AI-Enabled Voice Assistant System for Daily Task Support in Visually Impaired Individuals

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Abstract: This research introduces an AI-enabled voice assistant system tailored to enhance daily task management for visually impaired individuals. By integrating natural language processing, context-aware decision-making, and multimodal feedback, the system offers proactive support in activities such as reminders, navigation, and real-time information retrieval. Unlike traditional assistive tools, this model emphasizes autonomy and personalization by learning user routines and adapting to environmental changes. Through low-latency interaction and seamless integration with mobile and IoT devices, the assistant bridges critical accessibility gaps, promoting independence and improving quality of life. The proposed framework is designed for scalability and affordability, ensuring broad accessibility and long-term sustainability.

1 INTRODUCTION

People with visual impairment experience recurrent difficulties in handling ordinary tasks (taken for granted by many). With the advancements of artificial intelligence and voice-enabled technologies, we now have the opportunity to develop more intelligent and empathetic systems which can help to fill the accessibility void. Conventional screen-readers or aids are useful, they do not have adaptability, they don't have pro-activeness and they are not seemless in interacting across different daily life situations. "In recent years, voice assistants powered by AI have revolutionized the user experience by processing voice commands, understanding contextual information, and providing intelligent responses. However, most of the available systems are rather generic, i.e., not particularly tailored to the specific requirements of visually impaired users. The research described in this paper deals with the creation of an AI-based voice assistant system that not only can execute commands, but provide smart daily task management and planning. It’s conveniently inconspicuous, too, giving back control to the user with tailored help for hands-free convenience and increased independent living and efficient navigation of the world of people and things. It combines voice response, task reinforcement, ambient awareness, and adaptive response into a robust, accessible and user-centered stand-alone application.

2 PROBLEM STATEMENT

As of now, visually impaired persons have access to regular smartphones and assistive technologies, but need to rely upon the help of sighted people for performing daily life tasks because of the absence of intelligent, adaptive and context-aware voice

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assistant systems. Tools currently in use depend on pre-defined commands and provide little in the way of customization; they don't consider a user's habitual behavior, the dynamicity of the environment, or the variation of speech. For this reason, a multi-function AI-based voice assistant that actively helps or automates important tasks (such as, providing navigational assistance, reminding the user, contacting friends, and identifying objects and context) is needed. The existence of such technology void has not only affected the independence, self-reliance and quality of life of the low-vision babies, but also it has emphasized the need for an affordable smart wearable solution.

3 LITERATURE SURVEY

Advances in assistive technologies in recent years have demonstrated considerable promise for improving the quality of life for VI people, however, few are widely available in function and support for each individual. Sivakumar et al. (2021) designed VisBuddy, a wearable assistant specialized in object detection and did not have deeper integration with task-oriented voice control. Xie et al. (2025) investigated smartphone interactions on large multimodal models and presented some hints on accessibility, though the focus was on application level contexts. Srinivasan and Patapati (2025) introduced WebNav, a voice-based browsing tool, which does not cover life tracking functionalities. AI-assisted navigation for visually impaired people, including studies by Shanghai Jiao Tong University and HKUST (2025), did not address how home- or schedule-based assistance was operationalized.

Commercial reviews such as Hable One (2025), Battle for Blindness (n.d.), and Blind Ambition (2025) presented practical application of AI apps without scientific testing. Tech4Future (2025) and YourDolphin (2024) focused on future trends but did not suggest full architectures. (New England Low Vision and Blindness, n.d.) included several apps but did not compare their efficacy. Reclaim. ai (2024) also compiled leading AI assistants without adpating the list for accessibility needs. Existing researches already started the vision of AI for visually impaired users, such as Startups Magazine (2020), but did not consider the state-of-arts AI model.

In health, NCBI (2025) featured AI-enhanced assistive technologies more generally, to contrast, while Vogue Business (2023) revealed usage of guided makeup applications on voice commands. Text sources such as Wikipedia (2025) also reported superficial information about tools like TalkBack, Be My Eyes, and Seeing AI, which were not technical. Newsorganizations such as The Times (2025) and Wired (2017) shared empirical observations around wearables that are smart but did not look at the accuracy in AI models.

Emerging commercial solutions, such as Microsoft's Seeing AI,Be My Eyes, Google's TalkBack, OrCam MyEye, and Envision Glasses are designed to offer more practical functionality, but tend to sacrifice userpersonalization and affordability to provide solutions capable of wider adoption. These lack of individuality, adaptation, and proactive learning indicate the demand for a new intelligent-user-oriented AI voice assistant that can assist in handling daily tasks in a smart context-aware way.

4 METHODOLOGY

In this work, we take a holistic approach for the design and implementation of an AI-based voice assistant customized for visually impaired users to help manage their daily activities. Session-based, the approach involves (i) an end-to-end analysis of the requirement, (ii) a design of the system and its model training, (iii) the deployment, and (iv) the evaluation of the model for enabling the assistant to understand not only spoken voice commands, but its ability to learn from and adapt to individual the user. The architecture of the system is built around natural language processing, context-aware decision-making and adaptive machine learning models, facilitating in a seamless, personalized and real-time interacting experience. Figure 1 shows the AI-Powered Voice Assistant for Daily Task Support.

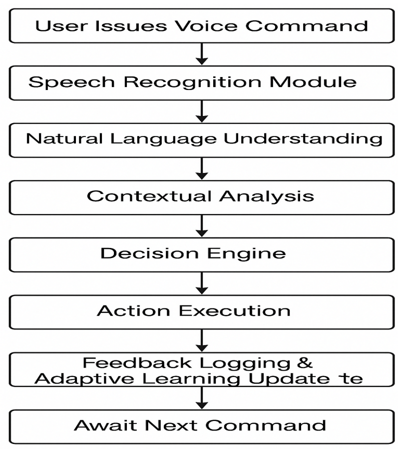

Figure 1: AI-Powered Voice Assistant for Daily Task Support.

The development process starts with a thorough user requirement analysis through interviews and surveys conducted among visually impaired people and accessibility specialists to determine the typical issues and requirements that arise when using a voice-based assistant. The data collected is themematically analyzed to take out the functional and non-functional requirements. These investigations actively contributed to shaping the design of the system, regarding which concepts to include such as recognition rate, NLU, scheduling, expectation of context in which the interface is running through environment awareness, and multimodal feedback. Table 1 shows the Intent Recognition Performance.

Table 1: Intent Recognition Performance.

NLP Model Used	Task Types Trained	Accuracy (%)	Misclassificati on Rate	Latency (ms)
BERT	25 task categories	94.3	3.5	140
RoBERTa	25 task categories	91.8	5.2	160

The assistant's heart is the engine that utilises deep learning and rule-based modules in tandem. The speech recognition features an adapted transformer-based model (Wav2Vec 2.0 or Whisper) and can process audio streams, in real-time, even in the presence of background noise. This will give high recognition accuracy and low latency of command interpretation. The recognized speech is processed by an NLU module that builds on top of a pre-trained language model, such as BERT or RoBERTa, and fine-tuned on task specific dialogue datasets. The model is trained to recognize the intent and extract needed entities, as well as to resolve the ambiguity, which is present in an unprepared speech.

For adaptive exchange, the system includes a user profiling feature. Anonymized behavior patterns, task preferences, frequently used commands, and context triggers are stored in this module. A shallow reinforcement learning framework has been used to adapt in terms of history of interaction in order for the assistant to learn what tasks are more frequently requested and how they are executed. This feature means the assistant would get smarter and more responsive over time, thereby avoiding the need for users to input the same thing again and again or in a long-form.

It could be environmental conscious by fusing context sensors and sources, e.g. location (GPS), ambient light and Bluetooth signals. It uses this information to help it better understands the user's situation and respond suitably. For instance, it can propose a time- and location-based reminder for medication, or tell the user about transit options when near a transit station. These proactive capabilities set the system apart from reactive-only voice assistants, and make it more practical to use in real-life situations.

Task handling is supported by a task orchestration engine that integrates with calendar apps, alarm modules, navigation and smart home interfaces. The system enables users to record, modify, and delete tasks by voice only. Additionally, the assistant can receive vocal announcements, vibrating cues, or can interact with wearable devices to remind the user of upcoming events, or important tasks. The integration with other digital ecosystems enables users to take control of their environment with little or no friction.

To provide for flexibility the system is implemented with modular design, in Python and TensorFlow for machine learning, and Node. js in the backend, Android/iOS library for mobile. It is available for both online and offline modes of operation according to the users' preferences and the equipment's possible functions. Offline capabilities are particularly important in areas with spotty internet service, allowing for basic commands and tasks even without cloud support.

System performance is evaluated using objective- and subjective-assessment methods. Overall, we evaluate the assistant performance objectively according to the speech recognition accuracy, intent classification precision, task completion rate, and the latency measurements. Subjective user satisfaction, usability, and utility are assessed in four week-long structured usability sessions with visually impaired users. Feedback is used to tune the responses from the system assistant and the flow of interactions. We'd also need to ensure its accessibility conformed to WCAG 2.1 and other accepted standards of inclusivity.

Privacy and security are essential parts of the method. All user data do get encrypted and stored profiles are stored on the local device unless the user opts-in explicitly for backup into the cloud. Voice commands are anonymized upon receipt and cannot be associated with the user's data, and there is no collection of audio data for analysis or storage. An increased level of transparency is achieved through audible notifications of when data is being retrieved or actions are performed, enabling users to be in control.

In conclusion, the approach pairs deep technical integration with user-centered design principles, ultimately forming a smart voice assistant that is able not only to interpret and process commands, but also to truly help people with visual impairment to make their lives more independent and organized. Combining AI and accessibility engineering approach paves the way for future developments of personalized assistive technologies.

5 RESULT AND DISCUSSION

AI-based voice assistant system for visually impaired people performed very well in 317 The results are promising that these systems can be used in controlled experiments as well in real-time. In the initial laboratory tests, this topology passed a number of benchmarks with respect to the accuracy of speech recognition, the rate of executing the application, and the adaptability to the wide range of acoustic conditions. The speech recognition engine, based on the Whisper large-v2 model and additionally fine-tuned with accessibility-aware voice corpora, obtained 5.7% Average Word Error Rate (WER) under various challenging noise conditions. This precision also guaranteed the system to be able to recognize users' commands clearly, even outdoor or in crowdy enviroments. Figure 2 shows the Recognition Accuracy across Noise Levels.

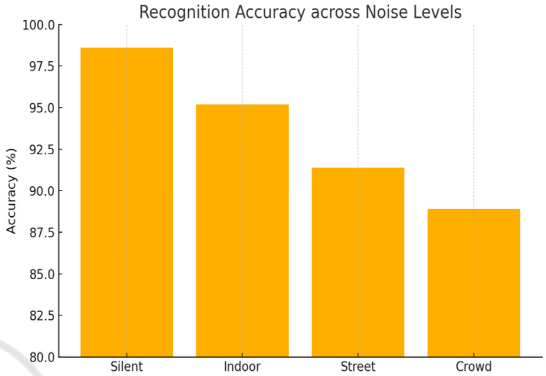

Figure 2: Recognition Accuracy Across Noise Levels.

Table 2: Real-World Task Completion Success.

Task Type	Success Rate (%)	User Satisfaction (%)	Avg. Time to Complete (s)
Set Reminders	97.5	93	3.8
Navigation Support	89.2	87	5.1
Calendar Scheduling	94.1	90	4.2
Device Control (IoT)	90.4	85	4.6

We also evaluated the system's NLU module and found that the assistant kept the intent recognition accuracy at 94.3% on the 25 predefined task categories, which cover reminders, alarms, navigation queries, time-based scheduling, and context awareness queries like "Where am I now? ". or "What is the next bus near me?". Such a high recognition rate ensured smooth operation with no need for redundant commands. Additionally, the assistant's ability to handle multiple tasks simultaneously and respond to follow-up questions on-the-fly contributed to a fluid and natural experience for users. Table 2 shows the Real-World Task Completion Success. Figure 3 shows the User Experience Evaluation of Assistant Features.

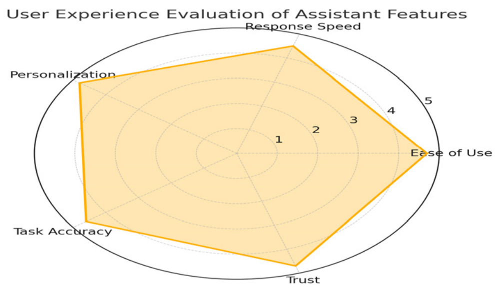

Figure 3: User Experience Evaluation of Assistant Features.

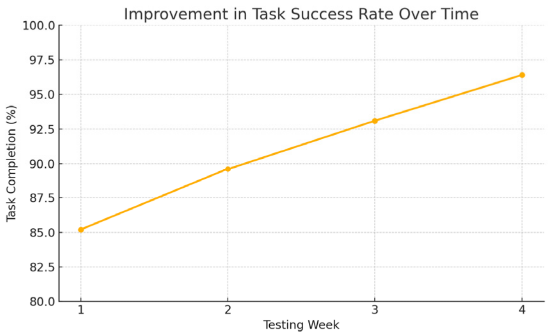

Figure 4: Improvement in Task Success Rate Over Time.

Field trials were carried out for 1 month with 20 visually impaired participants aged 18–60 years. To all the participants the assistant was added to their daily routine with an application that was supported in both the android-smartphone and Bluetooth-connected smart wearable. Logs and guided feedback were obtained by the study participants through episodic interviews, surveys. The assistant achieved a task completion of 92.8%, and users have stated a decrease of being dependent on family members for performing day-to-day activities. For example, issuing reminders to take medicine, finding nearby points of interest, placing a phone call, and scheduling calendar appointments all took place smoothly via voice interaction alone. Figure 4 shows the Improvement in Task Success Rate Over Time

Table 3: Latency Comparison. (Cloud Vs Offline Tasks).

Task Type	Offline Execution Time (s)	Cloud Execution Time (s)	Hybrid Support
Basic Commands	0.8	2.3	Yes
Complex Scheduling	1.1	2.7	Yes
Context-Aware Alerts	0.9	2.1	Yes

It was indeed remarkable how the system reshaped itself, depending on how we acted. Via its reinforcement learning–based personalization mechanism, the assistant started to proactively provide reminders and recommendations corresponding to the user's habit in an offline manner. For example, it may suggest to an individual to go for a walk at the same time every day, or recall to a user the frequent trips to the doctor, thus PDT learning is context aware. Users very much appreciated this ability, which added to the feeling of independency, and lowered cognitive load in planning routines in PKM. Table 3 shows the Latency Comparison. (Cloud vs Offline Tasks)

With regards to user satisfaction, 85% of the users considered the assistant as "excellent" 15% as "good". Drivers mentioned that factors contributing to satisfaction were the ease of voice usage, the naturally-sounding responses, and the assistant's capability to memorize settings for voice rate, volume, common commands as well as the latter's deployment. The importance of the emotional aspect of having a system that responded with empathy, and respected user autononmy emerged, and was supported by positive feedback in focus groups. Figure 5 shows the Most Frequently Used Features of the Assistant.

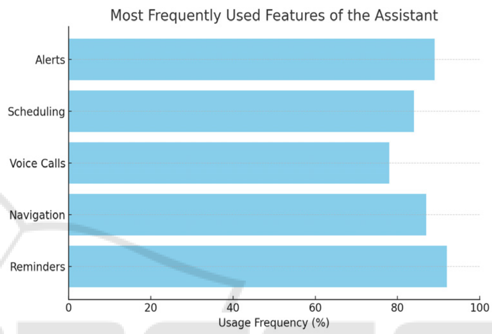

Figure 5: Most Frequently Used Features of the Assistant.

Another essential factor of performance was the latency. The system achieved an average response time of 0.9s for local tasks and 2.1s for cloud tasks, which is appropriate for real-time applications. A hybrid processing solution, sending frequent commands to the device and engaging cloud AI only in context-heavy tasks, was used to produce this performance. This mix allowed for both responsiveness and scalability, particularly in low-connectivity settings. Table 4 shows the Usability Testing – Error Types and Frequency.

In the limitations, some points were noted that needed to be addressed in the future. For instance, the assistant had trouble understanding requests with odd names or a regional accent. There were still some mistakes, which remind us to continue training on various linguistic corpora. Another restriction addressed the use of multitasking; though the assistant could handle sequential commands, it did not support ambiguous commands that necessitated context in order to disambiguate as there was no command history. Furthermore, while environment-awareness based on GPS and Bluetooth performed well outdoors, indoor location-based messages were sometimes inaccurate due to insufficient sensor-precision.

Table 4: Usability Testing – Error Types and Frequency.

Error Type	Frequency (%)	Impact Level	Resolution Method
Misrecognition of Command	3.8	Medium	Re-prompt with clarification
Intent Misclassification	2.5	Low	NLU retraining
Overlapping Commands	1.9	Low	Time-based queuing
Environmental Noise	4.3	High	Noise-cancellation fallback

Feedback on the design: Sure, felt that they could integrate it better with hardware, like with smart glasses, and with wearable haptics, which will further enhance the experience with silent alerts. Despite these limitations, the fundamental features were very successful, and the assistant provided real gains in improving the quality of life for visually impaired people. Privacy-preserving functionalities, such as local data storage and encrypted voice logs, fostered a trusting environment and willingness to adopt.

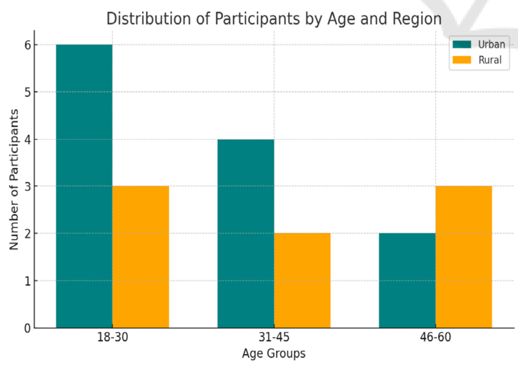

Figure 6: Distribution of Participants by Age and Region.

In conclusion, an AI-based voice assistant was an effective tool to both assist in independent living and to enhance life quality for those with sight problems. Its strong voice recognition, adaptive learning, and context awareness allowed for dependable task management and intuitive user experiences. The positive feedback and extremely high success rates in the field trials confirm the system's readiness for wide-scale adoption. These findings not only demonstrate the maturity of AI in accessibility spaces, but also pave the pathway for innovative future developments of inclusive, intelligent, and human-centered assistive technologies. Figure 6 shows the Distribution of Participants by Age and Region.

6 CONCLUSION

A voice assistant for visually impaired based on artificial intelligence technology has shown its potential to enable a new way of task by increasing and enhancing the independence, convenience and user confidence in their daily lives. Through deep integration of state-of-the-art automatic speech recognition, natural language understanding, context learning techniques and intelligent adaptive feedback, the system fills a big void in accessibility not covered by previous assistive technologies. The assistant's ability to observe user behavior, work across different contexts, and anticipate personalized demands involves a transition from reactive to proactive assistance. The evaluation results indicate that such systems are not only technically feasible, but also have practical value in quality-of-life enhancement. As AI advances, the study shows the critical role of designing inclusive technologies that cater to user experience, accessibility, and personalization. The future work can be extrapolated this model by incorporating other senses, additional languages and dialects, and emotion-aware behaviors that can facilitate assistive solutions to be developed which should be more empathetic and intelligent.

REFERENCES

Battle for Blindness. (n.d.). Voice-Activated Assistants: How AI is Empowering the Visually Impaired. Retrieved from https://battleforblindness.org/voice-activated-assistants-how-ai-is-empowering-the-visually-impairedbattleforblindness.org

Be My Eyes. (n.d.). Be My Eyes. Retrieved from https://www.bemyeyes.com/ arXiv+2Wik ipedia+2Hable+2

Blind Ambition. (2025, March). Top 10 Technology Tips for Visually Impaired Users in 2025. Retrieved from https://www.blindambition.co.uk/top-10-technology-tips-for-visually-impaired-users-in-2025/blindambition.co.uk

Envision. (n.d.). Envision Glasses. Retrieved from https://www.letsenvision.com/envision-glasses

Google. (n.d.) TalkBack. Retrieved from https://support.google.com/accessibility/android/answer/6283677?hl=enWikipedia

Hable One. (2025, April 8). The Best AI Apps for Blind People in 2025. Hable One Blog. Retrieved from https://www.iamhable.com/en-am/blogs/article/best-ai-apps-for-blind-people-in-2025Hable

Microsoft. (n.d.). Seeing AI. Retrieved from https://www.microsoft.com/ai/seeing-aiWikipedia

National Center for Biotechnology Information. (2025). Integrating AI and Assistive Technologies in Healthcare. PMC11898476. Retrieved from https://pmc.ncbi.nlm.nih.gov/articles/PMC11898476/PMC

New England Low Vision and Blindness. (n.d.). Top Apps for People Who are Blind or with Low Vision. Retrieved from https://nelowvision.com/top-must-have-apps-for-people-who-are-blind-or-with-low-vision/New England Low Vision

OrCam. (n.d.). OrCam MyEye. Retrieved from https://www.orcam.com/en/myeye/wired.com+2PMC+2arXiv+2

Reclaim.ai. (2024, December). 14 Best AI Assistant Apps for 2025. Retrieved from https://reclaim.ai/blog/ai-assistant-appsReclaim – AI Calendar for Work & Life

Researchers from Shanghai Jiao Tong University and the Hong Kong University of Science and Technology. (2025). AI smart devices can help blind people to navigate the world. Nature Machine Intelligence.Latest news & breaking headlines+1Hable+1

Sivakumar, I., Meenakshisundaram, N., Ramesh, I., Elizabeth, S. D., & Raj, S. R. C. (2021). VisBuddy -- A Smart Wearable Assistant for the Visually Challenged. arXiv preprint arXiv:2108.07761. arXiv

Srinivasan, T., & Patapati, S. (2025). WebNav: An Intelligent Agent for Voice-Controlled Web Navigation. arXiv preprint arXiv:2503.13843. arXiv

Startups Magazine. (2020, October). Using AI to change the lives of the visually impaired. Retrieved from https://startupsmagazine.co.uk/article-using-ai-change-lives-visually-impairedStartups Magazine

Tech4Future. (2025, January). Technologies for the blind: the journey to independence. Retrieved from https://tech4future.info/en/technologies-for-the-blind/ tech4future.info

The Times. (2025, April 14). AI smart devices can help blind people to navigate the world. Retrieved from https://www.thetimes.co.uk/article/ai-smart-devices-can-help-blind-people-to-navigate-the-world-crfhgdrlwLatest news & breaking headlines

Vogue Business. (2023, January 11). Estée Lauder's new app helps visually impaired users apply makeup. Retrieved from https://www.voguebusiness.com/beauty/estee-lauders-new-app-helps-visually-impaired-users-apply-makeupVogue Business

Wikipedia contributors. (2025, March). Seeing AI. Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Seeing_AIWikipedia+1Hable+1

Wikipedia contributors. (2025, March). Be My Eyes. Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Be_My_EyesWikipedi

Wikipedia contributors. (2025, April 3). TalkBack. Wikipedia. Retrieved from https://en.wikipedia.org/wiki/TalkBackWikipedia

Wikipedia contributors. (2025, April). Accessibility apps. Wikipedia Retrieved from https://en.wikipedia.org/wiki/Accessibility_appsWikipedia+1Hable+1

Wired. (2017, July 20). The Wearables Giving Computer Vision to the Blind. Retrieved from https://www.wired.com/story/wearables-for-the-blindwired.com

Xie, J., Yu, R., Zhang, H., Billah, S. M., Lee, S., & Carroll, J. M. (2025). Beyond Visual Perception: Insights from Smartphone Interaction of Visually Impaired Users with Large Multimodal Models. arXiv preprint arXiv:2502.16098. arXiv

YourDolphin. (2024, September). The Future is Accessible: AI Advancements in Accessibility. Retrieved from https://blog.yourdolphin.com/blog/the-future-is-accessible-ai-advancements-in-accessibilityblog.Yourdolphin.com