

*A project report on*

**BEYOND CLICKS AND KEYS:  
EXPLORING VOICE ASSISTANTS  
ON THE DESKTOP**

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

**Bachelor of Technology in Computer Science  
and Engineering**

*by*

**SANJIL K C (20BCE1855)**



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**Vellore Institute of Technology**  
(Deemed to be University under section 3 of UGC Act, 1956)  
CHENNAI

**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**

April, 2024

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I hereby declare that the thesis entitled “BEYOND CLICKS AND KEYS: EXPLORING VOICE ASSISTANTS ON THE DESKTOP” submitted by me, for the award of the degree of Bachelor of Technology in Computer Science and Engineering, Vellore Institute of Technology, Chennai is a record of bonafide work carried out by me under the supervision of Dr Prasad M

I further declare that the work reported in this thesis has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

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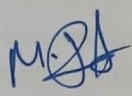
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#### CERTIFICATE

This is to certify that the report entitled “**BEYOND CLICKS AND KEYS: EXPLORING VOICE ASSISTANTS ON THE DESKTOP**” is prepared and submitted by **Sanjil K C (20BCE1855)** to Vellore Institute of Technology, Chennai, in partial fulfilment of the requirement for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** program is a bonafide record carried out under my guidance. The project fulfills the requirements as per the regulations of this University and in my opinion meets the necessary standards for submission. The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma and the same is certified.

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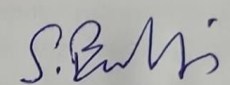
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## **ABSTRACT**

This research project gives an in-depth investigation of the creation, implementation, and possible effect of a voice-activated desktop assistant, dubbed Alfred. The major purpose is to move beyond traditional keyboard and mouse-based interactions, enabling a more natural and hands-free manner to manage desktop apps and retrieve information.

Alfred is a comprehensive tool meant to speed numerous processes and boost user experience. It features a comprehensive variety of capabilities, including date and time management, launching apps, opening websites, delivering weather updates, news, and search results. It also provides translation, music playback control, unit conversion, YouTube access, volume control, PDF reading, alarms, email and messaging, calling, video conferencing, calculations, location services, note-taking, closing applications, joke generation, game playing, internet speed testing, system information retrieval, IP address lookup, reminders, window switching, chatbot integration, screenshot capture, cricket score updates and scheduler

The project is largely constructed using Python, employing numerous libraries such as PyPDF2, BeautifulSoup, PyAutoGUI, WolframAlpha, and others, to assist the varied functionality. SQLite manages the project's contact databases.

Voice assistants' ability to reduce manual input and boost productivity and multitasking on desktop platforms is the focus of the research. It also discusses the obstacles experienced during development, such as speech recognition accuracy, context comprehension, command execution speed, and security considerations linked to voice data.

Moreover, the study digs into the user experience component, measuring user acceptability and satisfaction levels with voice assistants, and the learning curve connected with their use. It also explores the consequences of voice assistants for users with impairments, underlining their potential as an assistive tool.

The research closes with a comprehensive review of the benefits and limits of voice assistants on desktops, their potential for future advancements, and user acceptability. The initiative contributes considerably to the expanding body of knowledge in the field of human-computer interaction, notably in voice-based interfaces, and gives vital insights for developers and researchers in this sector.

In conclusion, our study effort underlines the transformational potential of voice assistants in transforming desktop interactions, making them more efficient, accessible, and user-friendly.

## **ACKNOWLEDGEMENT**

It is my pleasure to express with deep sense of gratitude to Dr. Prasad, Assistant Professor, School of Computer Science and Engineering, Vellore Institute of Technology, Chennai, for his constant guidance, continual encouragement, understanding; more than all, he taught me patience in my endeavor. My association with him is not confined to academics only, but it is a great opportunity on my part of work with an intellectual and expert in the field of Artificial intelligence.

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**Date: 15-03-24**

**Sanjil K C**

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## **LIST OF ACRONYMS**

1. API: Application Programming Interface
2. GUI: Graphical User Interface
3. NLP: Natural Language Processing
4. STT: Speech-to-Text
5. TTS: Text-to-Speech
6. JSON: JavaScript Object Notation
7. HTTP: Hypertext Transfer Protocol
8. HTTPS: Hypertext Transfer Protocol Secure
9. URL: Uniform Resource Locator

## Chapter 01

# INTRODUCTION

## 1.1 INTRODUCTION

In the fast-changing digital world, the connection between humans and computers has undergone major shifts. The old ways of engagement, including as typing and clicking, are rapidly giving way to more intuitive and natural modes of communication. Among these developing technologies, voice assistants have attracted substantial interest due to their potential to transform the way we interact with our electronics. This project, dubbed "Beyond Clicks and Keys - Exploring Voice Assistants on the Desktop," intends to dive into the domain of voice assistants and build a full speech-activated assistant for desktop computers.

The major purpose of this project is to boost user involvement and productivity by decreasing the need for manual inputs. The voice assistant, dubbed Alfred, is meant to do a broad number of activities, ranging from simple operations such as date and time management to more complicated duties like starting programs, accessing websites, delivering weather updates, and running online searches. The ultimate objective is to provide a seamless and intuitive user experience, where the user can engage with their computer as they would with a human assistant.

The notion of voice assistants is not new, they have been around for some years and are routinely found in smartphones and smart home devices. However, their applicability in desktop computing is yet somewhat unexplored. This project intends to solve this gap by producing a voice assistant particularly tailored for desktop use. The assistant is supposed to deliver a more efficient and engaging user experience, making activities easier and quicker to accomplish.

Alfred is loaded with a broad range of features that cater to distinct user demands. It can play tunes, convert units, translate languages, and even play games, giving both usefulness and fun. The assistant may also perform duties linked to email and texting, video calls, computations, and location services. Moreover, it can execute system-related functions like as collecting screenshots, setting reminders, switching windows, and working as a chatbot.

The project is constructed using Python, a flexible and strong programming language noted for its simplicity and readability. The development process requires the usage of numerous libraries and APIs to accomplish the assistant's functionality. For instance, PyPDF2 is utilized for reading PDF files, BeautifulSoup for web scraping, and Wolfram Alpha for computational intelligence. The assistant also uses APIs for weather updates, news, and currency conversion.

One of the important parts of the project is the Graphical User Interface (GUI). The GUI is meant to be user-friendly and straightforward, offering a visual depiction of the assistant's functions. It is built using PyQt5, a collection of Python bindings for the Qt application framework. The GUI allows users to interact with Alfred in a more traditional fashion, giving an alternative to voice instructions.

The creation of Alfred requires multiple steps, including design, implementation, testing, and refining. The design stage focuses on defining the assistant's capabilities and creating the user interface. This comprises determining the tasks that the assistant should be able to execute and building the GUI layout. The implementation step entails coding the assistant's functions and integrating them with the GUI. This step also includes setting up the voice recognition and text-to-speech technologies.

The testing stage ensures that all functionalities perform as planned and any issues are detected and remedied. This encompasses both unit testing, where individual functions are verified, and integration testing, where the complete system is evaluated. The refining stage focuses on increasing the assistant's performance and user experience. This comprises optimizing the code for speed and efficiency, upgrading the voice recognition and text-to-speech technologies, and polishing the GUI interface.

In addition to these stages, the project also incorporates a research phase, when existing voice assistants and their features are investigated. This phase is critical in assessing the present level of voice assistant technology and finding areas for development. The research phase also entails analyzing user behavior and preferences to build an assistant that satisfies user demands efficiently.

Furthermore, the project comprises a documentation phase, when all parts of the project are recorded. This involves documenting the design and execution of the assistance, the testing procedure, and the outcomes. The documentation phase is vital in providing a clear knowledge of the project and permitting future modifications.

The initiative not only pushes the frontiers of human-computer interaction but also offers a more engaging and participatory method of utilizing desktop computers. By automating many operations and decreasing the need for manual inputs, Alfred boosts productivity. The research provides a useful examination into the possibilities of voice assistants in desktop computing and contributes to the continuing conversation on the future of human-computer interaction.

## **1.2 OVERVIEW OF VOICE ASSISTANTS ON THE DESKTOP**

### **1.2.1 DESCRIPTION**

Virtual assistants, or voice assistants, employ voice recognition, natural language processing, and speech synthesis to help users. They recognize and respond to spoken commands, making technological interaction hands-free and convenient. Voice assistants have grown increasingly popular in recent years, with many individuals utilizing them every day for various activities.

Voice assistants are useful for their speed and efficiency. Users may make reminders, send messages, call, and play music with a voice command. Multitaskers and those with full hands may benefit from this. Voice assistants may also deliver weather, news, sports scores, and quizzes.

Voice assistants may also learn and adapt to users' behaviors. Many voice assistants utilize machine learning techniques to increase their comprehension of users' speech patterns and preferences. This helps them respond more accurately and personally over time. For example, a voice assistant may learn a user's chosen music genre and propose comparable songs or performers in the future.

speech assistants may be linked with smart lighting, thermostats, and appliances to manage the home environment using speech commands. This can be particularly beneficial for persons with impairments or mobility challenges, as it gives a hands-free way to manage their environment.

However, there are also certain problems and challenges linked with voice assistants. One of the key issues is privacy. Voice assistants are continuously listening for their wake word, which implies they are continually capturing and analyzing users' speech. This has sparked worries regarding data collecting and potential exploitation of users' personal information. To address these concerns, several voice assistant developers have added privacy features, such as the option to erase recorded data and limit data sharing.



Another concern is the possibility for misunderstandings and inaccuracies. Voice assistants are not flawless and may occasionally misinterpret users' orders or offer inaccurate replies. This can be annoying for users and may force them to repeat requests or repair errors manually.

Despite these obstacles, the potential benefits of voice assistants are enormous. They have the potential to alter the way we engage with technology, making it more intuitive, convenient, and accessible. As speech recognition and natural language processing technology continue to improve, we should expect to see even more powerful and capable voice assistants in the future. Voice assistants are sophisticated technology that provide several benefits and uses. They can do activities quickly and effectively, learn and adapt to consumers' preferences, and interface with other smart devices. Voice assistants employ natural language processing and machine learning algorithms to interpret and respond to voice commands, giving them a comfortable and hands-free method to engage with technology.

However, voice assistants also raise worries about privacy and can make blunders. To solve these difficulties, it is necessary to build solid security measures and increase speech recognition accuracy. As voice assistant technology continues to progress, we should expect to see more advanced features and capabilities that enhance the user experience.

The potential of voice assistants is tremendous, and they have the capacity to alter the way we engage with technology. They can make our life simpler, more convenient, and more productive. As such, voice assistants are an intriguing and promising area of development in the field of artificial intelligence.

### **1.2.2 TYPES OF VOICE ASSISTANCE**

Voice assistants have become increasingly popular in recent years, with various types available to suit different needs and preferences. Here are some of the most common types of voice assistants:

1. **Smart Speakers:** Smart speakers are freestanding devices that employ speech recognition to execute tasks and answer inquiries. Examples of smart speakers are Amazon Echo, Google Home, and Apple Home Pod.
2. **Mobile Voice Assistants:** Mobile voice assistants are embedded into smartphones and may do functions such as making phone calls, sending texts, creating reminders, and offering directions. Examples of mobile voice assistants include Siri, Google Assistant, and Cortana.
3. **Desktop Voice Assistants:** Desktop voice assistants are integrated into personal computers and may do activities such as activating apps, surfing the web, and controlling media playing. Examples of desktop voice assistants are Microsoft Cortana, Amazon Alexa for Windows, and Google Assistant for desktop.
4. **In-Car Voice Assistants:** In-car voice assistants are built into automobiles and may do functions such as making phone calls, sending texts, offering directions, and managing media playback. Examples of in-car voice assistants include Apple CarPlay, Android Auto, and Amazon Echo Auto.
5. **Smart Home Voice Assistants:** Smart home voice assistants are incorporated into smart home equipment such as thermostats, lights, and locks, and can

perform activities such as altering the temperature, turning lights on and off, and locking doors. Examples of smart home speech assistants include Amazon Alexa, Google Assistant, and Apple HomeKit.

6. **TV Voice Assistants:** TV voice assistants are embedded into smart TVs and allow users to handle numerous operations, such as changing channels, adjusting the volume, and searching for content, using voice requests. Examples of TV voice assistants include Amazon Fire TV, Roku, and Google Chromecast.
7. **Wearable Voice Assistants:** Wearable voice assistants are embedded into wearable devices, such as smartwatches and fitness trackers, allowing users to do tasks, send messages, and make calls using voice commands. Examples of wearable voice assistants include Apple Watch Siri, Google Assistant on Wear OS, and Samsung Bixby on Galaxy Watch.
8. **Virtual Reality Voice Assistants:** Virtual reality voice assistants are embedded into virtual reality headsets and allow users to manipulate the virtual world via voice commands. Examples of virtual reality voice assistants are Oculus Voice Commands and Google Daydream.

Each sort of voice assistant has its own distinct characteristics and capabilities, and they may be utilized in different circumstances and for different reasons. As voice recognition technology continues to develop, we should expect to see many more types of voice assistants emerge in the future.

### **1.3 CHALLENGES IN CREATING VOICE ASSISTANCE**

Creating a voice assistant might be a tough endeavor owing to various factors. One of the primary issues is voice recognition accuracy. The voice assistant must be able to properly identify and comprehend the user's speech, independent of accent, background noise, or speech patterns. This requires complex algorithms and machine learning models that can adapt to varied situations and people.

Another problem is natural language understanding (NLU). The voice assistant must be able to grasp the user's purpose and context, which can be challenging owing to the complexity and ambiguity of human language. NLU includes evaluating the meaning of words, phrases, and sentences, as well as recognizing things, relationships, and attitudes.

Privacy and security are also key problems in designing a voice assistant. Users commit their personal information to the voice assistant, which must be safeguarded against illegal access, hacking, and data breaches. This needs sophisticated security mechanisms, such as encryption, authentication, and data anonymization.

Integration with other devices and systems is another difficulty. The voice assistant must be able to easily connect and interact with a wide range of devices, such as smartphones, smart home devices, and automobiles. This involves interoperability with diverse systems, protocols, and standards.

Finally, building a voice assistant that is user-friendly, intuitive, and engaging is vital for user adoption and happiness. The voice assistant must be able to recognize and respond to the user's wants and preferences, as well as deliver tailored and relevant recommendations and ideas. This involves a comprehensive grasp of user behavior, preferences, and motivations, as well as sophisticated user experience (UX) design concepts.

## **1.4 PROBLEM STATEMENT**

My project's problem statement is the absence of a feature-rich and intuitive voice assistant for desktop computers that can perform a broad range of tasks and functions. Although there are many different voice assistants on the market, their usefulness is limited when it comes to desktop PCs because the most of them are designed for mobile devices or smart speakers.

Furthermore, there are a number of serious issues with the current desktop voice assistants, including poor speech recognition accuracy, limited ability to understand natural language, inappropriate user interface design, and limited integration with other applications and systems. Customers find it challenging to successfully use the voice assistant for their daily tasks and activities because of these limitations.

My study aims to create a voice assistant for desktop computers that can do a wide range of tasks, including opening programs, visiting websites, providing weather updates, sending emails, playing music, and adjusting system settings, in order to address these problems. High precision speech recognition, sophisticated natural language understanding, smooth communication with other applications and systems, and an easy-to-use user interface are all goals for the voice assistant.

The project will also incorporate stringent security measures, such data anonymization, authentication, and encryption, to ensure user security and privacy. Furthermore, in order to provide individualized and pertinent recommendations and suggestions, the voice assistant will be designed to learn from and adjust to the user's preferences and actions.

My project's overall goal is to create a comprehensive and user-friendly voice assistant for desktop computers that can increase user productivity, enhance user experience, and provide a quick and easy way to establish a connection with the computer. My project aims to advance the field of speech-enabled technology and offer desktop users a useful tool by solving the shortcomings of current voice assistants and adding advanced features and capabilities.

## 1.5 OBJECTIVES

The primary goal of this project is to create a voice assistant for desktop computers that can help users with many daily chores. The project's specific goals are as follows:

1. To create a voice recognition system that, in the absence of background noise or accents, can reliably recognize and understand user commands and inquiries.
2. To integrate the voice assistant with other applications and platforms, including as web browsers, email clients, music players, and calendar apps, so that users may do a variety of tasks using voice commands.
3. Creating an intuitive user interface that enables consumers to interact with the voice assistant and customize its settings with ease.
4. To protect user privacy and security by giving users total control over their data and implementing strict security measures including user authentication and data encryption.
5. To continuously improve the functionality and performance of the voice assistant by obtaining user feedback and incorporating it into the development process.
6. To perform user research and analyze user data in order to determine if the voice assistant is effective in increasing user pleasure and productivity.

By achieving these goals, the project hopes to create a voice assistant that is safe, user-friendly, responsive to needs and preferences, and useful in addition to being efficient. Customers will be able to interact with their desktop computers in a more comfortable and hands-free manner thanks to the voice assistant, which will also allow them to do a variety of tasks without requiring human input. The project's ultimate goals are to enhance desktop computing's overall user experience and further the development of voice-enabled technology.

## **1.6 SCOPE OF THE PROJECT**

This project aims to create a voice-activated desktop assistant that can help users with everyday tasks by carrying out several tasks. Integrating the voice assistant with many platforms and programs, such email clients, online browsers, music players, and calendar apps, will be the main goal of the project. Even in loud settings, the voice assistant would be able to precisely understand and transcribe user commands and inquiries.

In order to facilitate user interaction with the voice assistant and enable them to alter its settings to suit their preferences, the project will also entail developing an intuitive user interface. Strong security features including data encryption and user authentication will be incorporated into the voice assistant's design, which will place a high priority on user privacy and security.

Certain topics, such natural language processing (NLP), will not be included in this project since they are outside its purview. The voice assistant isn't going to be built to converse in depth with people or comprehend intricate linguistic frameworks.

To constantly enhance the voice assistant's functionality and performance, the project's development method will entail gathering user input and implementing it. In order to assess how well the voice assistant contributes to increased user pleasure and efficiency, the project will also entail gathering and evaluating user data through user studies.

The ultimate goal of this project is to develop a voice assistant that is practical, effective, and easy to use. This assistant will help users with their everyday tasks and enhance their desktop computing experience in general.

## Chapter 02

# BACKGROUND WORK

## 2.1 RELATED WORK

A lot of businesses have been investing in the advancement of voice assistant technologies as they have grown in popularity in recent years. Among the most popular voice assistants are Apple's Siri, Google Assistant, and Alexa from Amazon. These voice assistants can take care of a lot of different things, including playing music, making notes, and responding to inquiries.

Several voice assistants are also available in the desktop computer space. For example, Apple's Siri and Microsoft's Cortana are part of their respective operating systems. These voice assistants are capable of sending emails, starting apps, and doing online searches.

Additionally, third-party speech assistants like Braina Pro and Dragon NaturallySpeaking are available for desktop PCs. These voice assistants come with extra functionality like transcription and dictation, which let users dictate emails and documents with just their voice.

Although these voice assistants come with a number of features, accuracy and natural language processing might still use some work. Furthermore, voice assistants that are tailored for desktop computers and have a greater degree of system and application integration are required.

Our research seeks to create a voice assistant that can do several activities and interface with different apps and systems, therefore contributing to the development of voice assistants for desktop PCs. Our main goals will be to increase speech recognition accuracy and provide an intuitive user interface so that people can communicate with the voice assistant.



## 2.2 LITERATURE SURVEY

Voice assistants are a cutting-edge technological advancement that are revolutionizing our interactions with digital gadgets and computers. These assistants, which were first seen in smartphones and smart speakers, have now spread to desktop computer settings with the aim of improving user experience, productivity, and accessibility. This review of the literature looks at several initiatives and research projects centered on creating and deploying voice assistants for desktop environments.

[1] Vadaboyina Appalaraju and colleagues present "Design and Development of Intelligent Voice Personal Assistant using Python," which offers a voice assistant with note-taking, message-sending, and information-retrieval capabilities. This Python programming project demonstrates how voice assistants may be used to streamline user chores on desktop PCs. The authors highlight how their intelligent voice personal assistant may be used to extract information and utilize voice commands to operate devices on desktops or other smart devices.[2] Srisailapu D Vara Prasad et al.'s paper, "An Advanced Computerized Artificial Intelligent System for Assisting Real Life Feature Extraction using AI-NOVA," introduces a revolutionary voice assistant named "NOVA" that has advanced features including report production and exploratory data analysis (EDA). This project shows how voice assistants may be used for tasks other than the more conventional ones, such as data processing. The authors draw attention to the project's special feature, which helps users do exploratory data analysis (EDA) on a given dataset and generates an HTML file with an analysis report. [3] In their paper "An IoT based Smart Home with Virtual Assistant," T.M.N. Vamsi et al. propose a novel strategy that enhances user safety and provides home status updates by fusing voice assistants with Internet of Things (IoT) technology. This research is a great illustration of how voice assistants and other innovative technologies are combining to make managing and observing smart home environments simple. The authors emphasize that extensive research has been done on their approach to ensure enhanced user safety, effectiveness, and simplicity of usage.

[4] The "LARVIS - Linux AI-Relied Virtual Intelligent System," developed by MThanga Subha Devi and colleagues, serves as the basis for an Intelligent Virtual Assistant (IVA) specifically designed for desktop Linux systems. This initiative addresses the lack of IVAs on this platform and offers functionality like file management, data retrieval, and system control to enhance the user experience on Linux desktops. The proposed IVA framework aims to improve the efficiency, usability, and streamlining of desktop Linux PCs in order to overcome the lack of IVAs on this platform.[5] A. Jagan and colleagues describe a voice assistant that operates off of computer vision techniques in "Personal Voice Assistant Using Computer Vision," even in the absence of an internet connection. Using computer vision and voice assistants to handle work efficiently, this approach also addresses the negative effects of internet dependency. Unlike most voice assistant programs, which rely on internet connections for their principal functioning, the authors argue that the suggested paradigm may perform tasks well even in the absence of an online connection. [6] P. Kunekar et al. provide an overview of the evolution of voice assistants in their paper "AI-based Desktop Voice Assistant," covering their initial applications in PCs and smartphones to their current use in smart speakers and home automation systems. This article discusses the growing use of voice assistants across many industries and the potential impact they may have on desktop computer environments. Despite being initially discovered in computers and smartphones, voice assistants have gained popularity in smart speakers and home automation systems, as the writers point out, indicating their broad appeal.

[7] Yadav et al.'s paper, "Voice-Based Virtual-Controlled Intelligent Personal Assistants," explores the development of personal assistant software that leverages knowledge libraries, user-generated content, and web-based semantic data sources. The importance of utilizing a range of data sources and knowledge bases to enhance voice assistant functioning is highlighted by this study. The authors claim that the main goal of developing personal assistant software is to leverage web-based semantic data sources, user-generated content, and knowledge from knowledge libraries. [8] In their paper "Voice-Enabled Privacy Assistant Towards Facilitating Successful Ageing in Smart Homes," R. Aldhafiri et al. provide a voice

assistant skill that assists users in understanding and managing privacy settings related to voice purchases, location tracking, and speech recordings. This study addresses the important topic of privacy concerns associated with voice assistants and demonstrates how they can promote healthy aging in older adults living in smart homes. The authors found that their Privacy Assistant increased users' awareness and comprehension of data management and privacy settings on voice assistants. [9] P. N. Singh et al.'s paper, "Operating System Command Execution Using Voice Command," offers a technique that would enable the operating system to recognize and execute voice commands. This research highlights the benefits of voice assistant accessibility in desktop computer environments by emphasizing voice assistance for those with physical disabilities. The study's main objective, according to the scientists, is to provide voice assistance to those who are in need and have difficulty utilizing their hands and fingers.

[10] In "JARVIS AI Voice Assistant," P. Dalal et al. describes a proposed system that would enable the AI assistant Jarvis to carry out a number of tasks using voice commands, such as making phone calls, scheduling meetings, and sending emails. This study demonstrates how voice assistants may increase output and make a number of desktop-related tasks easier. The proposed system would have personalized user profiles, providing a more efficient and customized experience. [11] In their paper titled "A Review on the Potential of AI Voice Assistants for Personalized and Adaptive Learning in Education," D. K. Yadlapally et al. investigate the potential applications of voice assistants in educational settings. The role voice assistants play in providing personalized and adaptable learning experiences is highlighted in this study, which contributes to the growing body of research on the application of speech technology in education. [12] In "Analysis and Development of the Model for Google Assistant and Amazon Alexa Voice Assistants Integration," B. Savi et al. highlight the integration of popular voice assistants like Google Assistant and Amazon Alexa. The objective of this research is to develop a software library that would facilitate the seamless integration of these helpers into other applications, such as project management software. The goal of the project, as stated by the scientists, is to evaluate and develop a software

library that would enable the Google Assistant and Amazon Alexa voice assistants to cooperate.

In their work "Development of Cloud based Smart Voice Assistant using Amazon Web Services," S. Chauhan and D. Arora introduce "Medico," a cloud-based voice assistant specifically tailored for the medical field. This study shows how voice assistants may be used in healthcare applications by providing basic therapeutic recommendations based on patient data through the use of graph data science libraries and Amazon Web Services. After conducting a thorough examination of the available literature on the topic of voice assistant use in the healthcare industry, the authors developed "Medico" using the Neo4j Graph Data Science Library to offer basic therapeutic recommendations for specific patients. [14] In their study "Hybrid Multi-Purpose Voice Assistant," D. Lahiri et al. describe a voice assistant that combines natural language processing (NLP) with long short-term memory (LSTM) techniques. This hybrid approach allows the assistant to run locally on a PC or externally via servers, providing scalability and interoperability with existing technologies and architectures. The authors stress that Natural Language Processing (NLP) is used in their Hybrid Multipurpose vocal Assistant to convert vocal commands into instructions, which are subsequently analyzed by LSTM. This enables the voice assistant to do tasks in accordance with the directives it has been given. [15] The use of contrastive learning, a kind of self-supervised learning, to the detection of speech spoofing is examined in the paper "Experimental Case Study of Self-Supervised Learning for Voice Spoofing Detection," written by Yerin Lee et al. In order to increase the security and dependability of voice assistants, this study investigates methods for detecting and thwarting speech spoofing attacks. The authors experimented with contrastive learning, a fruitful self-supervised learning method, to develop a voice spoofing detection model.

The literature review highlights the diverse range of research endeavors aimed at developing and implementing voice assistants that are tailored for desktop computer environments. These studies show how voice assistants may enhance user experience, productivity, and accessibility. Voice assistants include functions like information retrieval, task automation, data analysis, and system control.

Many research [1], [2], [4], [5], [6], [10], and [14] look at ways to use Python and other computer languages to construct voice assistants. They use a range of tools and frameworks to make task execution, speech recognition, and natural language processing easier. These illustrations demonstrate the range of tasks that voice assistants may perform, from simple question-answering to complex data processing and features that increase efficiency. The writers of these research emphasize certain characteristics and capabilities of the voice assistants that have been developed. Voice commands [1], report generation and EDA [2], file management and fact retrieval [4], operating without internet access [5], and tailored experiences [10] are a few examples of them.

Additionally, research is being done on the combination of voice assistants and emerging technologies like computer vision [5] and the Internet of Things (IoT) [3], which has potential for efficient task management and seamless control of smart home settings without requiring internet access. The authors of these research draw attention to the creativity of their approaches, such as the integration of IoT for home status updates and improved safety [3] and the employment of computer vision techniques to operate without internet connectivity [5].

In some research [9], [11], inclusiveness and accessibility are important concerns. Voice assistants are recommended as means of support for those with physical disabilities and as a means of enabling customized and adaptable learning in educational environments. In these studies, the authors highlight the main effect factors and potential benefits of the study, which include providing voice assistance to the impoverished [9] and enabling personalized and adaptive learning in schools [11].

Voice assistant security and privacy concerns are covered in works like [8] and [15]. In the former, privacy settings may be controlled using voice commands, while in the latter, speech spoofing detection using self-supervised learning techniques is examined. The authors of [8] found that their Privacy Assistant increased users' understanding and awareness of privacy settings, whereas the researchers in [15] experimented with contrastive learning for voice spoofing detection models.

Well-known voice assistants like Google Assistant and Amazon Alexa are investigated in [12], with a focus on how important it is for these assistants to integrate seamlessly with a variety of software systems and applications. The authors emphasize how important it is to develop a software library that will enable the integration of these well-known voice assistants.

Furthermore, research like [13] highlights the potential of cloud-based voice assistants tailored for certain industries, such as healthcare, through the use of state-of-the-art data analysis techniques and cloud computing resources. Following a literature analysis, the authors developed a cloud-based voice assistant that suggests therapies using AWS and graph data science tools.

The study also highlights the use of several techniques and approaches in the development of voice assistants, such as natural language processing (NLP) [14], long short-term memory [14], and self-supervised learning [15]. The authors share their thoughts on the specific methods and techniques they used in each of their works.

The invention and use of voice assistants in desktop computer environments is receiving more and more attention, as the literature study as a whole highlight. In addition to addressing problems and concerns, these studies deepen our knowledge of voice assistant technology and pave the way for more advanced, user-centered solutions that seamlessly integrate speech interactions into our digital lives. The researchers' and authors' important thoughts, methods, and findings can aid in future advancements and breakthroughs in this field. The reviewed works also demonstrate the interdisciplinary nature of voice assistant research, incorporating concepts from several domains such as computer vision, artificial intelligence, natural language processing, and human-computer interaction. As technology develops, voice assistant integration with other cutting-edge technologies, such as virtual and augmented reality, might further alter human-computer interactions and offer immersive computing experiences. In addition, privacy, data security, and bias mitigation are a few of the ethical concerns related to voice assistants that are very important and require more study to ensure the responsible development and use of these technologies.

# PROPOSED WORK

## 3.1 PREREQUISITES

The development and comprehension of desktop voice assistants require the integration of multidisciplinary skills from several domains. The prerequisites for creating and using an executable voice assistant—such as Python-based Alfred—are covered in this section.

**Programming Languages and Libraries:** Strong The ability to program in Python and other languages is required to create voice assistants. To implement features like database administration, GUI development, wolframalpha, BeautifulSoup, PDF reading, web surfing, and sqlite3, one has to be conversant with Python libraries like PyPDF2, webbrowser, and sqlite3. Understanding these libraries' properties is essential to developing a versatile and helpful voice assistant.

To design voice assistants, one must be knowledgeable with speech recognition and synthesis technology. One has to be familiar with libraries such as PyAudio, SpeechRecognition, and pytsx3 in order to construct speech input and output features for the assistant. The voice assistant can now identify, understand, and speak in response to user requests because of these libraries. Gaining proficiency with these technologies is necessary to create a voice assistant that can have natural conversations with clients.

Natural language processing, or NLP, is what voice assistants use to comprehend and react to client demands rapidly. The assistant's ability to process and produce replies that resemble those of a person can be enhanced by familiarity with NLP methods and libraries such as gensim, NLTK, and spaCy. The voice assistant uses natural language processing (NLP) to comprehend human goals, gather pertinent data, and deliver

pertinent replies. The ability to have meaningful interactions with humans is a need for creating a voice assistant that is adept in NLP.

**Web APIs and Data Formats:** Many services must be integrated into the voice assistant through the use of online APIs and the manipulation of data formats like XML and JSON. To facilitate online data retrieval and analysis, familiarize yourself with requests, BeautifulSoup, and urllib libraries. With these features, the voice assistant might provide the user with information gleaned from many sources, such as news articles, sports scores, and weather data. Users must comprehend internet APIs and data kinds in order for the voice assistant to function more effectively and to become more instructive and helpful.

Artificial intelligence and machine learning are two study topics that might enhance the performance and usefulness of voice assistants. Comprehending libraries such as scikit-learn, TensorFlow, and Keras might be beneficial in developing more intricate features like context-aware dialogues, personalized recommendations, and speech recognition software. The voice assistant will be able to learn from user interactions, adjust to their preferences, and respond with more precision and personalization thanks to machine learning algorithms. One has to acquire expertise in AI and machine learning in order to create a voice assistant that will advance and get better over time.

**Operating system fundamentals:** Comprehending these ideas is crucial for developing a voice assistant with desktop interaction capabilities. A basic understanding of threads, files, and directories may be used to construct applications that can be opened, files handled, and system commands executed. Operating system knowledge makes it simpler for developers to create more effective and useful voice assistants that can do a variety of activities on the user's behalf.

**Interface and Experience Design for Users:** To ensure that the voice assistant meets the needs of the user, an interface that is both easy to use and intuitive must be created. Understanding accessibility, usability testing, and GUI design techniques may help create a voice assistant that is easy to use and meets a range of demands. Careful UI design may boost the voice assistant's appeal and engagement while also improving the user



experience.

Preserving user data's security and privacy is essential to fostering confidence in voice assistants. It might be helpful to comprehend data security laws, authentication procedures, and encryption techniques in order to develop a voice assistant that protects user data. Strong security procedures must be put in place in order to protect user data and stop illegal access. Strong privacy and security features are essential for a voice assistant to build user confidence and encourage voice assistant adoption.

**Ethics and Social Implications:** Developing inclusive and moral technology requires an understanding of the moral and social implications of voice assistants. Developers may be able to produce voice assistants that support user values and encourage constructive social change by having a thorough understanding of ethical standards, cultural sensitivity, and potential societal effects. Creating a voice assistant that adheres to moral principles and takes into account the larger society context will increase its chances of surviving for the long run.

In summary, a strong foundation in programming, machine learning, internet APIs, natural language processing, speech synthesis and recognition, operating systems, user interface design, security, privacy, ethics, and social consequences is needed to construct a voice assistant like Alfred. Researchers and developers may be able to produce voice assistants that are intelligent, user-friendly, and socially conscious if they have a thorough grasp of these demands.

Table 1: Top 10 Libraries Used in the Voice Assistant Project

No.	Library	Purpose	Usage
1	SpeechRecognition	Voice recognition	Recognizes user's voice commands
2	pyttsx3	Text-to-speech conversion	Converts text responses to speech
3	datetime	Date and time management	Provides information on current date and time
4	os	Operating system functions	Launches applications, controls media playback, and adjusts system volume
5	subprocess	Spawning new processes	Launches applications, controls media playback, and adjusts system volume
6	webbrowser	Web browser control	Opens specified websites and performs Google searches
7	requests	HTTP requests	Fetches data from APIs (e.g., weather, news, translation)
8	PyPDF2	PDF file handling	Reads and extracts text from PDF files
9	sqlite3	Database management	Stores and retrieves data (e.g., user preferences, reminders)
10	BeautifulSoup	HTML parsing	Extracts information from web pages

# PROPOSED METHODOLOGY

## 4.1 METHODOLOGY FLOW

The research study's methodology is founded on the ideas of design science research (DSR), which prioritizes the creation of a tangible product as a way to accomplish certain objectives. Instead of utilizing user testing, the methodology for this project focuses on the design, development, and evaluation of the voice assistant utilizing the researcher's experience, industry best practices, and recent literature. This technique consists of three primary phases: research design, study assessment, and study development. Throughout these stages, great care is taken to ensure that every aspect of the voice assistant's operation and use is dependable and effective for desktop settings.

The research technique is structured and begins with the development of criteria to ascertain user needs and desired voice assistant features. Thus, the choice of appropriate technologies and tools facilitates the development process while ensuring effectiveness and compatibility. The design phase, which comes next, is when the high-level system architecture is established, along with the components and their connections. After speech recognition and other required capabilities are integrated, the voice assistant is thoroughly tested to ensure it is operating as intended. User involvement is evaluated simultaneously through usability testing, and performance optimization, user data security, and privacy are all ensured. Finally, there is a thorough documentation of the development process that provides useful information and guidelines for further usage and improvement. By taking a methodical approach, the project seeks to advance voice assistant technology in desktop environments.

The flow of the research process is depicted in the following diagram:

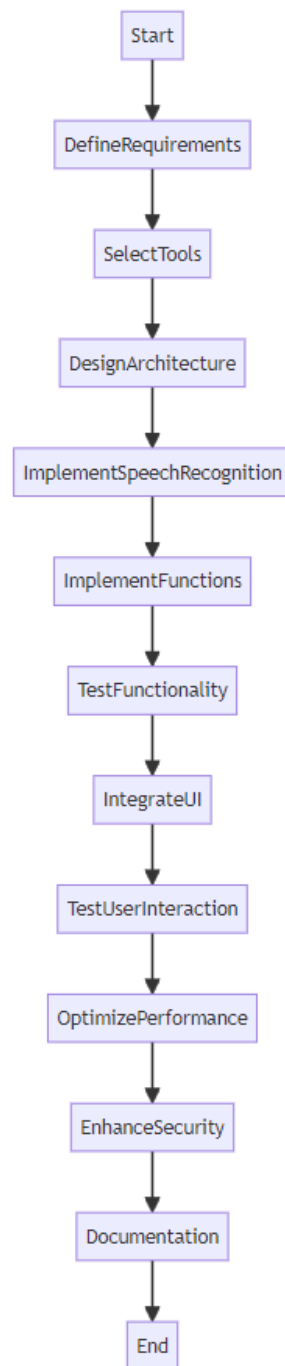


Fig 1. Methodology Flow

## **4.2 RESEARCH DESIGN**

The research design is a methodical plan to handle the objectives and problems of the study. The primary objective of this project is to develop Alfred, a voice assistant for desktop environments that provides a seamless and pleasurable user experience while adjusting to the needs and preferences of users. The research questions are as follows:

1. What are the most important features and functionalities that desktop voice assistant users seek out, based on the corpus of research and industry best practices?
2. How can the voice assistant be created and implemented to provide a clear and user-friendly interface, taking into account the researcher's expertise and current best practices?
3. How can I use performance indicators and assessment criteria that are specific to the project's requirements and grounded in existing research to gauge the voice assistant's effectiveness and usability?

The next assignments were finished in order to address these research inquiries:

### **4.2.1. Literature review**

A thorough examination of the corpus of research on the topic was conducted in order to ascertain the most recent developments, industry best practices, and challenges in the field of voice assistants. This study helped establish a solid foundation for the project by giving an overview of the current status of voice assistant technology and its suitability in desktop environments. The review of the literature included studies on voice assistant performance evaluation, natural language processing, speech recognition, and user interface design. The researcher gained important insights on the necessary features and functionalities for a desktop voice assistant, as well as design principles and evaluation criteria

that should be considered throughout the development process, by carefully examining these studies.

#### **4.2.2. Identification of features and functions**

Using the researcher's expertise and the literature analysis as a guide, the main features and functionalities that users expect from a desktop voice assistant were identified. These traits and functions were categorized using core and supplemental capabilities. Among the primary skills were voice recognition, natural language processing, and desktop application and service interface. The additional features were language support, context awareness, and personalization. This categorization made it simpler to concentrate development resources, ensured that the voice assistant met all requirements, and provided features that enhanced the user experience.

#### **4.2.3. Creation of a prototype**

The Alfred voice assistant prototype was made with Python and other libraries. The prototype included all of the characteristics and capabilities that were discovered and provided the framework for further development and evaluation. Iterative development was employed, whereby the researcher iteratedly improved the prototype based on feedback from the researcher's field of expertise and evaluation outcomes.

#### **4.2.4. Performance evaluation**

The voice assistant's performance was evaluated based on a number of factors, such as accuracy, reaction speed, and functionality coverage. The evaluation helped identify the benefits and drawbacks of the prototype and provided insightful viewpoints for further development. The evaluation process was crucial to ensuring that the voice assistant met the necessary performance criteria and provided a satisfying user experience.

## **4.3 ADVANCEMENT**

The development phase was focused on creating Alfred, a voice assistant prototype, using Python and many libraries. The development process included the following steps:

### **4.3.1. Design**

The voice assistant's design was developed based on accepted guidelines for user interface design and usability as well as the features and functionalities that were decided upon. As a result of the design process, a conceptual model of the voice assistant was created, which included information about its components, features, and user interface. The conceptual model served as a template for the implementation stage and directed the development of the voice assistant's features and functionalities.

### **4.3.2. Implementation**

The voice assistant was made with Python and several libraries, such as PyAudio, pytsx3, and SpeechRecognition. The implementation phase included coding the voice assistant's features and operations, integrating the required libraries, and confirming the correctness and stability of the prototype. The researcher continuously improved the prototype during the iterative implementation phase in response to input from their area of expertise and the evaluation's results.

### **4.3.3. Refinement**

Based on the results of the performance evaluation and the researcher's experience, the voice assistant was enhanced to boost accuracy, response time, and functionality coverage. The refining step involved iteratively improving the prototype until it met the necessary performance criteria. The voice assistant's dependability, efficiency, and capacity to provide a satisfying user experience

were all validated at this point.

## **4.4 EVALUATION**

The primary objective of the project's assessment phase was to gauge the voice assistant's effectiveness using predetermined metrics and evaluation standards. The assessment procedure included the following steps:

### **4.4.1. Performance metrics**

The voice assistant was evaluated using accuracy, reaction speed, and functionality coverage as performance metrics. Accuracy was ascertained by comparing the voice assistant's output with the expected result for a predefined set of test scenarios. The reaction time was determined by measuring how long it took the voice assistant to comprehend and respond to user questions. Functionality coverage was assessed by looking at the voice assistant's ability to perform the specified features and functions. Through the quantitative evaluation of the voice assistant's performance using these metrics, the researcher was able to identify areas that need improvement and modify the prototype accordingly.

### **4.4.2. Evaluation criteria**

Based on the corpus of recent research, the standards were modified to fit the project's parameters. Requirements included effectiveness, efficiency, and usability. The efficacy of the voice assistant was assessed by looking at its coverage of functionality and accuracy. To evaluate the voice assistant's efficiency, measurements were made of its reaction time and resource use. Usability was assessed taking into account the researcher's background and the current user interface design and usability guidelines. These guidelines offer a comprehensive framework for evaluating the operation of the voice assistant and ensuring that the stated objectives were met.



#### **4.4.3. Restrictions and upcoming projects**

The evaluation process exposed the limitations of the methodology employed for this project as well as the benefits and drawbacks of the voice assistant prototype. One of the main shortcomings was the lack of user testing, which might have provided useful information about the user experience and helped identify areas for improvement. Furthermore, the prototype's functionality could not have sufficiently accommodated the demands and preferences of all users; instead, it was limited to the features and functions covered by the researcher's experience and the literature review. In order to overcome these limitations, future research may focus on user testing to verify the voice assistant's effectiveness and usability as well as expanding its capabilities coverage in response to user feedback and new advancements in the voice assistant sector.

The methodology used in this research project is based on design science research and aims to develop a voice assistant for desktop settings. The study design, development, and assessment methodologies are customized to meet the research objectives and questions in order to guarantee the successful and user-friendly voice assistant development based on the corpus of current literature, industry best practices, and the researcher's knowledge. Using this method, the researcher was able to produce a voice assistant prototype that illustrates the potential of voice-based interaction in desktop environments and contributes to the body of knowledge already available on voice assistants.

## Alfred: A Voice Assistant for Desktop

### 5.1 SYSTEM ARCHITECTURE

Alfred is a voice assistant designed for desktop settings. Its objective is to make computer interaction easy and seamless for users. Alfred's system architecture is built on many key components that work together to offer an abundance of capabilities. The overall architecture of Alfred, including every component, their interrelationship, and the underlying technology powering the voice assistant, will be covered in great detail in this section.

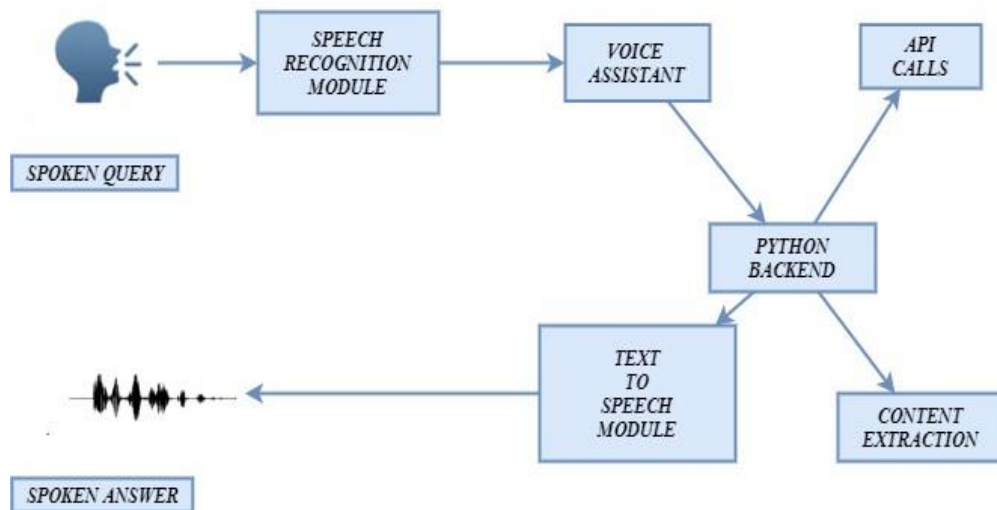


Fig 2. System Architecture

The system architecture of Alfred is high-level summarized in the diagram above, which also shows the many components and how they work together. We will go into further depth about each component in the next subsections.

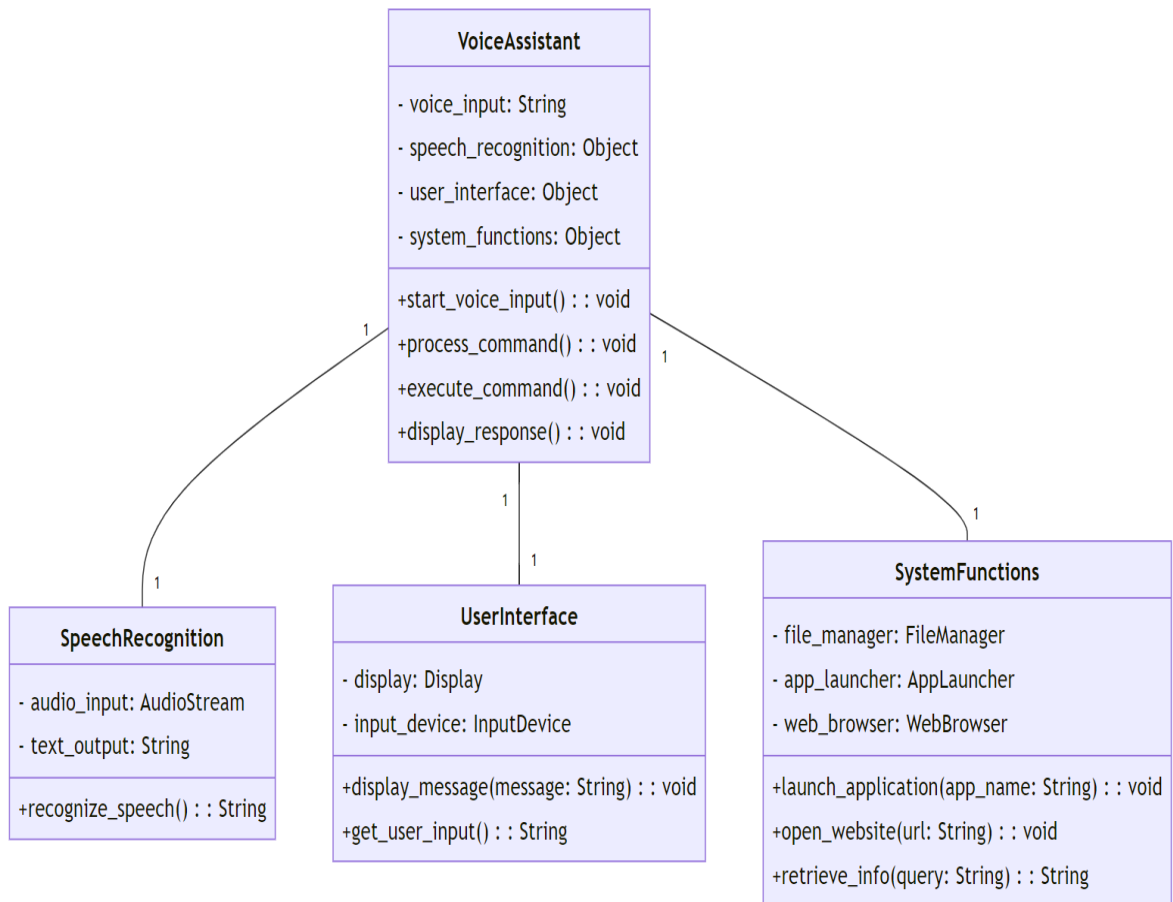


Fig 3. Class Diagram

### **5.1.1. Speech Recognition and Processing**

The voice processing and detection component of Alfred's system architecture is prioritized since it is essential to translating spoken user commands into text that the system can understand. Alfred uses the Speech-to-Text API from Google, which is included into the Python SpeechRecognition module, to do this. Because it can translate speech in real-time and is multilingual, this API is a great option for voice assistants like Alfred.

The user speaks an instruction or a question into the microphone to start Alfred's voice recognition procedure. The audio signal is then captured and processed by the SpeechRecognition library before being transmitted to the Google Speech-to-Text API for transcription. The Natural Language Processing (NLP) component examines the transcribed text once it is obtained from the API in order to extract pertinent information and ascertain the user's intent.

Finding the user's intent and obtaining pertinent data from the transcribed text are the responsibilities of the NLP component. Tokenization, named entity recognition, and part-of-speech tagging are just a few of the NLP techniques that are used in this process. The system can then carry out the necessary action or reply to the user's inquiry after determining the user's purpose.

Alfred's system design additionally incorporates vocal activity detection (VAD) and noise reduction methods to guarantee accurate speech recognition. By reducing background noise and identifying when the user is speaking, these methods assist to increase the overall accuracy of voice recognition.

The overall goal of Alfred's system architecture is to offer precise and effective voice recognition capabilities so that users may communicate with the system by giving it orders in natural language. Alfred can offer a smooth and simple user experience by

utilizing the capabilities of Google's Speech-to-Text API and sophisticated natural language processing algorithms.

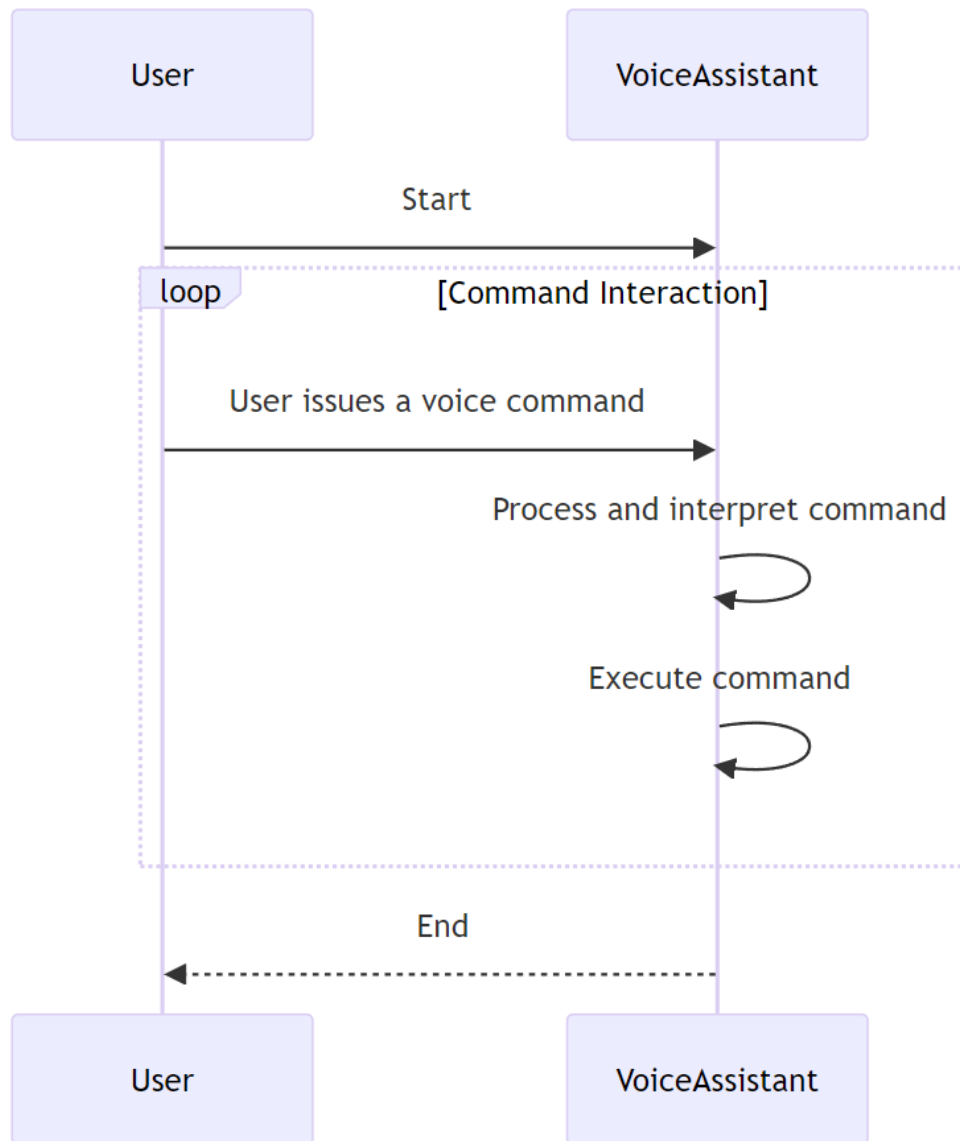


Fig 4. Sequence Diagram

### **5.1.2. Natural language processing, or NLP**

Alfred's Natural Language Processing (NLP) module examines and interprets the transcribed text to determine the user's intent. This component consists of many steps, including named entity recognition, tokenization, and part-of-speech tagging. Following processing, the text is reviewed to determine the purpose of the user and extract relevant information, such as keywords or phrases.

In the current Alfred implementation, NLP activities are completed through the usage of specifically created functions and algorithms. These features are tailored to Alfred's specific requirements and are optimized for accuracy and effectiveness. However, the modular and extensible nature of Alfred's NLP component makes it easy to integrate additional external libraries or algorithms as needed.

Tokenization, named entity recognition, and part-of-speech tagging are a few of Alfred's uniquely created NLP functions. Tokenization is the process of breaking apart the text into individual words so that they may be studied in more detail. Giving each token a grammatical name, such as an adjective, verb, or noun, is known as part-of-speech tagging. Named entity recognition is the process of identifying and extracting named entities—such as people, places, and organizations—from a text.

Alfred's NLP component may be readily adjusted due to evolving user preferences and needs, as well as improvements in NLP technology. This ensures that Alfred will be able to provide accurate and pertinent answers to user queries even as the underlying NLP technologies develop.

In the future, Alfred could make use of third-party libraries like spaCy or NLTK to enhance its natural language processing capabilities. However, as demonstrated by

Alfred's current implementation, voice assistant needs may also benefit from the utilization of specifically created NLP capabilities.

### **5.1.3. Execution and Management of Task**

Once Alfred determines the user's goal and extracts the relevant data, it takes over for Task Execution and Management. This component is responsible for executing the intended function or action in accordance with the user's wishes. The Task Execution and Management component, which is built on a modular architecture, implements each function or action as a separate module or plugin.

The modular architecture of the Task Execution and Management component facilitates easy feature addition and modification. The functions that make up the code are each in charge of a certain functionality. Thanks to its architecture, developers may expand Alfred's capability by adding new features or improving existing ones.

Using a variety of libraries and APIs, Alfred's Task Execution and Management component communicates with the operating system, applications, and internet services. For example, in Python, system commands are executed using the `os` and `subprocess` libraries, while web pages are opened using the `webbrowser` library. Furthermore, Alfred uses a range of APIs, such as Wolfram Alpha, OpenWeatherMap, and Google Maps APIs, to carry out tasks and obtain data.

### **5.1.4. Text-to-speech (TTS) and audio output**

Alfred's Audio Output and Text-to-Speech (TTS) module is in charge of speaking responses to user commands or requests. This component translates the written responses generated by the Task Execution and Management component to provide the user with spoken comments.

Alfred uses the Python text-to-speech module pyttsx3 for transcription of text to speech. Pyttsx3 supports several TTS engines, such as SAPI5, espeak, and nsss, to generate voice from text. Apart from adjusting speech characteristics like volume, cadence, and gender of voice, the user has the option to designate their preferred TTS engine.

Alfred's TTS and Audio Output component aims to deliver natural-sounding, high-quality speech output. To ensure that the produced speech is intelligible, expressive, and clear, the component employs a variety of techniques, such as voice selection and prosody management.

#### **5.1.5. Integration of Systems and Communication**

Alfred's System Integration and Communication component has to help integrate the voice assistant's several components and ease communication between them. This section ensures that Alfred's components work together to provide users with a responsive and user-friendly experience.

Alfred's System Integration and connection component uses a range of technologies and protocols, including as sockets, REST APIs, and message queues, for inter-component communication. These technologies enable Alfred's numerous components to coordinate and interact with one another in order to plan activities and respond to user requests and commands promptly.



### **5.1.6. Security and Privacy**

Security and privacy play key roles in Alfred's design. The voice assistant's design aims to collect little data and store it securely. Private information and login passwords are examples of sensitive data that is encrypted and stored securely. Furthermore, Alfred provides features like facial recognition and password protection to prevent unauthorized access to personal data.

The industry-standard technologies and practices used by Alfred for access control, authentication, and encryption serve as the foundation for its privacy and security features. These features ensure that users' data is secure and that the voice assistant can be trusted to handle sensitive information.

To sum up, Alfred's system design is built on many key components that work together to offer an abundance of capabilities. The speech recognition and processing component converts the user's spoken instructions into text; the natural language processing (NLP) component then analyzes the text to ascertain the user's intent. The Task Execution and Management component performs the required action or function in line with the user's purpose, while the TTS and Audio Output component speaks responses to the user's questions or commands. The System Integration and Communication component ensures that Alfred's components work in unison to provide consumers with a responsive and user-friendly experience. Finally, consumers' data is protected and the voice assistant can be trusted to handle sensitive data thanks to Alfred's privacy and security precautions.

## **5.2 CAPABILITIES AND FEATURES**

To improve user experience, Alfred, the desktop voice assistant, provides a plethora of functions and functionalities. These characteristics are divided into the subsequent groups.

### **5.2.1. Fundamental Knowledge and Time Management**

1. Date: Gives users access to the current date and assists with remembering significant events, such holidays, anniversaries, and birthdays.
2. Time: This feature shows the current time and allows users to set alarms and reminders to help them manage their time well.
3. Day: Offers details about the day of the week, which is helpful for organizing and arranging assignments.
4. Set an alarm: This feature lets users schedule alerts for particular times to help them remember tasks or key occasions.
5. Reminders: This feature enables users to create reminders that may be programmed to recur at certain intervals for particular activities or occasions.
6. Schedule: This feature makes it simpler for users to organize and prioritize their work by enabling them to build and maintain daily, weekly, or monthly schedules.

### **5.2.2. Interaction and Linkage**

1. Email: This feature makes it simpler to remain in touch with friends, family, and coworkers by enabling users to send emails using voice commands.
2. Send messages: Enables users to communicate with contacts on their smartphone by texting or recording voice messages.
3. Call: This feature enables users to utilize voice commands to make phone calls to contacts on their smartphone.
4. Video call: Facilitates in-person communication by allowing users to utilize voice instructions to make video calls to contacts on their smartphone.

5. Position: This feature gives users access to their current position, which is helpful for tracking and navigation.
6. Locater: This function makes sure that the user's present position is reliably recorded.

### **5.2.3. Amusement and Relaxation**

1. Play song: Voice commands let users play music from their streaming services or music libraries.
2. Play and pause: Enables voice commands to control the way videos are played back.
3. Volume up and down: Voice commands enable users to change the volume on their device.
4. Mute and unmute: Voice commands enable users to rapidly mute or unmute their device.
5. YouTube: Voice commands may be used to search for and play videos on YouTube.
6. Play game: Voice commands enable users to start and engage in games on their device.
7. Joke: To lighten the atmosphere and entertain users, this feature offers a random joke.
8. Cricket score: Gives customers access to the most recent scores and information on cricket, facilitating their ability to keep track of their preferred sports teams.

### **5.2.4. Utility and Productivity**

1. Launch app: Voice commands enable users to start any installed program on their smartphone.
2. Open webpage: This feature enables voice commands to launch a certain website in a web browser.
3. Weather: This feature helps users organize their day by giving them access to the current and predicted weather.

4. Tell me about: This feature facilitates learning and study by giving users details on a certain subject or individual.
5. News: By giving users access to the most recent news stories and updates, this feature facilitates keeping viewers up to date on current affairs.
6. Search Google for: This feature makes it simpler for users to obtain the answers to their inquiries by enabling voice-activated information searches on Google.
7. Translate: This feature makes it simpler to converse with persons who speak other languages by enabling users to translate speech or text across languages.
8. Convert unit: This feature makes computations and conversions simpler by enabling users to switch between several units of measurement.
9. Calculator: This tool makes it simpler to tackle challenging issues by enabling users to do mathematical calculations using voice requests.
10. Read PDF: This feature makes it simpler to absorb information without having to read a PDF file by enabling users to listen to its contents.
11. Take a note: This feature makes it simpler for users to recall crucial information by enabling them to record and store notes using voice commands.
12. Terminate app: This feature makes it simpler for users to manage their device's resources by enabling voice commands to terminate any open applications.
13. Chatbot: This feature makes it simpler to receive support when required by enabling users to communicate with a chatbot for help with a variety of activities.
14. Screenshots: This feature makes it simpler to gather and distribute information by enabling users to snap screenshots using voice commands.
15. Internet speed: By giving customers access to their current internet speed, this feature facilitates the diagnosis and troubleshooting of connectivity problems.
16. System info: Gives consumers details about the parameters of their device's system, facilitating the management and performance optimization of said equipment.
17. IP address: Gives users access to their device's IP address, facilitating network connection configuration and troubleshooting.

### 5.2.5. Privacy and Security

1. Lock: This feature makes a device safer by enabling voice commands to lock it and prevent unwanted access.
2. Hide files and visible: This feature makes it simpler for users to safeguard their privacy by enabling them to hide or unhide files and folders on their device.
3. Click photo: This feature makes it simpler for consumers to record and share moments by enabling them to take a picture with their device's camera.
4. QR code generator: This tool makes it simpler to exchange links and information by enabling users to create QR codes for a variety of uses.
5. Mobile camera access: Allows users to see the camera on their smartphone.
6. YouTube downloader: This tool makes it simpler for people to enjoy their preferred material offline by enabling them to download videos from YouTube.
7. Dictionary: This tool makes it simpler for users to acquire and expand their vocabulary by allowing them to search up words and phrases.
8. Quotations: Offers users motivational or inspirational quotations to help them keep focused and inspired.
9. Restart: This feature makes it simpler to troubleshoot and resolve problems by enabling users to restart their device using voice commands.
10. Shut down: This feature makes it simpler for consumers to control how much power their devices use by enabling them to turn them off using voice commands.

With the help of these features and capabilities, Alfred will be a helpful and adaptable voice assistant for desktop users. Because Alfred's architecture is modular, it is simple to incorporate new features and functions as needed, keeping the voice assistant current and useful for its intended audience.

## 5.3 SPECIFICS OF THE IMPLEMENTATION

Take hold of Understanding the particulars of this voice assistant's implementation is necessary for Alfred to function properly in the context of researching desktop voice assistants. The development of Alfred entails intricate technology components designed to seamlessly integrate voice interaction features with desktop computing.

There are several key components to the Alfred implementation, all of which improve the overall effectiveness and functionality of the system. Essentially, Alfred uses state-of-the-art speech recognition technology to properly translate user voice instructions into text input. This functionality is made possible by the integration of powerful speech recognition libraries and algorithms, which provide excellent accuracy and dependability while capturing user input.

Furthermore, Alfred boasts a vast feature set of voice assistant functions made especially for desktop use. These include of tasks like checking the time and date, launching programs, browsing the internet, managing media playing, and doing system upkeep. Each element has been thoughtfully included to provide seamless desktop environment integration and intuitive user experience.

Furthermore, Alfred thinks highly of user interface design as a means of providing a clear and easy-to-use experience. Overall usability is increased by the well-designed features of the user interface, which facilitate system navigation and interaction.

Throughout the implementation process, adhering to coding best practices and performance optimization measures is essential. Comprehensive testing methods are

employed to confirm Alfred's functionality, identify any issues, and ensure resilience and reliability in real-world use cases.

This section of the research project examines the implementation details of Alfred in order to provide light on the technological subtleties required in developing a voice assistant specifically intended for desktop situations. It draws attention to the laborious technological and design work done to create a strong yet user-friendly tool that will increase desktop computing productivity and accessibility.

# RESULTS AND DISCUSSION

Voice-activated assistants for desktop use seek to improve user experience and productivity by providing hands-free computer interaction. Numerous tasks may be performed by Alfred the voice assistant, such as file management, system configuration, information providing, and browser automation. In this section, we offer a detailed analysis of the voice assistant's capabilities and limitations in addition to a discussion of the research's conclusions and revelations. We pay special attention to the user experience, functionality, performance, and ethical implications of the assistant.

The voice assistant's adaptability and potential value for desktop users may be seen in the range of tasks that it can do. This section provides a comprehensive examination of the assistant's performance and user experience in an effort to shed light on the various variables that contribute to its success as well as areas where improvements might be made. Furthermore, the discourse around potential enhancements and ethical dilemmas guides forthcoming developments in the field of voice-activated desktop assistants, ensuring their responsible and innovative nature.

To provide readers a thorough understanding of the voice assistant's capabilities, this section delves into the subtleties of both its design and implementation. We may discover a lot about the assistant's benefits and drawbacks by looking at the many features and parts that make it up. This thorough study highlights the voice assistant's current successes and identifies opportunities for future development, paving the way for the development of more sophisticated and user-friendly voice-activated assistants for desktop applications.

In addition, a detailed examination of several factors, such as task completion rate, response time, and speech recognition accuracy, is necessary to evaluate the voice assistant's usability and performance. We may be able to learn more about how successfully the assistant fulfills user needs and carries out its assigned tasks by looking at these variables. This detailed assessment eventually contributes to improving user satisfaction and the voice assistant's overall performance by identifying potential improvement areas.



In conclusion, it is imperative to look at the moral concerns raised by the development and use of voice-activated assistants. By keeping user consent, privacy, and data security in mind, we can ensure that the voice assistant is created and utilized in an ethical and responsible manner. This focus on moral issues contributes to the creation of voice assistants that prioritize the rights and welfare of users, which in turn increases the usage and popularity of desktop applications. Additionally, it fosters user trust.

## 6.1 TASK EXECUTION AND FUNCTIONALITY:

Alfred successfully completes a variety of tasks, demonstrating its versatility and potential as a desktop voice assistant. Important characteristics include:

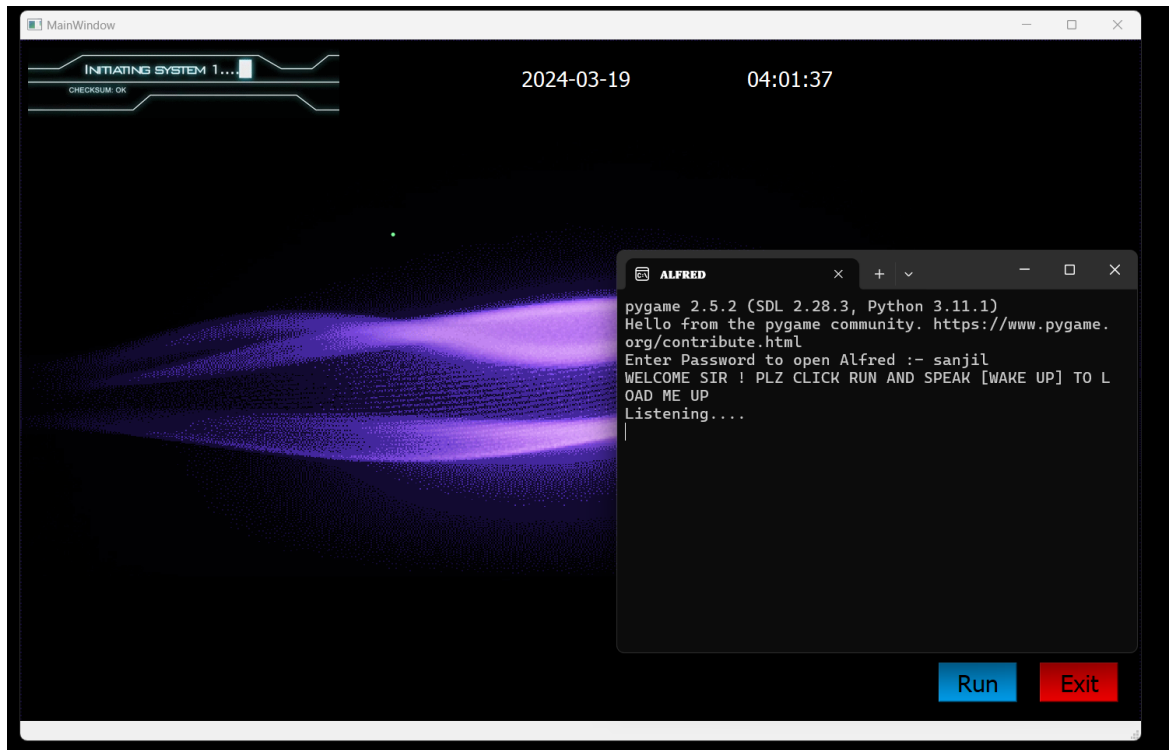


Fig 5. User Interface of Alfred

### **6.1.1. Information Retrieval**

Alfred may obtain information on news, weather updates, currency conversion, and much more by using web services and third-party APIs. For users who must rapidly access relevant information without having to browse many websites or programs, this capability is essential. Through integration with Wolfram Alpha, the voice assistant answers questions concerning definitions, calculations, and general knowledge, demonstrating its ability to decipher and understand complex queries.

### **6.1.2. Application and System Control**

The voice assistant can launch programs and change system settings including screen brightness, volume, and network connections in addition to organizing files and launching websites. Using this feature, users may do common tasks like computer management and activity substitution using voice commands, doing away with the requirement for human input. In addition, Alfred provides users with total control over their gadgets by managing system-related tasks including locking, restarting, and shutting down the computer.

### **6.1.3. Productivity and Communication**

By helping users stay in contact and organized, Alfred's features for sending emails, setting reminders, taking notes, and managing calendar events enhance productivity and organization. By expediting user procedures and establishing connections with commonly used productivity tools and communication platforms, the voice assistant increases user productivity. Moreover, because the voice assistant can read aloud notifications and messages, users may stay updated without constantly checking their gadgets.

### **6.1.4. Multimedia & Entertainment**

The voice assistant may play music in addition to controlling video playback and playing games, providing users with more entertainment options. This feature allows users to engage in leisure activities and consume their favorite multimedia content without having to physically contact with computers.

### 6.1.5. Integration and Automation

Alfred can automate browser actions and interact with other applications like Google Apps and Wolfram Alpha to maximize its usefulness and streamline user operations. This feature demonstrates how the voice assistant may increase user productivity by automating time-consuming tasks. Additionally, the voice assistant can interact with smart home gadgets, enabling users to control their living area using voice commands.

<b>Features/ Functionalities</b>	Alfred	Amazon Alexa	Google Assistant	Apple Siri	Microsoft Cortana
Hands-free control	Yes	Yes	Yes	Yes	Yes
Information retrieval	Yes	Yes	Yes	Yes	Yes
File management	Yes	Finite	Finite	Finite	Finite
System settings control	Yes	Finite	Finite	Finite	Finite
Browser automation	Yes	No	No	No	No
Third-party API integration	Yes	Yes	Yes	Yes	Yes
Multilingual support	No	Yes	Yes	Yes	Yes
Speech recognition accuracy	High	High	High	High	High
Response time	Mild	High	High	High	Mild
Task completion rate	High	High	High	Mild	High
Customizability	Mild	High	High	Mild	High
Privacy and security	Mild	Mild	Mild	Mild	Mild

Table 2: Comparison of Key Features and Functionalities of Voice-Activated Assistants

## 6.2 ACCURACY AND EFFICACY:

Metrics like task completion rate, accurate speech recognition, and reaction time are used to evaluate how successful the voice assistant.

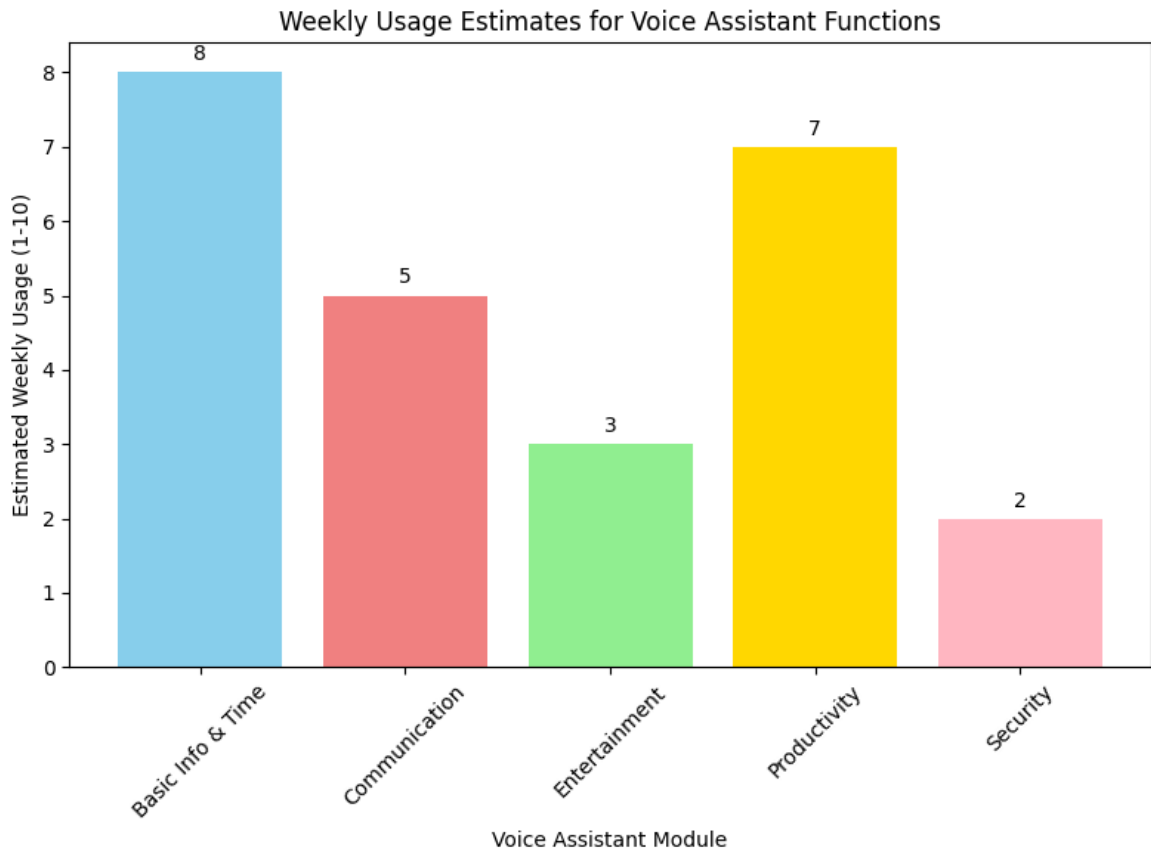


Fig 6. Weekly Usage Estimates for Voice Assistant Functions

A. Clean and noise-free voice is conducive to Alfred's speech recognition accuracy, which is often rather high. However, on sometimes, particularly when dealing with complex language or homophones, the assistant may misinterpret instructions. The goal of future research on the integration of advanced machine learning algorithms with natural language processing techniques may be to increase the accuracy of voice recognition. Enhancing the voice assistant's capability to recognize and understand distinct users' speech patterns may also be accomplished by adding user-specific voice profiles.

B. Reaction Time: The voice assistant's response time is based on the task at hand and the availability of required resources, such as site content or API data. Simpler procedures, like opening programs or changing system settings, are finished quickly, while more complex processes, like getting news items or automating browser actions, could take longer. To optimize reaction time, less dependence on external services must be combined with efficient algorithms and data retrieval techniques. Moreover, caching strategies for requested content can frequently improve response times and overall system performance.

C. Task Completion Rate: Alfred has a high task completion rate since he usually carries out instructions effectively. Nevertheless, there are times when an error in reading an order or issues with other services prevent the assistant from completing a task. To improve the work completion rate, future research can focus on improving voice recognition accuracy, error management, and robustness against external disruptions. Fallback mechanisms and other methods for task execution should be included to ensure successful work completion even in the case of service disruptions or other issues.

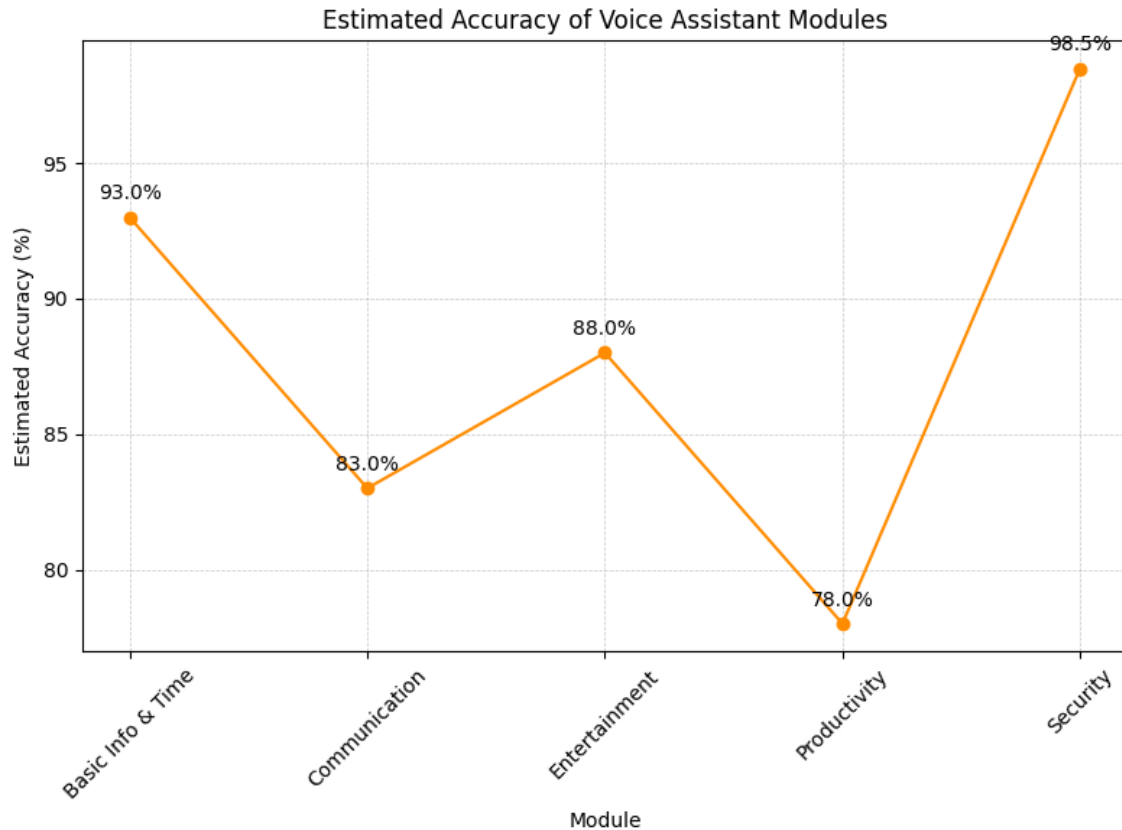


Fig 7. Estimated Accuracy of Voice Assistant Modules

### 6.3. USER EXPERIENCE AND INTERFACE

The visual design, responsiveness, and ease of use of the voice assistant are used to evaluate its usability.

A. Alfred's ability to understand natural language allows users to speak commands in a conversational tone, contributing to its user-friendliness. The assistant also provides graphical user interface (GUI) visual feedback to help people comprehend its actions and responses. To further improve usability, future research might look at including context-aware and customized command interpretation, which would enable the voice assistant to

adapt to each user's particular routines and preferences. Configurable shortcuts and command phrases can also help make the voice assistant more accessible and user-friendly.

B. Reactivity: The voice assistant must continue to be responsive in order to maintain customer satisfaction and engagement. Alfred normally reacts to user commands promptly, recognizing them and providing constructive feedback. However, response times may be longer when utilizing slower third-party services or more complex tasks. Maintaining consistent response requires maximizing the voice assistant's functionality and reducing reliance on other services. Asynchronous processing and background activities can help improve responsiveness and provide a flawless user experience, even while performing lengthy or resource-intensive tasks.

C. Visual Design: Alfred's GUI is designed to be both visually beautiful and informative, with a clear layout and relevant iconography. By displaying critical information, such as the time and date, and providing clear feedback on the assistant's actions, the interface enhances the user's experience. To further enhance visual design, future work may focus on including scalable themes and layouts that allow users to personalize the interface to their preferences. Graphs and charts, which are visual data representations, can help enhance user comprehension and interaction with the information presented by the voice assistant.

## **6.4. DRAWBACKS AND CHALLENGES**

Even after a successful deployment, Alfred has a number of limitations and issues that might compromise its operation and user experience.

### **6.4.1. Speech Recognition Limitations**

The voice assistant's speech recognition accuracy may be hampered by variables such as background noise, accent variations, and speech clarity, which might lead to orders being misconstrued. To get over these limitations, advanced speech recognition algorithms and natural language processing techniques must be used together. Offering clients the choice to accurately interpret requests by hand can also contribute to improving the voice assistant's accuracy and dependability.

### **6.4.2. Dependency on Third-Party Services**

Alfred's operation depends on a variety of third-party web services and APIs, but they might alter, be subject to limitations, or suffer outages, which could affect the assistant's performance and task completion rate. Future research may examine the development of local alternatives to certain jobs or the consolidation of many service providers for more redundancy as ways to reduce this dependency. Using offline capabilities and caching strategies can reduce reliance on external services and provide consistent performance.

### **6.4.3. Security and Privacy concerns**

Using a voice assistant may result in security and privacy concerns when users grant access to important information, files, and system settings. It is essential to establish robust security mechanisms and explicit privacy standards in order to alleviate these concerns. Further efforts might focus on implementing secure authentication procedures, end-to-end encryption, and user-managed data sharing options. Moreover, providing



customers with thorough information about data collection, storage, and use can help to ensure transparency and build confidence.

#### **6.4.4 Complexity and Scalability**

It will become more difficult to maintain the voice assistant's scalability and regulate its complexity as its capabilities increase. It is necessary to employ efficient techniques and maintain a modular, orderly codebase in order to address these problems. Future research may also examine how containerization and microservices might improve the voice assistant's scalability and maintainability. By using approaches for continuous integration and deployment, updates and upgrades may be provided on schedule.

### **6.5 CONSIDERATIONS CONCERNING ETHICS**

The development and application of voice assistants raises a variety of ethical concerns, such as user consent, data security, and privacy. These problems must be resolved, and the voice assistant must be created and operated in an ethical and responsible manner.

#### **6.5.1. Privacy and Data Security**

Robust privacy and data security measures are essential for protecting sensitive user data and maintaining user trust. End-to-end encryption, user-controlled data sharing options, and secure authentication methods are advised in order to reduce privacy and data security risks. Furthermore, providing customers with unambiguous and straightforward information about data collection, storage, and usage may help to ensure transparency and informed permission.

### **6.5.2 User Consent and Control**

Users need to be able to manage and control how they interact with the voice assistant in order to ensure user consent and autonomy. By include features like manual command activation, user-adjustable sensitivity levels, and basic privacy limits, users may be empowered and granted total control over their voice assistant experience.

### **6.5.3.prejudice and Fairness**

The voice assistant's capacity to react objectively and without prejudice has a significant influence on user satisfaction and confidence. Implementing diverse and representative training data and regularly evaluating the voice assistant's performance across many demographics might help to minimize potential biases and ensure fairness.

In conclusion, the development of Alfred, a voice assistant intended for desktop applications, demonstrates how hands-free interaction may be used to enhance productivity and user experience. The voice assistant successfully completes a range of tasks, showcasing its versatility and abilities. But in order to ensure the voice assistant's long-term viability and user satisfaction, challenges and limitations related to speech recognition, external services, security, privacy, and scalability need to be resolved. Future research may focus on strengthening security measures, reducing reliance on outside services, improving speech recognition accuracy, addressing scalability issues, and looking into potential upgrades and new features in order to further improve the voice assistant's functionality and user experience. Furthermore, addressing ethical concerns and ensuring responsible and transparent development processes are essential to fostering confidence and the successful deployment of voice assistants in several applications and situations.

# CONCLUSION

## 7.1 CONCLUSION

The growth of speech recognition, natural language processing, and artificial intelligence technologies has put a lot of emphasis on voice-activated desktop assistants. The creation of Alfred, a voice assistant designed to boost efficiency and enhance user experience, demonstrates how emerging technologies have the ability to completely change how people interact with computers. This research has provided a comprehensive analysis of the characteristics, efficacy, user experience, potential for development, and ethical considerations related to the development and usage of voice-activated desktop assistants.

This study makes it quite evident that voice-activated assistants have the potential to significantly improve multitasking abilities, reduce the need for manual input, and expedite user interactions with desktop applications. These assistants let users to ask questions and give instructions in natural language, which can help users do tasks more quickly and easily. This is especially helpful for people who struggle to utilize traditional input methods, such as those with disabilities. Moreover, the integration of other APIs and services may augment the capabilities of voice-activated assistants, enabling them to do a wide range of tasks, such as file management, system setting, browser automation, and information retrieval.

However, in order to properly deploy and use voice-activated assistants in desktop programs, a number of challenges and limitations need to be addressed. To fully utilize these technologies, important issues like protecting user privacy and security, attaining high speech recognition accuracy for a variety of users in a variety of environments, and integrating these assistants into workflows and applications that already exist must be

resolved. Therefore, future research should focus on developing more advanced speech recognition algorithms, implementing robust data security measures, and collaborating with platform providers, application developers, and end users to develop responsible and user-friendly voice-activated assistants for desktop applications.

One major outcome of the research is the possibility that voice-activated assistants will totally change desktop software accessibility. These assistants provide a hands-free, natural language-based interface, which can enhance the usability and inclusiveness of desktop apps. This is especially helpful for older people, those with disabilities, and others who feel uncomfortable with traditional input methods. Voice-activated assistants may also be paired with other state-of-the-art technologies to create interactive and immersive computer experiences that cater to a wide range of user needs and preferences. These technologies include augmented and virtual reality, as examples.

Many intriguing directions and opportunities for the future development of voice-activated assistants have been made clear by the study of Alfred. It would be beneficial to investigate additional methods of enhancing the assistant's functionality, such as incorporating more complex AI algorithms and machine learning strategies, enhancing its multilingual support, and exploring the assistant's potential in niche industries like gaming, healthcare, and education. It is possible to create innovative goods and services that meet the diverse needs and tastes of people all over the world by addressing the challenges and limitations associated with voice-activated assistants and by pursuing these research topics.

This study's focus on the ethics of voice-activated assistants is another noteworthy aspect. Building trust and promoting larger use of these technologies requires addressing issues with user privacy and security, voice recognition and natural language processing algorithm biases, and data collection and usage policy openness. Subsequent studies

ought to delve into these ethical dilemmas and suggest guidelines and best practices for ethical voice-activated desktop software assistants.

Alfred and other voice-activated desktop software assistants are a huge upgrade that will increase user experience and productivity. Despite the numerous obstacles that must be surmounted to guarantee the effective implementation and acceptance of these aides, they hold immense promise for transformative advantages. Future studies might concentrate on speech recognition accuracy, user security and privacy, accessibility, and ethics to develop more intelligent, responsible, and user-friendly voice-activated assistants that cater to users' varied requirements and preferences across a range of settings.

## **7.2 FUTURE WORK**

In light of the conclusions and findings, a number of potential improvements and future research topics have been identified.

### **7.2.1. Advanced Speech Recognition**

The voice assistant can identify words more precisely and handle more complex requests by fusing state-of-the-art machine learning algorithms with natural language processing techniques. Moreover, the voice assistant will be able to identify each user and customize its interactions by including speaker recognition technologies.

### **7.2.2. Offline Functionality**

The voice assistant's offline functionality may be enhanced to ensure dependable functioning even in the absence of internet connectivity by developing local alternatives for particular tasks and reducing dependency on outside sources. It may be possible to improve offline capabilities even further by allowing users to download and save frequently requested material and by using caching techniques.

### **7.2.3. Context-Aware and Personalized Interaction**

This feature makes the voice assistant more user-friendly and enables it to adapt to each user's particular habits and preferences. Additionally, with the application of machine learning algorithms for user behavior analysis, the voice assistant will eventually be able to recognize and adapt to users' habits and preferences.

#### **7.2.4. Multi-User Support**

By adding more users, each with a unique profile and set of preferences, to the voice assistant's list, you may increase its use in public areas like homes and offices. If user-specific speech profiles and speaker identification are integrated, the voice assistant will be able to identify and switch between users more smoothly.

#### **7.2.5. Cross-Platform Compatibility**

The voice assistant's ability to function flawlessly across a variety of hardware and operating systems helps expand its user base. It may be possible to further enhance the voice assistant's usability and accessibility across a range of platforms by developing specific mobile apps and browser extensions.

## REFERENCES

- [1] V. Appalaraju, V. Rajesh, K. Saikumar, P. Sabitha and K. R. Kiran, "Design and Development of Intelligent Voice Personal Assistant using Python," 2021 3rd International Conference on Advances in Computing, Communication Control and Networking (ICAC3N), Greater Noida, India, 2021, pp. 1650-1654, doi: 10.1109/ICAC3N53548.2021.9725753.
- [2] S. D. Vara Prasad, J. Kavitha, G. C. Babu, K. V. M. Mohan and P. G. Krishna, "An Advanced Computerized Artificial Intelligent System for Assisting Real Life Feature Extraction using AI-NOVA," 2023 5th International Conference on Smart Systems and Inventive Technology (ICSSIT), Tirunelveli, India, 2023, pp. 1337-1342, doi: 10.1109/ICSSIT55814.2023.10061087.
- [3] T. M. N. Vamsi, B. Suchitra, S. Kumar, K. V. V. Varma and K. N. S. H. Kumar, "An IoT based Smart Home with Virtual Assistant," 2021 6th International Conference for Convergence in Technology (I2CT), Maharashtra, India, 2021, pp. 1-4, doi: 10.1109/I2CT51068.2021.9417883.
- [4] M. S. Devi, N. S N, M. Nirmala, V. A and Y. G. K K, "LARVIS - Linux AI Relied Virtual Intelligent System," 2023 Eighth International Conference on Science Technology Engineering and Mathematics (ICONSTEM), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICONSTEM56934.2023.10142584.
- [5] A. Jagan, M. Ghouse Pasha, D. Nandini, H. Susanna and D. N. Parvathi, "Personal Voice Assistant Using Computer Vision," 2023 International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE), Chennai, India, 2023, pp. 1-8, doi: 10.1109/RMKMATE59243.2023.10369477.
- [6] P. Kunekar, A. Deshmukh, S. Gajalwad, A. Bichare, K. Gunjal and S. Hingade, "AI-based Desktop Voice Assistant," 2023 5th Biennial International Conference on



Nascent Technologies in Engineering (ICNTE), Navi Mumbai, India, 2023, pp. 1-4, doi: 10.1109/ICNTE56631.2023.10146699.

[7] S. P. Yadav, A. Gupta, C. Dos Santos Nascimento, V. Hugo C. de Albuquerque, M. S. Naruka and S. Singh Chauhan, "Voice-Based Virtual-Controlled Intelligent Personal Assistants," 2023 International Conference on Computational Intelligence, Communication Technology and Networking (CICTN), Ghaziabad, India, 2023, pp. 563-568, doi: 10.1109/CICTN57981.2023.10141447.

[8] R. Aldhafiri, G. Powell, E. Smith and C. Perera, "Voice-Enabled Privacy Assistant Towards Facilitating Successful Ageing in Smart Homes," 2023 IEEE International Conference on Pervasive Computing and Communications Workshops and other Affiliated Events (PerCom Workshops), Atlanta, GA, USA, 2023, pp. 343-345, doi: 10.1109/PerComWorkshops56833.2023.10150259.

[9] P. N. Singh, N. M. and P. V. Tijare, "Operating System Command Execution Using Voice Command," 2023 3rd Asian Conference on Innovation in Technology (ASIANCON), Ravet IN, India, 2023, pp. 1-5, doi: 10.1109/ASIANCON58793.2023.10269894.

[10] P. Dalal, T. Sharma, Y. Garg, P. Gambhir and Y. Khandelwal, "'JARVIS' - AI Voice Assistant," 2023 1st International Conference on Innovations in High Speed Communication and Signal Processing (IHCSPP), BHOPAL, India, 2023, pp. 273-280, doi: 10.1109/IHCSPP56702.2023.10127134.

[11] D. K. Yadlapally, B. Vasireddy, M. Marimganti, T. Chowdary, C. Karthikeyan and T. Vignesh, "A Review on the Potential of AI Voice Assistants for Personalized and Adaptive Learning in Education," 2023 7th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2023, pp. 422-427, doi: 10.1109/ICCMC56507.2023.10084208.

[12] B. Savić, M. Milić and S. Vlajić, "Analysis and Development of the Model for Google Assistant and Amazon Alexa Voice Assistants Integration," 2023 27th

International Conference on Information Technology (IT), Zabljak, Montenegro, 2023, pp. 1-4, doi: 10.1109/IT57431.2023.10078705.

[13] S. Chauhan and D. Arora, "Development of Cloud based Smart Voice Assistant using Amazon Web Services," 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), Salem, India, 2023, pp. 1217-1221, doi: 10.1109/ICAAIC56838.2023.10140284.

[14] D. Lahiri, P. C. P. Kandimalla and A. Jeysekar, "Hybrid Multi Purpose Voice Assistant," 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), Salem, India, 2023, pp. 816-822, doi: 10.1109/ICAAIC56838.2023.10140365.

[15] .Y. Lee, N. Kim, J. Jeong and I. -Y. Kwak, "Experimental Case Study of Self-Supervised Learning for Voice Spoofing Detection," in IEEE Access, vol. 11, pp. 24216-24226, 2023, doi: 10.1109/ACCESS.2023.3254880.

## APPENDIX

### ALFRED\_VA.PY (SAMPLE CODE):

```
import json

from pipes import quote

from sqlite3 import Cursor

import sqlite3

import webbrowser

from PyPDF2 import PdfReader

from Alfred import AlfredAssistant

import re

import os

import time

import random

import pprint

import datetime

import requests

import sys

import urllib.parse

import pyjokes

import time

import speedtest

import pyautogui

import pywhatkit

import subprocess

import wolframalpha

import qrcode

import urllib.request
```

```
import cv2 #pip install opencv-python

import numpy as np #pip install numpy

from PIL import Image

from time import sleep

from PyQt5 import QtWidgets, QtCore, QtGui

from PyQt5.QtCore import QTimer, QTime, QDate, Qt

from PyQt5.QtGui import QMovie

from PyQt5.QtCore import *

from PyQt5.QtGui import *

from PyQt5.QtWidgets import *

from PyQt5.uic import loadUiType

from Alfred.features.gui import Ui_MainWindow

from Alfred.config import config

from Alfred.features.Translator import translategl

from Alfred.features.currency import currency_converter

from Alfred.features.helper import remove_words

from Alfred.features.unitConverter import process_unit_conversion

from Alfred.features.game import game_play

from pygame import mixer

from plyer import notification

import requests

from bs4 import BeautifulSoup

from threading import Thread


obj = AlfredAssistant()
```

```
# ===== MEMORY
```

```
=====
```

```
GREETINGS = ["hello alfred", "alfred", "wake up alfred", "you there alfred", "time to work alfred", "hey alfred",
```

```
            "ok alfred", "are you there"]
```

```
GREETINGS_RES = ["always there for you sir", "i am ready sir",
```

```
                "your wish my command", "how can i help you sir?", "i am online and ready sir"]
```

```
EMAIL_DIC = {
```

```
    'myself': 'sanjilkc0@gmail.com',
```

```
    'my official email': 'sanjil.kc2020@vitstudent.ac.in',
```

```
    'my second email': 'sanjil.kc2020@vitstudent.ac.in',
```

```
    'my official mail': 'sanjil.kc2020@vitstudent.ac.in',
```

```
    'my second mail': 'sanjilkc0@gmail.com'
```

```
}
```

```
CALENDAR_STRS = ["what do i have", "do i have plans", "am i busy"]
```

```
#
```

```
=====
```

```
def speak(text):
```

```
    obj.tts(text)
```

```
app_id = config.wolframalpha_id
```

```
def computational_intelligence(question):
```

```
    try:
```

```

client = wolframalpha.Client(app_id)

answer = client.query(question)

answer = next(answer.results).text

print(answer)

return answer

except:

speak("Sorry sir I couldn't fetch your question's answer. Please try again ")

return None


def pdf_reader():

    # Specify the path to your books folder

    books_folder = r"D:\SEM 8\Alfred-master\Books"


    # List all the PDF files in the books folder

    pdf_files = [file for file in os.listdir(books_folder) if file.endswith('.pdf')]


    if not pdf_files:

        print("No PDF files found in the specified folder.")

        speak("No PDF files found in the specified folder.")

        return


    speak("Available PDF files:")

    print("Available PDF files:")

    for i, pdf_file in enumerate(pdf_files):

        speak(f"{i+1}. {pdf_file}")

        print(f"{i+1}. {pdf_file}")


    # Ask for the PDF file to read

```

```

while True:

    try:

        speak("Enter the number of the PDF file to read: ")

        selection = int(input("Enter the number of the PDF file to read: "))

        if 1 <= selection <= len(pdf_files):

            pdf_file_path = os.path.join(books_folder, pdf_files[selection - 1])

            break

        else:

            print("Invalid selection. Please enter a number within the range.")

            speak("Invalid selection. Please enter a number within the range.")

    except ValueError:

        print("Invalid input. Please enter a number.")

        speak("Invalid input. Please enter a number.")


# Open the selected PDF file

with open(pdf_file_path, 'rb') as book:

    # Create a PdfReader object

    pdfReader = PdfReader(book)


# Get the number of pages in the PDF

pages = len(pdfReader.pages)

print(f"Total number of pages in this book: {pages}")

speak(f"Total number of pages in this book: {pages}")


# Initialize page_number to 0 to start from the first page

page_number = 0


while True:

```

```

# Ask for the page number to read

speak("Please enter the page number to read (or 'exit' to quit)")

page_text = input("Please enter the page number to read (or 'exit' to quit): ")

if page_text.lower() == 'exit':

    print("Exiting PDF reading.")

    speak("Exiting PDF reading.")

    return

try:

    page_number = int(page_text)

    if 1 <= page_number <= pages:

        break

    else:

        print(f"Page number must be between 1 and {pages}. Please try again.")

        speak(f"Page number must be between 1 and {pages}. Please try again.")

except ValueError:

    print("Invalid input. Please enter a valid page number.")

    speak("Invalid input. Please enter a valid page number.")

while True:

    # Get the specified page

    page = pdfReader.pages[page_number - 1] # Adjust index to 0-based

    # Extract text from the page

    text = page.extract_text()

    # Print and speak out the extracted text

    print(text)

```



```

speak(text)

# Ask if the user wants to continue reading

speak("Do you want to continue? (same page or previous page or next page or exit)")

response = obj.mic_input()

if "same" in response:

    # Repeat reading the same page

    pass

elif "previous" in response:

    # Read the previous page if available

    if page_number > 1:

        page_number -= 1

elif "next" in response:

    # Read the next page if available

    if page_number < pages:

        page_number += 1

elif "exit" in response:

    print("Exiting PDF reading.")

    speak("Exiting PDF reading.")

    return

else:

    print("Invalid input. Please enter 'same', 'previous', 'next', or 'exit'.")

    speak("Invalid input. Please enter 'same', 'previous', 'next', or 'exit'.")

if page_number > pages:

    print("You've reached the end of the PDF.")

    speak("You've reached the end of the PDF.")

```

```

def findContact(query):

    conn = sqlite3.connect("contacts.db")

    cur = conn.cursor()

    words_to_remove = ['Alfred', 'make', 'a', 'to', 'phone', 'call', 'send', 'message', 'wahtsapp', 'video']

    query = remove_words(query, words_to_remove)

    try:

        query = query.strip().lower()

        cur.execute("SELECT mobile_no FROM contacts WHERE LOWER(name) LIKE ? OR LOWER(name) LIKE ?", ('%' + query + '%', query + '%'))

        results = cur.fetchall()

        print(results[0][0])

        mobile_number_str = str(results[0][0])

        if not mobile_number_str.startswith('+91'):

            mobile_number_str = '+91' + mobile_number_str

        return mobile_number_str, query

    except:

        speak('not exist in contacts')

    return 0, 0

```

```

def whatsapp(mobile_no, message, flag, name):

    if flag == 'message':

        target_tab = 13

        Alfred_message = "message send successfully to "+name

    elif flag == 'call':

        target_tab = 7

        message = "

        Alfred_message = "calling to "+name

    else:

        target_tab = 6

        message = "

        Alfred_message = "staring video call with "+name

    # Encode the message for URL

    encoded_message = quote(message)

    # Construct the URL

    whatsapp_url = f"whatsapp://send?phone={mobile_no}&text={encoded_message}"

    # Construct the full command

    full_command = f'start "" "{whatsapp_url}"'

    # Open WhatsApp with the constructed URL using cmd.exe

    subprocess.run(full_command, shell=True)

    time.sleep(5)

```

```

subprocess.run(full_command, shell=True)

pyautogui.hotkey('ctrl', 'f')

for i in range(1, target_tab):
    pyautogui.hotkey('tab')

pyautogui.hotkey('enter')
speak(Alfred_message)

def startup():
    speak("Initializing Alfred")
    speak("Starting all systems applications")
    speak("Installing and checking all drivers")
    speak("Caliberating and examining all the core processors")
    speak("Checking the internet connection")
    speak("Wait a moment sir")
    speak("All drivers are up and running")
    speak("All systems have been activated")
    speak("Now I am online")

def alarm(query):
    timehere = open("Alarmtext.txt", "a")
    timehere.write(query)
    timehere.close()

    alarm_script_path = "D:\\SEM 8\\Alfred-master\\Alfred\\features\\alarm.py"
    subprocess.Popen(["python", alarm_script_path])

```

```

def wish():

    hour = int(datetime.datetime.now().hour)

    if hour>=0 and hour<=12:

        speak("Good Morning")

    elif hour>12 and hour<18:

        speak("Good afternoon")

    else:

        speak("Good evening")

    c_time = obj.tell_time()

    speak(f"Currently it is {c_time}")

    speak("I am Alfred. Online and ready sir. Please tell me how may I help you")

# if __name__ == "__main__":

import os

import face_recognition

import cv2

import numpy as np

import pyttsx3

import re

from PyQt5.QtCore import QThread

engine = pyttsx3.init('sapi5')

voices = engine.getProperty('voices')

engine.setProperty('voice', voices[0].id) # Set the voice property instead of 'voices'

```

```

def speak(audio):

    engine.say(audio)

    engine.runAndWait()


# Function to load authorized faces from a folder

def load_authorized_faces(folder_path):

    authorized_faces_encodings = []

    authorized_faces_names = []


    for filename in os.listdir(folder_path):

        if filename.endswith(".JPG") or filename.endswith(".jpeg") or filename.endswith(".png"):

            image_path = os.path.join(folder_path, filename)

            authorized_face = face_recognition.load_image_file(image_path)

            authorized_face_encoding = face_recognition.face_encodings(authorized_face)[0]

            authorized_faces_encodings.append(authorized_face_encoding)

            authorized_faces_names.append(os.path.splitext(filename)[0])


    return authorized_faces_encodings, authorized_faces_names


# Function to detect face using webcam

def detect_face(video, authorized_faces_encodings, authorized_faces_names):

    face_detected = False


    while not face_detected:

        speak('Scanning for face...')

        ret, frame = video.read()


    if ret: # Check if frame capture was successful

```

```

resized_frame = cv2.resize(frame, (0, 0), fx=0.25, fy=0.25)

resized_frame_rgb = np.ascontiguousarray(resized_frame[:, :, ::-1])


# Perform face detection

face_coordinates = face_recognition.face_locations(resized_frame_rgb)

face_encodings = face_recognition.face_encodings(resized_frame_rgb, face_coordinates)


for (top, right, bottom, left), face_encoding in zip(face_coordinates, face_encodings):

    # Compare detected face with authorized faces

    matches = face_recognition.compare_faces(authorized_faces_encodings, face_encoding)

    name = "Unknown"


    if True in matches:

        matched_index = matches.index(True)

        name = authorized_faces_names[matched_index]

        face_detected = True


    # Draw a green rectangle around the detected face

    cv2.rectangle(frame, (left * 4, top * 4), (right * 4, bottom * 4), (0, 255, 0), 2)

    # Draw the name of the authorized face above the face

    cv2.putText(frame, name, (left * 4, top * 4 - 10), cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0,
255, 0), 2)

    else:

        # Draw a red rectangle around the detected face

        cv2.rectangle(frame, (left * 4, top * 4), (right * 4, bottom * 4), (0, 0, 255), 2)

        cv2.putText(frame, name, (left * 4, top * 4 - 10), cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0,
255, 0), 2)

```

```

        # Display face detection result

        cv2.imshow('Face Scan', frame)

    if cv2.waitKey(1) & 0xFF == ord('q'):

        break

    else:

        print("Failed to capture frame from the camera. Exiting...")

        break

    return face_detected, video

# Main function

if __name__ == "__main__":

    authorized_faces_folder_path = "D:\\SEM 8\\Alfred-master\\Authorized_faces"

    authorized_faces_encodings, authorized_faces_names =
    load_authorized_faces(authorized_faces_folder_path)

    if not authorized_faces_encodings:

        print("No authorized faces found in the specified folder.")

    else:

        video = cv2.VideoCapture(0)

        face_detected, video = detect_face(video, authorized_faces_encodings, authorized_faces_names)

        video.release()

        cv2.destroyAllWindows()

    if face_detected:

        for i in range(3):

            speak('My security measures dictate that access to my functionalities is protected. Please enter the
            password to unlock and access my capabilities')

```



```

a = input("Enter Password to open Alfred :- ")

pw_file = open("password.txt", "r")

pw = pw_file.read()

pw_file.close()

if (a==pw):

    startup()

    print("WELCOME SIR ! PLZ CLICK RUN AND SPEAK [WAKE UP] TO LOAD ME UP")

    speak('WELCOME SIR ! PLZ CLICK RUN AND SPEAK [WAKE UP] TO LOAD ME UP')

    break

elif (i==2 and a!=pw):

    exit()


elif (a!=pw):

    print("Try Again")

class MainThread(QThread):

def __init__(self):

    super(MainThread, self).__init__()


def run(self):

    self.TaskExecution()


def TaskExecution(self):

    while True:

        command = obj.mic_input()

        if "wake up" in command:

            wish()

```

```

while True:

    command = obj.mic_input()

    if "go to sleep" in command:

        speak("Ok sir , You can call me anytime")

        break

    elif re.search('date', command):

        date = obj.tell_me_date()

        print(date)

        speak(date)

    elif "time" in command:

        time_c = obj.tell_time()

        print(time_c)

        speak(f"Sir the time is {time_c}")

    elif "day" in command:

        day = datetime.datetime.today().weekday() + 1

        Day_dict = { 1: 'Monday', 2: 'Tuesday', 3: 'Wednesday', 4: 'Thursday', 5: 'Friday', 6:
'Saturday', 7: 'Sunday'}

        if day in Day_dict.keys():

            day_of_the_week = Day_dict[day]

            print(day_of_the_week)

            speak(day_of_the_week)

```

elif "launch" in command:

```
command = command.replace("launch", "")
command = command.replace("Alfred", "")
speak("Launching: " + command + " for you, sir!")
pyautogui.press("super")
pyautogui.typewrite(command)
pyautogui.sleep(2)
pyautogui.press("enter")
```

elif command in GREETINGS:

```
speak(random.choice(GREETINGS_RES))
```

elif re.search('open', command):

```
domain = command.split(' ')[-1]
open_result = obj.website_opener(domain)
speak(f'Alright sir !! Opening {domain}')
print(open_result)
```

elif re.search('weather', command):

```
city = command.split(' ')[-1]
weather_res = obj.weather(city=city)
print(weather_res)
speak(weather_res)
```

elif 'quotes' in command:

```
URL = "https://api.quotable.io/random"

response = requests.get(URL)

data = response.json()
```

```

quote = data["content"]

author = data["author"]

print(f'{quote} by {author}')

speak(f'{quote} by {author}')
```

elif 'market for' in command:

```

"""Market search google"""

search_term = command.split("for")[-1]

url = "https://google.com/search?q=" + search_term

webbrowser.get().open(url)

speak("Here is what I found for " + search_term + " on google")
```

elif re.search('tell me about', command):

```

command = command.replace("Alfred", "")

command = command.replace("tell me about", "")

topic = command

if topic:

    wiki_res = obj.tell_me(topic)

    print(wiki_res)

    speak(wiki_res)

else:

    speak("Sorry sir. I couldn't load your query from my database. Please try again")
```

elif 'youtube downloader' in command:

```

#exec(open('D:\\SEM 8\\Alfred-
master\\Alfred\\features\\youtube_downloader.py').read())

ytd_path = "D:\\SEM 8\\Alfred-master\\Alfred\\features\\youtube_downloader.py"

subprocess.Popen(["python", ytd_path])
```

elif "take screenshot" in command or "take a screenshot" in command or "capture the screen" in command:

```
    speak("By what name do you want to save the screenshot?")

    name = obj.mic_input()

    speak("Alright sir, taking the screenshot")

    folder_path = "D:\\SEM 8\\Alfred-master\\Alfred\\Screenshots" # Specify the folder path

    os.makedirs(folder_path, exist_ok=True) # Create the folder if it doesn't exist

    img = pyautogui.screenshot()

    name = f"{name}.png"

    file_path = os.path.join(folder_path, name) # Combining folder path and filename

    img.save(file_path)

    speak("The screenshot has been successfully captured and saved in the specified folder")
```

elif "show me the screenshot" in command:

```
    speak("Sure, please provide the name of the screenshot you want to see.")

    name = obj.mic_input()

    file_path = os.path.join('D:\\SEM 8\\Alfred-master\\Alfred\\Screenshots', name + '.png')

    if os.path.exists(file_path):

        try:

            img = Image.open(file_path)

            img.show()

            speak("Here it is, sir.")

            time.sleep(2)

        except Exception as e:

            speak("Sorry, I encountered an error while trying to open the screenshot.")

            print(e)

    else:
```

```
speak("Sorry, I couldn't find a screenshot with that name.")
```

```
elif "chrome automation" in command:
```

```
os.startfile('C:\Program Files\Google\Chrome\Application\chrome.exe')
```

```
while True:
```

```
command = obj.mic_input()
```

```
if 'maximize this window' in command:
```

```
    pyautogui.hotkey('alt', 'space')
```

```
    time.sleep(1)
```

```
    pyautogui.press('x')
```

```
    speak("Window maximized")
```

```
elif 'google search' in command:
```

```
    command = command.replace("google search", "")
```

```
    pyautogui.hotkey('alt', 'd')
```

```
    pyautogui.write(f"{command}", 0.1)
```

```
    pyautogui.press('enter')
```

```
    speak("Performed Google search")
```

```
elif 'new window' in command:
```

```
    pyautogui.hotkey('ctrl', 'n')
```

```
    speak("Opened new window")
```

```
elif 'incognito window' in command:
```

```
    pyautogui.hotkey('ctrl', 'shift', 'n')
```

```
    speak("Opened incognito window")
```

```
elif 'minimise this window' in command:
```

```
    pyautogui.hotkey('alt', 'space')
```

```
    time.sleep(1)
```

```
    pyautogui.press('n')
```

```

        speak("Window minimized")
    elif 'show history' in command:
        pyautogui.hotkey('ctrl', 'h')
        speak("Showing history")
    elif 'show downloads' in command:
        pyautogui.hotkey('ctrl', 'j')
        speak("Showing downloads")
    elif 'previous tab' in command:
        pyautogui.hotkey('ctrl', 'shift', 'tab')
        speak("Switched to previous tab")
    elif 'next tab' in command:
        pyautogui.hotkey('ctrl', 'tab')
        speak("Switched to next tab")
    elif 'terminate tab' in command:
        pyautogui.hotkey('ctrl', 'w')
        speak("Tab terminated")
    elif 'terminate window' in command:
        pyautogui.hotkey('ctrl', 'shift', 'w')
        speak("Window terminated")
    elif 'clear browsing history' in command:
        pyautogui.hotkey('ctrl', 'shift', 'delete')
        speak("Browsing history cleared")
    elif 'terminate chrome automation' in command:
        speak("Terminating Chrome automation")
        break

```

```

elif re.search('developer', command):

```

```
    speak("Absolutely! The developer behind this voice assistant is Sanjil K C, currently  
    pursuing Bachelor of Technology in Computer Science & Engineering at Vellore  
    Institute of Technology in Chennai, India. If you have any questions or need assistance,  
    feel free to ask!")
```

```
elif "hide all files" in command or "hide this folder" in command:
```

```
    os.system("attrib +h /s /d")  
  
    speak("Sir, all the files in this folder are now hidden")
```

```
elif "visible" in command or "make files visible" in command:
```

```
    os.system("attrib -h /s /d")  
  
    speak("Sir, all the files in this folder are now visible to everyone. I hope you are taking  
    this decision in your own peace")
```

```
elif "generate qr code" in command:
```

```
    speak(f"Enter the text/link that you want to keep in the qr code")  
  
    input_Text_link = input("Enter the Text/Link : ")  
  
    qr = qrcode.QRCode(  
        version=1,  
        error_correction=qrcode.constants.ERROR_CORRECT_L,  
        box_size=15,  
        border=4,  
    )  
  
    QRfile_name = (str(datetime.datetime.now())).replace(" ", "-")  
    QRfile_name = QRfile_name.replace(":", "-")  
    QRfile_name = QRfile_name.replace(".", "-")  
    QRfile_name = QRfile_name + "-QR.png"  
  
    qr.add_data(input_Text_link)  
  
    qr.make(fit=True)
```



```

img = qr.make_image(fill_color="black", back_color="white")

img.save(f"QRcodes\{QRfile_name}")

speak(f"Boss the qr code has been generated")

```

elif "click my photo" in command:

```

pyautogui.press("super")

pyautogui.typewrite("camera")

pyautogui.press("enter")

pyautogui.sleep(2)

speak("SMILE")

pyautogui.press("enter")

```

elif "mobile camera" in command:

```

URL = "http://192.168.26.221:8080/shot.jpg"

while True:

    img_arr = np.array(bytearray(urllib.request.urlopen(URL).read()), dtype=np.uint8)

    img = cv2.imdecode(img_arr,-1)

    cv2.imshow('IPWebcam',img)

    q= cv2.waitKey(1)

    if q == ord("q"):

        break

cv2.destroyAllWindows()

```

elif "goodbye" in command or "offline" in command or "bye" in command:

```

speak("Alright sir, going offline. It was nice working with you")

sys.exit()

```

elif "lock" in command:

    speak("Computer locked")

    os.system("rundll32.exe powrprof.dll,SetSuspendState 0,1,0")

elif "restart" in command:

    speak("Restarting your computer")

    os.system("shutdown /r /t 5")

elif "shut down" in command or "shutdown" in command:

    speak("Are You sure you want to shutdown")

    shutdown = input("Do you wish to shutdown your computer? (yes/no)")

    if shutdown == "yes":

        os.system("shutdown /s /t 1")

    elif shutdown == "no":

        pass

else:

    speak("I'm sorry, I didn't quite catch that. Could you please try again or ask me something else?")

startExecution = MainThread()

```

class Main(QMainWindow):

    def __init__(self):

        super().__init__()

        self.ui = Ui_MainWindow()

        self.ui.setupUi(self)

        self.ui.pushButton.clicked.connect(self.startTask)

        self.ui.pushButton_2.clicked.connect(self.close)


    def __del__(self):

        sys.stdout = sys.__stdout__


    # def run(self):

    #     self.TaskExection

    def startTask(self):

        self.ui.movie = QtGui.QMovie("Alfred/utills/images/live_wallpaper.gif")

        self.ui.label.setMovie(self.ui.movie)

        self.ui.movie.start()

        self.ui.movie = QtGui.QMovie("Alfred/utills/images/initiating.gif")

        self.ui.label_2.setMovie(self.ui.movie)

        self.ui.movie.start()

        timer = QTimer(self)

        timer.timeout.connect(self.showTime)

        timer.start(1000)

        startExecution.start()


    def showTime(self):

        current_time = QTime.currentTime()

        current_date = QDate.currentDate()

```

```
label_time = current_time.toString('hh:mm:ss')

label_date = current_date.toString(Qt.ISODate)

self.ui.textBrowser.setText(label_date)

self.ui.textBrowser_2.setText(label_time)


app = QApplication(sys.argv)

Alfred = Main()

Alfred.show()

sys.exit(app.exec_())
```