

PERSONAL ASSISTANT SOFTWARE USING ARDUINO

Honey Bhardwaj^{*1}, Arpita Singh Chauhan^{*2}, Nivedita Verma^{*3}, Shoeab Ahmed^{*4},
Vishnu Kant Soni^{*5}

^{*1,2,3,4}B.Tech Student, Department Of Computer science And Engineering, LCIT Bilaspur,
Bilaspur (C.G.), India.

^{*5}Assistant Professor, Department Of Computer science And Engineering, LCIT Bilaspur,
Bilaspur (C.G.), India.

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ABSTRACT

A Voice Assistant is one of the hot topics in the current world that are programs that listen to human's verbal commands and respond to them which makes it a human-computer/device interaction. In the current days, a voice assistant is everywhere which is a lot useful in these busy days. Nowadays, almost everyone in the current world is using voice assistant because it's everywhere starting from Google smartphone assistant which every five year old kid will know how to use because of the current world pandemic which makes them use smartphone till Amazon's Alexa which will be very useful to do work starting from entertaining the users to turning on and off the IOT products. One of the greatest features is that it will be very useful to even physically challenged people, for example, people who aren't able to walk use the Internet Of Things (IOT) feature to operate the household products and maintain them. So we tend to develop a voice assistant which will be very useful to the users, same as the other voice assistants which are currently in the world.

As a voice assistant it assists the user with day-to-day activities like a general human conversation, searching queries, reading the latest news, translating words, live weather, sending mail through voice command. The software uses a device's microphone to receive voice commands while the output takes place at the system's speaker. It is an amalgamation of various technologies: voice recognition, voice analysis, and language processing.

Keywords: 1. Jarvis, 2. Personal Assistant, 3. Voice Assistant, 4. Artificial Intelligence, 5. Natural Language Processing, 6. Human-Computer Interaction.

I. INTRODUCTION

The very first voice activated product was released in 1922 as Radio Rex. This toy was very simple, wherein a toy dog would stay inside the dog house until the user exclaimed its name, "Rex" at which point it would jump out of the house. This was all done by an electromagnet tuned to the frequency similar to the vowel found in the word Rex, and predated modern computers by over 20 years.

In the 21st century, human interaction is being replaced by automation very quickly. One of the main reasons for this change is performance. There's a drastic change in technology rather than advancement. In today's world, we train our machines to do our tasks by themselves or to think like humans using technologies like Machine Learning, Neural Network etc. Now in the current era, we can talk to our machine with the help of virtual assistants.

Virtual assistants are software programs that help you ease your day to day tasks, such as showing weather reports, giving daily news, searching the internet etc. They can take commands by voice. Voice based intelligent assistants need an invoking word or wake word to activate the listener, followed by the command. We have so many virtual assistants, such as Apple's Siri, Amazon's Alexa and Microsoft's Cortana and this has been an inspiration for us to do this as a project. This system is designed to be used efficiently on desktops. Voice assistants are programs on digital devices that listen and respond to verbal commands. A user can say, "What's the weather?" and the voice assistant will answer with the weather report for that day and location.

II. LITERATURE REVIEW

The field of virtual assistants having speech recognition has seen some major advancements or innovations. This is mainly because of its demand in devices like smartwatches or fitness bands, speakers, Bluetooth

earphones, mobile phones, laptops, television etc. Almost all the digital devices which are coming nowadays are coming with voice assistance which helps to control the device with speech recognition only. A new set of techniques is being developed constantly to improve the performance of voice automated search.

As the amount of data is increasing exponentially now known as Big Data the best way to improve the performance of virtual assistants with machine learning and train our devices according to the uses. Other major techniques that are equally important are Artificial Intelligence, Internet Of Things, Big Data access and management etc. With the use of voice assistants, we can automate the tasks easily, just give input to the machine in speech form and all the tasks will be done by it from converting your speech into texts to taking our keywords from the text and executing the query to give results to the user.

Machine Learning is just a subset of Artificial Intelligence. This has been one of the most helpful advancements in technology. Before AI we were ones who were upgrading technology to do a task but now the machine itself is able to counter new tasks and solve it without the need to involve humans to evolve it.

This has been helpful in my day to day lifestyle. From mobile phones to personal desktops to mechanical industries these assistants are in very much demand for automating tasks and increasing efficiency.

- **Abeed Sayyed (2021)** – presented a paper on Desktop Assistant AI using Python with IOT features and also used AI features along with a SQLite Database with the use of Python.
- **P. Krishnaraj (2021)** –presented a project on Portable Voice Recognition with GUI Automation. This system uses Google’s online speech recognition system for converting speech input to text along with Python.
- **Rajdip Paul (2021)** – presented a project named A Novel Python Based Voice Assistance System for reducing the hardware dependency of modern age physical servers. This author has proposed an assistant project with python as a backend supporting system calls, api calls and various features.
- **V. Geetha (2021)** – presented a project namedThe Voice Enabler Personal Assistant for PC using Python. This author has proposed an assistant project with python as a backend and features like turning our PC off or restarting it or reciting some latest news are just one voice command away.
- **Dimitrios Buhalis (2021)** – proposed a paper on In room Voice based AI Digital Assistant transforming on site hotel services and guests’ experiences, where voice command is used for hotel services.
- **Phillip Sprenghoiz (2021)** – has proposed Ok Google using virtual assistant for data collection in physiological and behavior research which is a survey mate that they have developed which is an extension of the Google Assistant that was used to check the reliability and validity of data collected by this test.
- **Benedict D.C (2020)** – proposed consumer decision to wait for an artificial intelligent voice assistant that will have a strong psychological reaction to the systems’ look on human-like behavior.

III. PROPOSED METHODOLOGY

EXISTING SYSTEM

From the above literature survey, we have inferred that all the systems existing predict only particular diseases namely lung cancer, breast cancer, heart diseases, diabetes by implementing various algorithm on the particular dataset.

After implementing various algorithms, the most accurate one is selected and it is used for prediction of diseases. Sometimes we may get confused about what algorithm to use. Also all the systems find only the particular diseases and not the disease based on the symptoms.

PROPOSED SYSTEM

We are proposing the system in an efficient way of implementing a Personal Voice Assistant, speech recognition library has many in-built functions that will let the assistant understand the command given by the user and the response will be sent back to the user in voice, with Text to Speech functions. When an assistant captures the voice command given by the user, the underlying algorithm will convert the voice into text. And according to the keyword present in the text, respective actions will be performed.

This is made possible with the functions present in different libraries. Also the assistant will be able to achieve all the functionalities with the help of some API's. We had used these API's for functionalities like performing calculations, extracting news from website resources and for telling the weather. We will be sending a request and through the API we will be getting the respective output. APIs like WOLFRAMALPHA, are very helpful in performing things like calculations, making small web searches and for getting the data from the web. In this way we are able to extract news from various sources , and send them as input to a function for further purposes.

The Speech Application Programming or SAPI is an API developed by Microsoft to allow the use of speech recognition and speech synthesis within Windows applications. Then we define the speak function to enable the program to speak the outputs. After that we will define a function to take voice command using the system microphone. The main function is then defined where all the capabilities of the program are defined.

The following is a high level system design description for a personal desktop voice assistant.

User Interface: This should be intuitive and easy to use. The user should be able to interact with the voice assistant through NLP.

Speech Recognition: The system should have a robust speech recognition module that can accurately convert the user's voice commands into text. It should be able to distinguish between different users and adapt to their speech patterns.

Natural Language Processing: It should have an NLP module that can interpret the user's text commands and extract relevant information. It should be able to identify the user's intent and provide appropriate responses.

Knowledge Base: It contains information on a wide range of topics. It should be regularly updated to ensure that voice assistants can provide accurate and up-to-date information.

Machine Learning: The system should use ML algorithms to continuously improve its performance. It can also be used to improve speech recognition ability, NLP performance and user interaction.

APIs: The system should be able to integrate with other applications and services through APIs. This will enable the voice assistant to provide more comprehensive responses to user requests.

Privacy and Security: The system should be able to protect user privacy and ensure that user data is secure.

User Personalization: The system should be able to personalize the user experience based on the user's preferences and previous interaction.

Action Fulfillment: Once the intent of the user's request is identified, the system will execute the necessary action.

Response Generation: Finally, the system will generate a response to confirm that the requested action has been completed. The response could be as simple as a confirmation message or it could be more detailed providing additional information.

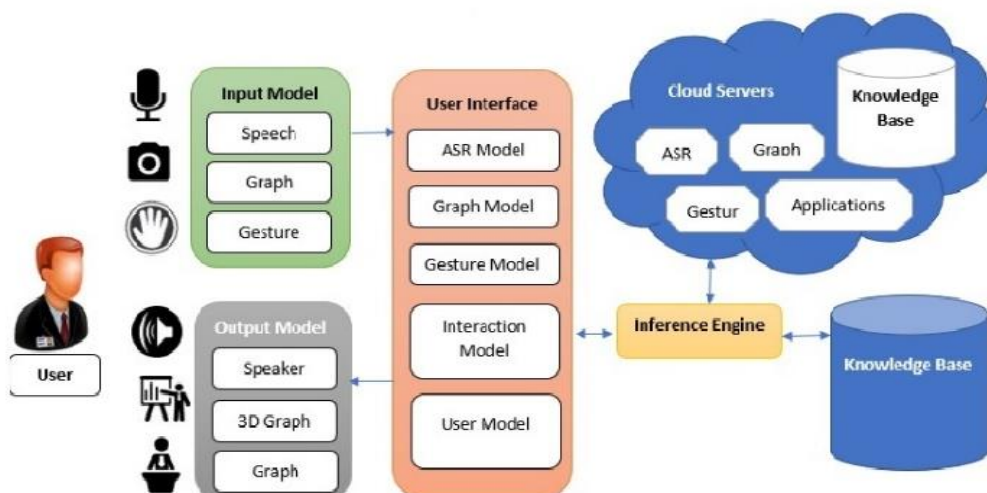


Fig 1:

USER-CASE DIAGRAM

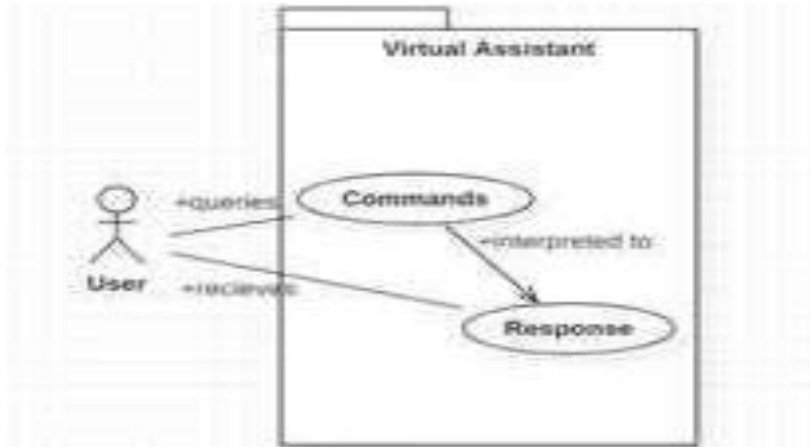


Fig 2:

In this project there is only one user. The user queries command to the system. System then interprets it and fetches an answer. The response is sent back to the user.

SEQUENCE DIAGRAM

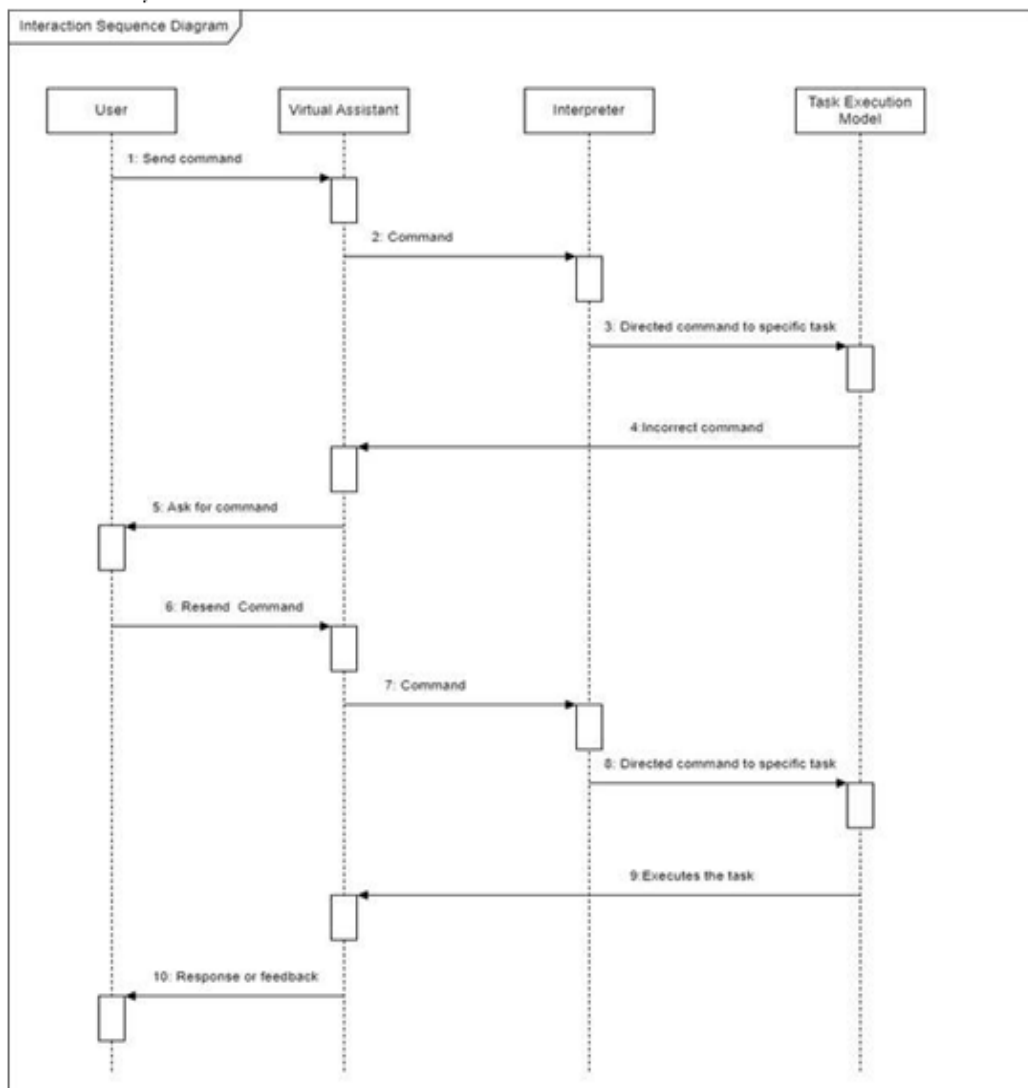


Fig 3: Sequence Diagram

- ✓ The user sends commands to the virtual assistant in audio form. The command is passed to the interpreter. It identifies what the user has asked and directs it to the taskexecutor. If the task is missing some information, the virtual assistant asks the user back about it. The received information is sent back to task and it is accomplished. After execution feedback is sent back to the user.
- ✓ The above sequence diagram shows how an answer asked by the user is being fetched from the internet. The audio query is interpreted and sent to Web scraper. The web scraper searches and finds the answer. It is then sent back to the speaker, where it speaks the answer to the user.

IV. OBJECTIVE OF PROJECT

1. **Administrative Support:** Virtual assistants often provide administrative tasks such as email management, scheduling appointments, data entry, and document preparation to help clients stay organized and efficient.
2. **Time Management:** VAs help clients save time by handling routine and time-consuming tasks, allowing them to focus on higher-priority activities.
3. **Customer Support:** Virtual assistants may interact with customers, respond to inquiries, and provide support through various communication channels such as email, chat, or phone.
4. **Research:** VAs conduct research on various topics, including market research, competitor analysis, product research, and more to help clients make informed decisions.
5. **Content Creation:** Some virtual assistants are skilled in content creation, including writing blog posts, creating social media content, or producing graphic design and multimedia content.
6. **Social Media Management:** Virtual assistants can manage social media accounts, schedule posts, and engage with followers to help clients maintain a strong online presence.
7. **Project Management:** VAs assist in project planning, coordination, and tracking tasks to ensure projects are completed on time and within budget.
8. **Data Analysis:** Some virtual assistants have expertise in data analysis and can help clients make data-driven decisions, create reports, and interpret data.
9. **Sales and Marketing Support:** Virtual assistants can help with lead generation, email marketing, cold calling, and other sales and marketing tasks to promote products or services.
10. **Personal Tasks:** VAs may assist with personal tasks such as travel planning, booking appointments, shopping, and managing household matters.
11. **Technical Support:** Some VAs provide technical assistance, troubleshoot IT issues, and help clients with software and hardware-related problems.
12. **Language Translation:** For clients with multilingual needs, virtual assistants may provide translation services to bridge language barriers.
13. **Event Planning:** Virtual assistants can assist in planning and coordinating events, including conferences, meetings, or social gatherings.
14. **Financial and Bookkeeping Tasks:** VAs may handle bookkeeping, expense tracking, invoicing, and financial record-keeping for businesses.
15. **Online Presence Management:** VAs help clients maintain a positive online reputation, manage online reviews, and handle online customer interactions.

V. PROBLEM IDENTIFICATION

Problem identification is a critical step in the development and implementation of any technology, including a personal assistant system like Jarvis. It involves identifying and defining the challenges, pain points, and opportunities that the system aims to address. Below are key aspects of problem identification in the context of developing a personal assistant system:

- **User Needs Assessment:** Understanding the needs, preferences, and behaviors of the target users is essential for identifying relevant problems to solve. This may involve conducting user research, surveys, interviews, and usability testing to gather insights into users' pain points, frustrations, and unmet needs related to information access, task management, and communication.

- **Market Analysis:** Analyzing the competitive landscape and market trends helps identify gaps and opportunities for innovation. It involves assessing existing personal assistant solutions, their features, strengths, and weaknesses, as well as identifying emerging technologies, user expectations, and industry trends that may impact the development and adoption of the personal assistant system.
- **Technical Feasibility:** Evaluating the technical feasibility of implementing the personal assistant system involves assessing the availability of relevant technologies, algorithms, and resources needed to achieve the desired functionality. It requires considering factors such as speech recognition accuracy, natural language understanding capabilities, integration with third-party services, and scalability.
- **Ethical and Privacy Considerations:** Identifying potential ethical and privacy concerns associated with the personal assistant system is crucial for ensuring responsible and ethical development. This involves assessing risks related to data privacy, security breaches, algorithmic bias, and unintended consequences of system behavior, and implementing measures to mitigate these risks.
- **Operational Challenges:** Identifying operational challenges and constraints that may impact the deployment and maintenance of the personal assistant system is essential for effective planning and resource allocation. This includes considering factors such as infrastructure requirements, regulatory compliance, organizational readiness, and stakeholder alignment.
- **User Experience Pain Points:** Identifying usability issues and user experience pain points in existing personal assistant solutions or alternative methods of interaction helps prioritize features and design considerations that enhance user satisfaction and engagement. This may involve analyzing user feedback, usability testing results, and user journey mapping to identify areas for improvement.
- **Domain-Specific Considerations:** Understanding the specific domain or industry context in which the personal assistant system will be deployed is crucial for identifying domain-specific challenges and requirements. This involves considering factors such as domain-specific terminology, workflows, regulations, and user expectations that may impact the design and functionality of the system.

By systematically identifying and defining the problems and challenges that the personal assistant system aims to address, developers can effectively prioritize features, allocate resources, and design solutions that meet the needs of users and stakeholders. This process sets the foundation for successful development, implementation, and adoption of the personal assistant system like Jarvis.

VI. IMPLEMENTATION & RESULTS

The project work of the voice assistant has been clearly explained in this report, how useful it is and how we can rely on a personal assistant for performing any/every task which the user needs to complete and how the assistant is developing everyday which we can hope that it'll be one of the biggest technology in the current technological world. Development of the software is almost complete from our side and it is working fine as expected which was discussed for some extra development. So maybe some advancement might come in the near future where the assistant which we developed will be even more useful than it is now.

The results of implementing a personal assistant like Jarvis can vary depending on factors such as the quality of the underlying technology, the scope of supported features, and the effectiveness of user interface design. Ideally, a successful implementation of Jarvis should yield the following outcomes:

- **Accurate and Responsive Interaction:** The personal assistant should be able to accurately understand user queries and execute tasks in a timely manner, providing relevant and helpful responses.
- **Enhanced Productivity and Convenience:** By automating routine tasks and providing quick access to information and services, Jarvis should improve users' efficiency and convenience in their daily lives.
- **Personalization and Adaptability:** Over time, Jarvis should learn from user interactions and adapt its behavior to better suit individual preferences and context, providing personalized assistance tailored to each user's needs.
- **Seamless Integration with Ecosystem:** Jarvis should seamlessly integrate with existing applications, services, and devices, enabling users to interact with their digital environment effortlessly.

IMPLEMENTATION

Implementing a personal assistant like Jarvis requires a multidisciplinary approach, involving expertise in artificial intelligence, natural language processing, software engineering, and user experience design. The implementation process typically follows these steps:

- **Research and Development:** Conduct research on existing technologies and algorithms relevant to speech recognition, natural language understanding, and task execution. Develop and train machine learning models using appropriate datasets and frameworks.
- **Prototyping and Testing:** Build prototype versions of the personal assistant system to validate key functionalities and gather user feedback. Conduct usability testing to identify areas for improvement and iterate on the design accordingly.
- **Integration and Deployment:** Integrate the personal assistant with relevant APIs, services, and platforms to enable seamless interaction and task execution. Deploy the system on appropriate devices and platforms, ensuring compatibility and scalability.
- **Monitoring and Maintenance:** Continuously monitor the performance of the personal assistant in real-world usage scenarios, collecting data on user interactions and system metrics. Address any issues or anomalies promptly and update the system regularly to incorporate new features and improvements.
- The **SpeechRecognition library** allows Python to access audio from your system's microphone, transcribe the audio and save it.
- Google **TextToSpeech package** converts your audio questions to text. The response from the lookup function that you write for fetching answer to the question is converted to audio phrase by it.
- **Playsound package** is used to give voice to the answer. Playsound allows Python to play MP3 files.
- **Web browser package** provides a high level interface that allows displaying web based pages to users.
- **Wikipedia** is used to fetch a variety of information from the Wikipedia website.

WORKING

It starts with a signal word, users say the name of the voice assistant for the same reason. They might say "Hey Siri!" or simply "Alexa", whatever the signal word is, it wakes up the device. It signals to the voice assistant that it should begin paying attention. After the voice assistant hears the signal word, it starts to listen. The device waits for a pause to know you have finished your request. The voice assistant then sends our request over to its source code. Once in the source code, our request is compared to other requests. It is split into separate commands that our voice assistant can understand. The source code then sends these commands back to the voice assistant. Once it receives the command, the voice assistant knows what to do next. If it understands, the voice assistant will carry out the task we asked for. The more directions the devices receive, the better and faster they get at fulfilling our requests. The user gives the voice input through a microphone and the assistant is triggered by the wakeup word and performs the Speech to Text and converts it into a text and understands the voice input and further performs the task said by the user repeatedly and delivers it via Text to Speech module via AI Voice.

These are the important features of the voice assistant but other than this, we can do plenty of things with the assistant.

List of features that can be done with an assistant:

Playing some video which the user wants to see.

Telling some random fact at the start of the day with which the user can do their work in an informative way and the user will also learn something new.

One of the features which will be there in every assistant is playing some game so that the user can spend their free time in a fun way.

Users might forget to turn off the system which might contain some useful data but with a voice assistant, we can do that even after leaving the place where the system is just by commanding the assistant to turn the system off.

VII. CONCLUSION

In conclusion, Jarvis stands as a testament to the remarkable progress achieved in voice assistance technology, representing a significant milestone in the evolution of human-computer interaction. Through its sophisticated capabilities in speech recognition, natural language understanding, and task execution, Jarvis has redefined how individuals interact with technology, offering a glimpse into a future where intuitive and intelligent virtual assistants seamlessly integrate into our daily lives. The journey of Jarvis, from its conceptualization to its implementation, underscores the collaborative efforts of researchers, engineers, and designers in pushing the boundaries of artificial intelligence and machine learning. By leveraging state-of-the-art algorithms and vast datasets, Jarvis has overcome numerous technical challenges to deliver accurate, responsive, and personalized assistance to users across diverse domains.

Moreover, Jarvis's impact extends beyond individual convenience, with implications for various sectors and industries. In healthcare, Jarvis empowers clinicians with quick access to patient information and medical knowledge, enhancing clinical decision-making and patient care. In education, Jarvis supports students and educators with personalized learning experiences and academic assistance, fostering a more engaging and effective learning environment.

In conclusion, Jarvis represents a paradigm shift in human-computer interaction, offering a glimpse into a future where intelligent virtual assistants seamlessly augment our capabilities and enrich our experiences. As we continue to push the boundaries of technology and innovation, Jarvis serves as a beacon of inspiration, guiding us towards a more connected, intelligent, and empowered future.

VIII. FUTURE SCOPE

The future scope of a personal assistant system like Jarvis is vast and holds significant potential for further innovation and advancement. Below are some key areas where the future of Jarvis and similar systems could evolve:

- **Enhanced Natural Language Understanding:** Future iterations of personal assistant systems will likely feature more advanced natural language understanding capabilities, allowing them to grasp complex queries, understand nuances in language, and accurately infer user intent. This advancement will enable more natural and intuitive interactions with users, enhancing the overall user experience.
- **Context-Awareness and Personalization:** Personal assistants will continue to evolve towards greater context-awareness and personalization. They will leverage data from various sources, including user preferences, behavior patterns, and environmental context, to tailor responses and recommendations to individual users in real-time. This level of personalization will result in more relevant and helpful assistance.
- **Multi-Modal Interaction:** Future personal assistants will support multi-modal interaction modalities, allowing users to interact through a combination of voice, touch, gestures, and even gaze. This will enable seamless interaction across different devices and environments, providing users with greater flexibility and convenience in how they engage with the assistant.
- **Integration with Emerging Technologies:** Personal assistants will increasingly integrate with emerging technologies such as augmented reality (AR), virtual reality (VR), and wearable devices. This integration will enable new use cases and interaction paradigms, such as AR-based visual overlays for contextual information or VR-based immersive experiences.
- **Advanced Task Automation and Assistance:** Future personal assistants will be capable of automating a wider range of tasks and providing more sophisticated assistance across various domains, including work, leisure, and daily life. They will handle tasks that require higher levels of cognitive reasoning and decision-making, such as complex scheduling, financial planning, and problem-solving.
- **Improved Privacy and Security:** Personal assistants will place greater emphasis on user privacy and security, implementing robust encryption, anonymization techniques, and user consent mechanisms to safeguard sensitive information. They will also provide users with more control over their data and transparency into how it is used and accessed.

- **Domain-Specific Specialization:** Personal assistants may evolve to specialize in specific domains or industries, offering tailored solutions and expertise in areas such as healthcare, finance, education, and entertainment. These specialized assistants will possess deep domain knowledge and be equipped to handle domain-specific tasks and queries with high accuracy and efficiency.
- **Collaborative and Social Capabilities:** Future personal assistants may incorporate collaborative and social capabilities, enabling users to interact with multiple assistants.

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