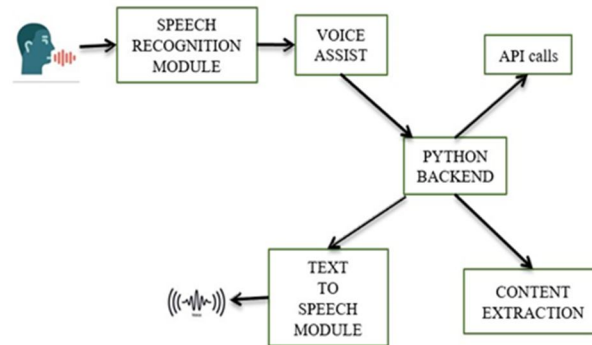


Fig. 1 : Overall block diagram of the project

II. PROPOSED METHODOLOGIES ADOPTED

The methodology provides a structured framework for the development and evolution of a voice-based personal desktop assistant, aiming to deliver a seamless and personalized user experience while addressing security, performance, and usability considerations. The proposed methodology for a voice-based personal desktop assistant encompasses a systematic approach to designing, developing, and deploying the assistant. Here's a breakdown of its key components:

Data Collection and Preprocessing: Involves gathering relevant voice command data and preparing it for analysis by cleaning, organizing, and augmenting the dataset.

Speech Recognition Model: Develops a deep learning model to accurately recognize and transcribe voice commands, optimizing it for speed, accuracy, and robustness.

Natural Language Understanding (NLU): Implements NLU techniques to interpret user intents and extract relevant information from commands, integrating with knowledge bases for context-aware responses.

Task Automation and Integration: Designs modules to automate tasks such as scheduling, email management, and data retrieval, integrating with external applications and services for seamless functionality.

Personalization and User Profiling: Utilizes machine learning to personalize responses and recommendations based on user preferences, behavior, and historical interactions.

Security and Privacy Measures: Implements measures to protect user data through encryption, authentication, and access controls, ensuring compliance with privacy regulations.

Performance Evaluation and Optimization: Evaluates system performance using metrics like accuracy, response time, and user satisfaction, continuously optimizing algorithms and workflows based on feedback.

User Experience (UX) Design: Focuses on creating an intuitive interface for voice interaction, incorporating multimodal feedback for enhanced usability and accessibility.

Testing and Deployment: Conducts thorough testing and validation to ensure functionality, reliability, and usability before deploying the assistant in controlled environments and scaling up gradually.

Continuous Improvement: Establishes a feedback loop for ongoing improvements, updates, and enhancements based on user feedback, usage analytics, and technological advancements.

III. SERIAL MODULES & LIBRARIES

We use various Serial Modules and libraries for the project-

Speech Recognition Module - The class which we are using is called Recognizer. It converts the audio files into text and module is used to give the output in speech. Energy threshold function represents the energy level threshold for sounds. Values below this threshold are considered silence, and values above this threshold are considered speech. Recognizer instance adjusts the ambient noise with the source, and duration, which adjusts the energy threshold dynamically using audio.

Speech to Text & Text to Speech Conversion Pyttsx3 is a text-to-speech conversion library in Python. And can change the Voice, Rate and Volume by specific commands. Python provides an API called Speech Recognition to allow us to convert audio into text for further processing converting large or long audio files into text using the Speech Recognition API in python. We have Included sapi5 and espeak TTS Engines which can process the same.

Process & Executes the Required Command - The said command is converted into text via speech recognition module and further stored in a temp. Then, Analyses the user's text via temp and decide what the user needs based on input provided and runs the while loop. This way these Commands are executed.

The various libraries are-

Pyttsx3 - It is a text to speech conversion library in python which is used to convert the text given in the parenthesis to speech. It is compatible with python 2 and 3. An application invokes the pyttsx3.init() factory function to get a reference to a pyttsx3. it is a very easy to use tool which converts the entered text into speech. The pyttsx3 module supports two voices first is female and the second is male which is provided by "sapi5" for windows.

Command to install: - pip install pyttsx3 It supports three TTS engines: - sapi5- To run on windows nsss – NSSpeech Synthesizer on Mac OS X espeak – eSpeak on every other platform

Speech recognition- It allows computers to understand human language. Speech recognition is a machine's ability to listen to spoken words and identify them. We can then use speech recognition in Python to convert the spoken words into text, make a query or give a reply. Python supports many speech recognition engines and APIs, including Google Speech Engine, Google Cloud Speech API.

Command to install :- pip install SpeechRecognition WolframAlpha- Wolfram Alpha is an API which can compute expert-level answers using Wolfram's algorithms, knowledgebase and AI technology. It is made possible by the Wolfram Language.

Randfacts - Randfacts is a python library that generates random facts. We can use randfacts.get_fact() to return a random fun fact.

Command to install :- pip install randfacts Pyjokes- Pyjokes is a python library that is used to create one-line jokes for the users. Informally, it can also be referred as a fun python library which is pretty simple to use.

Command to install :- pip install pyjokes

Datetime - This module is used to get the date and time for the user. This is a built-in module so there is no need to install this module externally. Python Datetime module supplies classes to work with date and time. Date and datetime are an object in Python, so when we manipulate them, we are actually manipulating objects and not string or timestamps. Random2- Python version 2 has a module named "random". This module provides a Python 3 ported version of Python 2.7's random module. It has also been back-ported to work in Python 2.6. In Python 3, the implementation of randrange() was changed, so that even with the same seed you get different sequences in Python 2 and 3.

Math - This is a built-in module which is used to perform mathematical tasks. For example, math.cos() which returns the cosine of a number or math.log() returns the natural logarithm of a number, or the logarithm of number to base.

Warnings- The warning module is actually a subclass of Exception which is a built-in class in Python. A warning in a program is distinct from an error. Conversely, a warning is not critical. It shows some message, but the program runs.

OS- The os module is a built-in module which provides functions with which the user can interact with the os when they are running the program. This module provides a portable way of using operating system-dependent functionality. This module has functions with which the user can open the file which is mentioned in the program.

Serial- This module encapsulates the access for the serial port. It provides backends for Python running on Windows, OSX, Linux, BSD and Iron Python. The module named "serial" automatically selects the appropriate backend.

Command to install :- pip install pyserial.

Time- This module provides many ways of representing time in code, such as objects, numbers, and strings. It also provides functionality other than representing time, like waiting during code execution and measuring the efficiency of our code. This is a built-in module so the installation is not necessary.

Wikipedia :-This is a Python library that makes it easy to access and parse data from Wikipedia. Search Wikipedia, get article summaries, get data like links and images from a page, and more. Wikipedia is a multilingual online encyclopaedia.

Command to install :- pip install wikipedia

Web browser- Web browser module is a convenient web browser controller. It provides a high-level interface that allows displaying Web-based documents to users. Web browser can also be used as a CLI tool. It accepts a URL as the argument with the following optional parameters: -n opens the URL in a new browser window, if possible, and -t opens the URL in a new browser tab. This is a built-in module so installation is not required.

IV. LITERATURE SURVEY

A number of researchers, engineers, students, scholars had worked on the proposed topic and here follows a abridged survey of the works carried out by them.

Nivedita Singh (2021) et al. proposed a voice assistant using python speech to text (STT) module and had performed some API calls and system calls which has led to developing a voice assistant using python which allows the user to run any type of command through voice without interaction of keyboard. This can also run on hybrid platforms. Therefore, this paper lacks in some parts like the system calls that aren't much supported.

Abeed Sayyed (2021) et al. presented a paper on Desktop Assistant AI using python with IOT features and also used Artificial Intelligence (AI) features along with a SQLite DB with the use of Python. This Project has a Database connection and a query framework but lacks API call and System calls features.

P.Krishnaraj (2021) et al. presented a project on Portable Voice Recognition with GUI Automation, This system uses Google's online speech recognition system for converting speech input to text along with Python. Therefore, this project has a GUI and is also has a portable framework. Accuracy of this text to speech (TTS) engine is comparatively less and also lacks IoT. Rajdip Paul (2021) et al. presented a project named A Novel Python-based Voice Assistance System for reducing the Hardware Dependency of Modern Age Physical Servers. This Author has proposed assistant project with python as a backend supporting system calls, api calls and various features. This Project is quite well responsive with api calls, also needs improvement in understanding and reliability.

Geetha (2021) et al. presented a project named The Voice Enabled Personal Assistant for Pc using Python. This Author has proposed assistant project with python as a backend and features like turning our PC off, or restarting it, or reciting some latest news, are just one voice command away. Also, this project has well supported library not every API will have the capability to convert the raw JSON data into text. And there is a delay in processing request calls. Dilawar Shah Zwakman (2021) et al. proposed the Usability Evaluation of Artificial Intelligence-Based Voice Assistants which can give proper response to the user's request. It also has a feature where it can make an appointment with the person mention by the user through voice but it lacks API calls.

Dimitrios Buhalis (2021) et al. proposed a paper on In-room Voice-Based AI Digital Assistants Transforming On-Site Hotel Services and Guests' Experiences. Where voice assistant is used for hotel services. It'll be very useful in this current COVID-19 era. Human Touch is considered as a danger in this COVID time and with a voice assistant, loss of human touch is not considered as an advantage. It can also be used to control the temperature controls and room light controls but it needs Complex Integration and Staff Training. Philipp Sprengholz (2021) et al. has proposed Ok Google: Using virtual assistants for data collection in psychological and behavioural research which is a survey mate that they have developed which is an extension of the Google Assistant that was used to check the reliability and validity of data collected by this test. Possible answers and synonyms are defined for every different type of questions so, it can be used to analyse the behaviour of an individual. As it is a psychological and behavioural research assistant.

Rahul Kumar (2020) et al. has proposed Power Efficient Smart Home with voice assistant by which we can say that a Voice Assistant is one of the important part of the Smart home which is becoming one of the major things in the current world as it can operate the Home Appliances just with voice which also increase the home security because of the smart locks but it requires a reliable internet connection which is crucial and sometimes, the user might lock themselves out of their own house.

Benedict D. C (2020) et al. proposed Consumer decisions with artificially intelligent voice assistants that will have stronger psychological reactions to the system's look on human like behaviours. The assistant has an IoT

(Internet of Things) features. It can also order stuffs which the user want but there are some cons in this paper. Voice assistant relies on the speaker's ability to represent the decision alternatives to catch up in voice dialogues and another main disadvantage is that, it lacks system calls. Tae-Kook Kim (2020) et al. has proposed a Short Research on Voice Control System Based on Artificial Intelligence Assistant which states AI assistant system using open API artificial intelligence, and the conditional auto-run system, IFTTT (IF This, Then That). It can control the system using the Raspberry PI board but it lacks system calls.

V. CONCLUSIONS

As stated before, "*voice assistant is one of the biggest problem solver*" and you can see that in the proposals with the examples that it is in fact one of the biggest problem solver of the current world. We can see that voice assistant is one of the major evolving artificial intelligence in the current world once again on seeing the proposal examples because at the past, the best feature which a voice assistant had was telling the date and searching the web and giving the results but now look at the functions that it can do so with this, we can say that it is an evolving software in the current world. The main idea is to develop the assistant even more advanced than it is now by linking other smart application into this project. Thus, will save an ample of time for users. I would like to conclude with the statement that we will try our best and give one of the finest voice assistants which we are able to.

VI. FUTURE WORKS

Some of the future works that could be done as an extension of the project is listed as under.

- Integration with Gmail API enables voice assistants to streamline email communication, enhancing productivity.
- Developing Voice User Interfaces (VUIs) like Alexa and Siri to offer hands-free interaction, improving efficiency and convenience.
- Integrating voice commands with other modes of interaction, such as gestures or touch, to create more versatile and intuitive user experiences.
- Implementing robust privacy and security features to protect user data and ensure secure interactions with voice assistants, addressing concerns about data privacy and potential vulnerabilities.

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