

# Blink-An Intelligent Personal Assistant for Enhancing Accessibility for Differently-Abled People

Khushi Allawadi<sup>1</sup>, Mitali Chugh<sup>2</sup> and Nagma Siddiqui<sup>3</sup>

<sup>1-3</sup>UPES, Dehradun, India

Email: allawadikhushi@gmail.com, mitalichugh11@gmail.com, nagmasaleem99@gmail.com

**Abstract**— The Advanced Research Projects Agency’s support of speech understanding research has led to a significantly increased level of activity in this area since 1971. Several connected speech recognition systems have been developed and demonstrated (Speech Recognition by Machine). Now more developments such as a personal assistant are designed to assist a busy knowledge worker in efficiently managing various tasks. (Myers et al., 2007) Our work aims to develop a personal assistant for Computers - *Blink*. Blink has its inspiration from Google Assistant on Android as it’s the leading and smartest assistant, but it is limited to mobile phones. Mobile phones are easy to use and learn due to just remembering a few things but this is not the case with computers. Smart Assistant tried to enter computers earlier but failed miserably. Apple’s Siri, and Microsoft’s Cortana are the most popular voice assistants (Hoy, 2018) that exist on OSX and Windows respectively but are extremely limited with Microsoft removing most of the functionality from Cortana. This is where Blink Comes in, it would be a personal assistant that would make using computers easier and more accessible to differently abled people. If they have some issues typing, they could just use the personal assistant via voice command to request their task or type it if they have issues speaking. It would also make doing stuff easier and faster for the young and older generations. Blink could rapidly directly compete with the competition as it would be able to listen to all the voice commands locally without the need for an internet connection and would maintain privacy which has been a major concern in most of the assistants.

## I. INTRODUCTION

As industry 4.0 is growing tremendously, AI has increasingly contributed to the betterment of human life. (Balakrishnan et al., 2021) It is claimed that AI is exciting, but no one said what it is ( $E = mc^2$ ). The interaction between computers and humans has been done via keyboard and some sort of mouse for most of the time since the beginning. But as the industry is growing the use of AI is rising, as of now 4.2 billion voice-based assistants are being used in devices around the world. IOT has brought in a type of personal assistant service (Zhang et al). The fact, computers were not so advanced to convert our voice into text let alone do commands based upon audio back then, but this has rapidly changed with the advancements in AI and computer processing power. In 2015, found that more than half (55%) of all U.S. teens use voice search every day (Burbach et al). Products such as “Ok, Google”, “And Alexa” use automated speech recognition and NLP to perform various tasks for users, Smart assistants are useful in many fields such as education, home appliances, etc. and the voice assistant is also useful for blind people(Shabu et al., 2021), similarly if we talk about Personal Assistants, these are also a trend in society on mobile phones with Google Assistant and Siri being the market leaders in mobile phones but there is a lack of them on computers and specifically the Windows operating system(Buteau & Lee, 2021). People are now moving

towards these SPA (smart personal assistants) (Srinivasan & Madheswari, 2018). A personal assistant is the modern method of input, it's software that makes doing tasks easy and more accessible for older and differently abled people. It can do actions based upon the inputs via voice commands or text commands as per the wish and ease of the user. Taking actions based on voice commands needs some key/essential components to make it work that includes voice processing which is done via NLP using a utility called NTLK (Bird, 2006). Input would be taken via voice/text then various ML algorithms would be applied to take actions, it would include tokenization where the voice commands would be broken into individual words, and based upon these words action would be taken. Well-defined scripts would allow the computer to know exactly what action to do, so it can easily respond to the voice command to the user. The personal assistant can highly improve accessibility and ease of use as computers have way more to discover and are more user-friendly. Opening applications to find files can be quite challenging for first-time users or differently-abled people. With the help of a simple voice/text command, they can easily request to open an application which would make it simple and easy for them to use. Everything cannot be perfect, and that's true with a personal assistant as well, privacy is the main concern as the user's microphones are being used 24\*7 and could be uploaded onto the web. In a study released in May 2018 by scientists at the University of California, Berkeley, it was revealed that imperceptible audio instructions could be seamlessly incorporated into music or spoken text. This method allowed for the manipulation of virtual assistants, prompting them to carry out specific tasks without the user's awareness. The researchers achieved this by making subtle modifications to audio files, effectively nullifying the recognizable speech patterns targeted by speech recognition systems. Instead, they inserted alternative sounds that the system would interpret in a distinct manner, enabling actions such as making phone calls, accessing websites, or transferring funds. (NATURAL-LANGUAGE VOICE-ACTIVATED ASSISTANT,) The possibility of this has been known since 2016,(NATURAL-LANGUAGE VOICE-ACTIVATED ASSISTANT)and affects devices from Apple, Amazon, and Google. This is a place where Blink would be extremely ahead due to being OSS in nature and not uploading and voice communication with/without user consent, unlike major assistants. (Mitchell et al.,)

## II. RELATED WORK

One prominent example of a smart assistant is Apple's Siri, which was introduced in 2011. Siri replaces the dance of your fingers on the glass of the screen of an iOS device with a conversation. (Goksel Canbek & Mutlu, 2016) Siri understands your voice and places what you say in context with the apps that it works with. Siri's success paved the way for the development of similar voice-activated assistants, such as Amazon's Alexa and Google Assistant, (Assefi et al., 2015) which expanded the capabilities of smart assistants and integrated them into smart home devices. There is a huge impression that voice assistants would be used more if the capacity for conversation were improved, with 68 percent of people saying that when it works as expected it is fantastic and extremely useful. Google Assistant, Siri, Cortana, Alexa etc. (Pramod)

In recent years, natural language processing (NLP) and machine learning techniques have played a significant role in advancing the capabilities of smart assistants (Reddy et al., 2020). Projects like Google's Duplex demonstrated the ability of a smart assistant to make phone calls on behalf of the user, schedule appointments or make reservations (Grevatt, 2018). This development showcased the potential of NLP models in understanding and generating human-like conversational responses.

Moreover, advancements in speech recognition technologies have contributed to the improved accuracy and reliability of smart assistants. Systems like Microsoft's Cortana and IBM's Watson have utilized deep learning models to enhance speech recognition capabilities, allowing for more precise interpretation of user commands and queries. Amazon also provides a feature called 'voice profile' to store the voice of each user (Hofing et al.,). Since they can't do more complex tasks such as scheduling doctor's appointments or arranging dinner at a restaurant with a friend, research is going on to make these systems better or develop more systems like them.

Additionally, research has been focused on incorporating contextual understanding into smart assistants. This involves the ability to analyse user preferences, habits, and the context in which commands are given to provide personalized and relevant responses. Context-aware assistants, such as Samsung's Bixby and Microsoft's Cortana (Klein et al., 2020), leverage user data and machine learning algorithms to adapt to individual needs, offering recommendations, reminders, and suggestions tailored to the user's preferences. Furthermore, open-source frameworks and platforms, like Mozilla's Deep Speech have enabled developers to build their intelligent smart assistants. One of the recent taken forward in the release of the large language model software OpenAI which will support the dissemination of relatively simple, accessible information (Hill-Yardin et al., 2023). Many articles have been published in the recent year about these brilliant assistants. These frameworks provide pre-trained

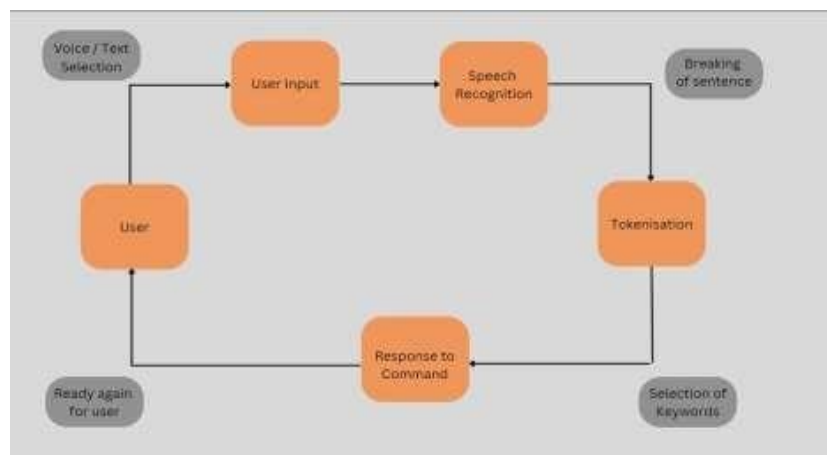
models and tools for speech recognition, natural language understanding, and generation, empowering developers to create customized and versatile smart assistant applications.

### III. METHODOLOGY

We used the model of a waterfall for the development of the project:

The waterfall is cheaper to develop as compared to other models, (Kakde et al.,) supports small projects better as compared to other models' resources are available and trained, (Petersen et al.,) and the main goal of the project is already set so we won't be needing many changes which is the major limitation of the waterfall model.

The waterfall model would also allow us to follow the path properly to develop the project so that we don't skip any portion of the project because the waterfall model does not allow us to do so. Transfer of information is also one of the key features so as the activity coordinator and mentor get to know about the project as well and stay up-to-date with the project development. The following UML diagram is a proper representation of the working of the assistant through user input to process to action taken.



### IV. BLINK – AT A GLANCE



It is an innovative application designed to serve as an intelligent smart assistant, aimed at enhancing user experiences and simplifying everyday tasks. The primary objective of this project is to develop a versatile assistant that seamlessly integrates into the user's digital ecosystem. With the significantly increased popularity in recent years the motivation of audio-based assistants resides in their versatility, (Principi et al.,) since audio signals allow for capturing people's activity, monitoring the acoustic environment and they enable speech-based user interfaces

with the power of voice and text commands, users can effortlessly control media playback, conduct web searches, and open applications, providing a convenient and personalized user experience.

One of the key ideas behind Blink is, it focuses on simplicity and ease of use. Using instinctive vocal and written instructions, individuals can engage with the assistant in a seamless and natural way. This ensures that even individuals with limited technical knowledge or physical disabilities can benefit from the application's capabilities.

## V. CONCLUSION

With the latest advancements in computer science, accessing and disseminating information can now be accomplished within seconds.(Goksel Canbek & Mutlu, 2016). In the computer world, there is no smart assistant that can help you, Windows OS lacks any Smart Assistant that can help in improving the user experience of the user. There is a lack of software that allows improved accessibility to challenged people or elderly people. People are using cell phones daily, but most people are not aware of the usage of computers or the power they can provide over a cell phone. To overcome this problem, we have developed software that improves accessibility and makes it easier for people to use computers. The overarching objective is to create a personal computer assistant that encourages children to adopt a healthy lifestyle while engaging in their daily activities at home. (IEEE Staff & IEEE Staff,)

## FUTURE SCOPE

The future scope of intelligent smart assistants is exciting and diverse. The main reason that the user wants to use the personal assistant is to make the life easier (Reddy et al., 2020). Below mentioned features can be facilitated.

As technology progresses, there are numerous areas for future advancements in smart assistants, including improvements in Natural Language Processing (NLP), the integration of smart home devices and third-party services, personalized recommendations, more sophisticated multimodal interactions, better contextual understanding, and stronger privacy and security measures. This ongoing evolution suggests that smart assistants could become increasingly intelligent, intuitive, and essential tools in our everyday routines.

As technology continues to evolve, smart assistants have the potential to become even more intelligent, intuitive, and indispensable in our daily lives.

## REFERENCES

- [1] Assefi, M., Liu, G., Wittie, M. P., & Izurieta, C. (2015). Experimental Evaluation of Apple Siri and Google Speech Recognition Internet of Things View project Quality Assurance in Cyber Systems View project An Experimental Evaluation of Apple Siri and Google Speech Recognition. <https://www.researchgate.net/publication/281826891>
- [2] Balakrishnan, J., Dwivedi, Y. K., Hughes, L., & Boy, F. (2021). Enablers and Inhibitors of AI-Powered Voice Assistants: A Dual-Factor Approach by Integrating the Status Quo Bias and Tech-nology Acceptance Model. *Information Systems Frontiers*. <https://doi.org/10.1007/s10796-021-10203-y>
- [3] Bird, S. (2006). NLTK: The Natural Language Toolkit.
- [4] Burbach, L., Halbach, P., Plettenberg, N., Nakayama, J., Ziefle, M., & Calero Valdez, A. Ac-ceptance-relevant factors of virtual voice-assistants.
- [5] Buteau, E., & Lee, J. (2021). Hey Alexa, why do we use voice assistants? The driving factors of voice assistant technology use. *Communication Research Reports*, 38(5), 336–345. <https://doi.org/10.1080/08824096.2021.1980380>
- [6] E = m c 2. [www.PlentyofeBooks.net](http://www.PlentyofeBooks.net)
- [7] Goksel Canbek, N., & Mutlu, M. E. (2016). On the track of Artificial Intelligence: Learning with In-telligent Personal Assistants. *International Journal of Human Sciences*, 13(1), 592. <https://doi.org/10.14687/ijhs.v13i1.3549>
- [8] Grevatt, N. (2018). Google's Duplex and Deception through Power and Dignity.
- [9] Hill-Yardin, E. L., Hutchinson, M. R., Laycock, R., & Spencer, S. J. (2023). A Chat(GPT) about the future of scientific publishing. In *Brain, Behavior, and Immunity* (Vol. 110, pp. 152–154). Academic Press Inc. <https://doi.org/10.1016/j.bbi.2023.02.022>
- [10] Hofing, J., Deshpande, R., Kalloor Vijay, N., Qi, Z., & Zhou, Y. Hidden commands audio attacks on Alexa and Siri GROUP-18. <https://ai-web-c7224.firebaseio.com/public/index.html>.
- [11] Hoy, M. B. (2018). Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants. *Medical Reference Services Quarterly*, 37(1), 81–88. <https://doi.org/10.1080/02763869.2018.1404391>
- [12] IEEE Staff, & IEEE Staff. 2009 3rd International Conference on Affective Computing and Intelli-gent Interaction.
- [13] Kakde, P., Shah, P., Meshram, A., Umap, Y., Misal, Y., & Anjkar, A. JARVIS-THE VIRTUAL AS-SISTANT. In *International Research Journal of Modernization in Engineering Technology and Science*. [www.irjmets.com](http://www.irjmets.com)
- [14] Klein, A. M., Hinderks, A., Rauschenberger, M., & Thomaschewski, J. (2020). Exploring voice assis-tant risks and potential with technology-based users. *WEBIST 2020 - Proceedings of the 16th Inter-national Conference on Web Information Systems and Technologies*, 147–154. <https://doi.org/10.5220/0010150101470154>

- [15] Mitchell, T., Caruana, R., Freitag, D., Mcdermott, J., & Zabowski, D. Experience With a Learning Personal Assistant 1.
- [16] Myers, K., Berry, P., Blythe, J., Conley, K., Gervasio, M., McGuinness, D., Morley, D., Pfeffer, A., Pollack, M., & Tambe, M. (2007). An Intelligent Personal Assistant for Task and Time Management.
- [17] NATURAL-LANGUAGE VOICE-ACTIVATED PERSONAL ASSISTANT.
- [18] Petersen, K., Wohlin, C., & Baca, D. The Waterfall Model in Large-Scale Development.
- [19] Pramod, D. Conversational System, Intelligent Virtual Assistant (IVA) named-DIVA using Raspberry Pi. [www.ijert.org](http://www.ijert.org)
- [20] Principi, E., Squartini, S., Bonfigli, R., Ferroni, G., & Piazza, F. An integrated system for voice command recognition and emergency detection based on audio signals.
- [21] Reddy, M. K. V., Lahari, S., Naveen, A., Chandra, G. S., & Scholars, B. E. (2020). Issue 6 [www.jetir.org](http://www.jetir.org) (ISSN-2349-5162). In JETIR2006456 Journal of Emerging Technologies and Innovative Research (Vol. 7). [www.jetir.org](http://www.jetir.org)
- [22] Shabu, E., Bore, T., Bhatt, R., & Singh, R. (2021). A Literature Review on Smart Assistant. International Research Journal of Engineering and Technology. [www.irjet.net](http://www.irjet.net)
- [23] Speech Recognition by Machine.
- [24] Srinivasan, A., & Madheswari, A. N. (2018). The Role of Smart Personal Assistant for improving personal Healthcare. International Journal of Advanced Engineering, Management and Science, 4(11), 769–772. <https://doi.org/10.22161/ijaems.4.11.5>
- [25] Zhang, N., Mi, X., Feng, X., Wang, X., Tian, Y., & Qian, F. Dangerous Skills: Understanding and Mitigating Security Risks of Voice-Controlled Third-Party Functions on Virtual Personal Assistant Systems.