American Journal of Psychiatric Rehabilitation

Expert Opinion Article

Enhancing Accessibility and Effectiveness on Social Networking Sites for Visually Impaired (VI) and Hearing-Impaired (HI) Users through the Use of AI Technology

Akhand Pratap Narain Mishra[1*], Dr. Asha Sharma[2]

[1*]Research scholar, Library & Information Science Banasthali Vidyapith, Rajasthan
E- mail: akhand21mishra@gmail.com
[2]Deputy Librarian, Banasthali Vidyapith, Rajasthan -304 022, India

ABSTRACT

Access to social networking sites forms an integral part of contemporary communication and interaction, but it becomes a terrific challenge for those with visual as well as auditory impairments. This paper investigates the ways in which Artificial Intelligence (AI) technology can help improve social media accessibility while enhancing effectiveness for the impaired. Access can be made possible through AI-based features such as speech recognition, automatic captioning, image descriptions, and personalized changes in the interface. The research assesses the user experience of these AI technologies at this time, in order to point out areas where they need improvement, to improve their efficacy. The researchers adopted a survey on the perceptions of the accessibility features "enriched" with AI by the users. The outcome indicates wide-ranging user satisfaction, as most users find the currently available technologies useful, but questions surrounding usability and awareness remain. The study suggests that despite being more accessible, it would be realized only in the ongoing innovation, user participation, and community-driven development that is realized for its inclusive networking of a social network of all users. The insights gained by them could help in the formulating of more responsive, user-centric AI solutions that address specific needs of people with visual and auditory impairments.

Keywords: Social Networking Sites, Artificial Intelligence, Visual Impairment, Hearing Impairment, User Experience, AI-based Assistive Technologies

INTRODUCTION

Artificial Intelligence (AI) technology can enhance accessibility and efficiency on social networking sites for users who are visually and hearing-impaired. AI-based screen readers can provide context-related feedback by analyzing as well as understanding photographs, infographics, and multimedia content. Using computer vision and natural language processing (NLP), AI-based descriptions of images will highlight intricate visuals [1]. AI-based voice assistants such as Siri, Alexa, or Google Assistant can enable voice commands and navigation.

AI-automatic subtitles would make content easier to reach as subtitles can be automatically created and fine-tuned for uploading videos, especially on social media platforms like YouTube or TikTok. Through computer vision technology, recognition of sign language and gesture will be possible for translation of sign language to text or voice and vice versa. Audio-to-text transcription involving AI will be able to transcribe real-time audio content or pre-recorded audio content into texts readable by hearing-impaired people, which makes technical jargon or fast speech easy to understand.

AI systems can create social media content based on the personal preferences of a user; thus, the platforms can change through algorithms in an autonomous way. AI technologies can identify emotions and guide users in communications with someone who is visually or hearing-impaired as to what the emotional tone of the dialogue or post might be. Through natural language processing, AI can break down complicated content so that a person suffering from cognitive issues or those relying purely on text created through hearing would better understand it. Infusing AI technologies into social media will help create a more engaging and immersive experience for everyone, including persons with visual or auditory impairments.

WHAT IS ARTIFICIAL INTELLIGENCE AND HOW DOES IT WORK REGARDING ACCESSIBILITY

AI refers to the simulation of human intelligence in machines, making it possible for them to perform tasks that otherwise would require human cognitive functions. Such tasks include experiential learning, thinking and problem-solving, language understanding, and perception. AI systems can function either based on instructions or on complex algorithms or computation, including machine learning, deep learning, and neural networks, to make decisions from large data sets, identify patterns, and even make judgments [2].

1. AI in Inclusion
AI contributes significantly to making digital technologies, services, and settings more accessible for people with impairments. It enables the bridging of gaps potentially linked to physical or cognitive impairments and thus better access to information, communication, and services.

Accessibility Enhancement
1. **Text-to-Speech and Speech Recognition**
Functionality: AI-based technologies can transform written material into audible voice, which is called text-to-speech or can transform spoken words into written content, also known as speech-to-text. It focuses on natural language processing which is a subcategory of artificial intelligence that can understand and interpret human language.

Advantages of Accessibility:
It has the ability to enable reading digital content for those who are blind by reading aloud from websites, applications, and devices in an audible voice.
Facilitates a user who is disabled and can't type fluently to make requests or dictate written text.

2. Artificial Intelligence of Screen Readers
How it Works: A screen reader is a software application that employs artificial intelligence in the interpretation of what appears on the computer screen to audio or Braille enabling a handicapped person with their visual impairments [3].

Advantages of Accessibility:
Artificial intelligence enables these systems to comprehend intricate web data that contains dynamic features and visuals, thereby enabling these systems to be far more effective in searching websites and applications.
Enhance the ability to describe pictures, charts, or any other form of non-textual images by auto-captioning images for the visually impaired.

3. Visual Understanding and Object Detection
Working Operations: Artificial intelligence systems scan images or videos and identify objects, faces, text, and other visual features. It is used in producing descriptions of images or detecting particular things within the view of the user.

Advantages for Accessibility:
This is assisting people who are visually impaired in understanding their surroundings as it describes the image that the camera captures through applications like Microsoft Seeing AI or Google Lookout.
Intelligent glass or gadgets with AI capabilities can enable its users to recognize objects, scan messages or figures.

4. Voice Assistants
How It Works: Through its usage of natural language processing and machine learning, AI-based voice assistants such as Amazon Alexa, Apple Siri, and Google Assistant can understand exactly what the user tells them to do and promptly execute the work requested and the results obtained.

Benefits of Access
Assists people with physical or motor impairment in accessing technology hand-free by enabling them on screen to perform technology-based tasks using voice commands, search information, and interact with gadgets.
Is helpful for cognitive impaired individuals, where the complexity of the task is abstracted and hidden, such as setting reminders, controlling smart home devices, or planning for a day.

5. Live Captioning and Subtitling
Function: The ability of a machine to interpret spoken words as 'live' captions or subtitles through the identification of the voice and translating it aptly in text [4].

Accessibility Benefits
Enable communication for those deaf or hard of hearing by providing real-time subtitles during any meetings, video conferencing, or even live broadcasts.
Google Live Caption and other applications such as Microsoft Teams apply AI technology that provides audio and video information to their users who are deaf and even hard of hearing.

6. Predictive Text and Autocorrect Mechanism:
AI-based predictive text algorithms observe a user's writing patterns and recommend words or phrases as they are writing. Autocorrect application uses machine learning algorithms to correct spelling and grammatical errors [8].

Benefits of Accessibility:
Benefits users with learning disabilities like dyslexia because it helps in spelling, grammar correction, and writing suggestions.
Reduces the physical efforts when typing, which is helpful for a person with a motor disability.

7. Adaptive User Interfaces
Characteristic: AI may make the user interface of a program or device individually adapted to the user's own needs or wishes. It learns based on the interaction patterns of the user and adapts to serving individual experiences.

Benefits Accessibility:
AI can make interfaces less cluttered for the visually impaired and unload difficult work from the minds of people with cognitive impairments
AI-based apps might alter font sizes or change colors so that a blind person can read their app content.

8. Translation Service
How it works: AI-based translation service works very similarly to Google Translate wherein they make simultaneous translations possible in different languages using natural language processing and machine learning algorithms.

Accessibility Benefits
Facilitates communication with deaf and hard-of-hearing people using AI-driven avatars that provide immediate sign language interpretation, such as SignAll.
Enables communication for people who do not read or speak by using existing content in a range of formats, such as sign language or simplified language [5].

LITERATURE REVIEW
Ghafoor, et al (2024) said that the study aims to support the visually impaired through improved social conversations and communication skills. The speech recognition and text-to-speech APIs with the tools facilitating real-time communication fall within. These technologies contain natural language processing and machine learning algorithms, applied for the purpose of analyzing spoken language and responding appropriately. They therefore foster self-confidence, reliance on themselves, and social competence and thus better relationships. For example, conversation assistive technology allows visually impaired people to communicate with friends, relatives, workmates, and strangers in public places more easily and naturally. As a result, a sense of isolation declines and general quality of life improves.

Kumar, & Nagar, (2024) in the paper explores how AI-powered language translation and interpretation services may facilitate educational access for students who are blind or have low vision. It investigates how such technologies work to provide near-real-time material modifications accessible to students. Findings indicated that AI services gave real-time access to written and oral content and decoded visual information, thereby greatly enhancing accessibility. However, several data privacy issues, tailored AI training, and some errors were observed in translation. The authors suggest that AI systems be designed context-sensitive and even adjustable to the changing needs of individuals. In this way, the relationship between AI developers and teachers with disability professionals can be fluid.
Kumar, et al. (2024) explains that the use of AI-based solutions to people with impairments has an impact as it will enable them to go on performing some day-to-day activities and learning new skills. As a result, AI technology tailored to support individuals with disabilities would offer an opportunity to enhance access, and develop further including persons in society; and assist persons in living independently in situations in which the impediment would be otherwise insurmountable or virtually impossible. The future advancement of AI might develop more advanced and innovative forms, potentially directing these towards methods that can even better service the complicated issues related to people with disabilities. Therefore, AI can be maximised for enhancing inclusion for this group of population.

METHODOLOGY
Quantitative data collection
Quantitative data can be collected by using tools such as surveys depending upon the nature of topic under discussion and also depending upon the feasibility of the data collection tool.

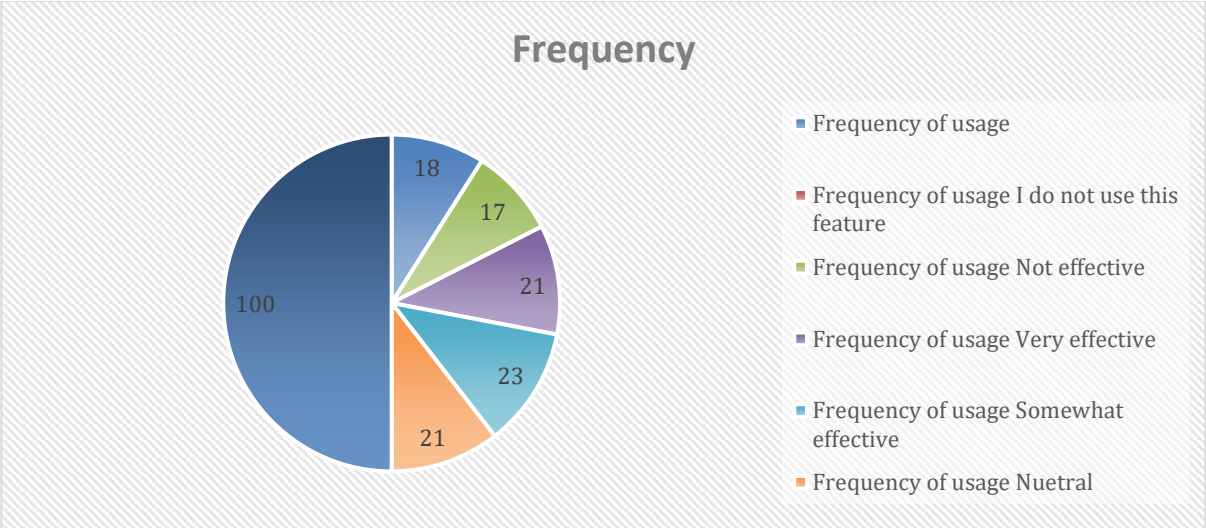
Qualitative collection of data
There are different reasons why a qualitative research approach has been adapted. Qualitative data collection has been done through the help of content analysis from different sources across the world. The sources can be journals or white papers or the science paper available on the internet.

Sample
Survey method will be applied by the investigator to study the research topic that is, 'Enhancing accessibility and effectiveness on social networking sites for visually and hearing-impaired users through the use of AI technology" [6]. The researcher will use questionnaires to understand and gather information on the research topic. Simple random sampling technique will be used by the investigator to select 100 participants both male and female.

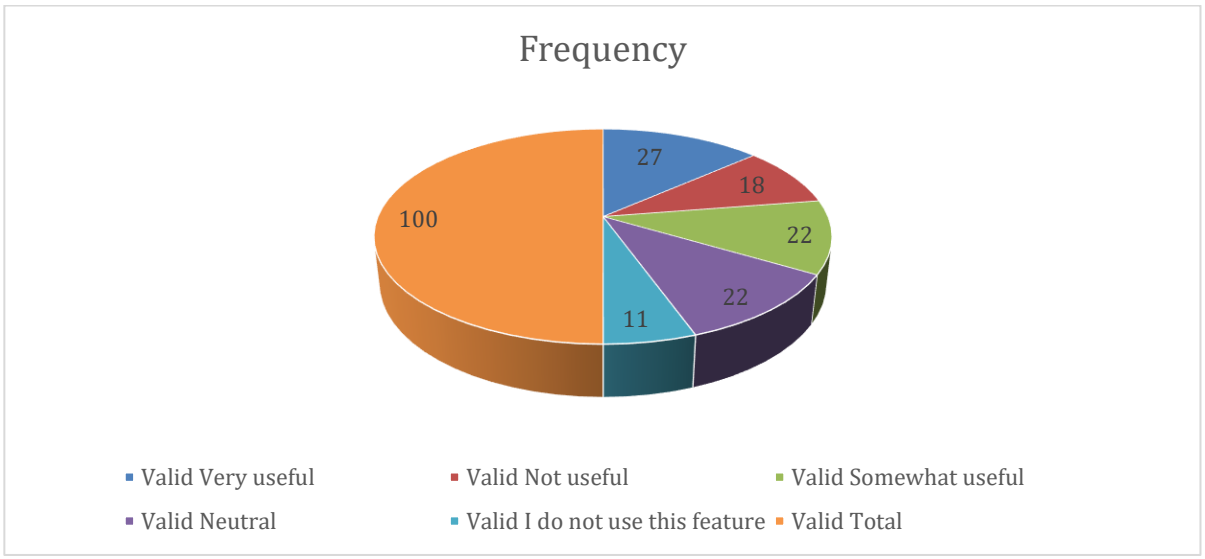
Tools used for data collection
Questionnaire tool
Questionnaire technique will be used by the investigator to ask questions among 100 participants both male and female. The questions will be asked in the written form and the students will have to give their answer in the form of a close ended option. The questions will be of likert scale or it could be multiple choice [7].

Statistical Analysis:
Use statistical tools like SPSS to process and analyse the survey data, frequency analysis is done throughout the study so that an understanding is created of how frequently AI is helping in the management of hearing and visually impaired people.

DATA ANALYSIS
1. How effective are the AI-generated image descriptions or alt text on social networking sites you use?
- Very effective
- Somewhat effective
- Neutral
- Not effective
- I do not use this feature



The data reflects that while many users (**44%**) find the feature at least somewhat effective, there is still a sizable group that either does not use it or finds it lacking in utility. The **21%** neutral responses suggest that some users may not have had enough experience with the feature or are undecided about its value.
Opportunity for Improvement: With **35%** of users either not using or finding the feature ineffective, there is a clear opportunity for platforms to either promote the feature better or enhance its functionality to ensure that it meets the needs of a broader range of users.
2. How useful are AI-generated captions or subtitles on video content shared on social media?
- Very useful
- Somewhat useful
- Neutral
- Not useful
- I do not use this feature

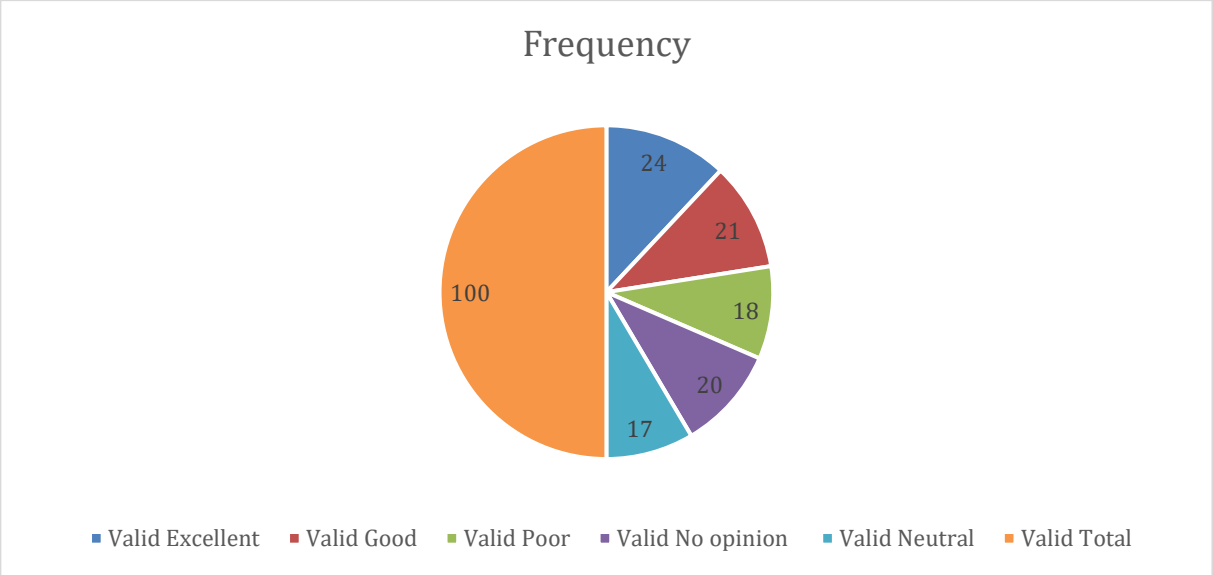


The majority of respondents recognize some degree of value in the AI-powered feature, with **49%** considering it either very or somewhat useful. However, the **18%** who find it unhelpful and the **22%** who are neutral suggest that improvements are needed to increase the tool's relevance and effectiveness.

Additionally, the **11%** who do not use the feature might indicate either unfamiliarity with the feature or that it does not align with their specific needs, pointing to opportunities for better education or feature promotion.

3. How would you rate the current role of AI in improving accessibility on social networking platforms?

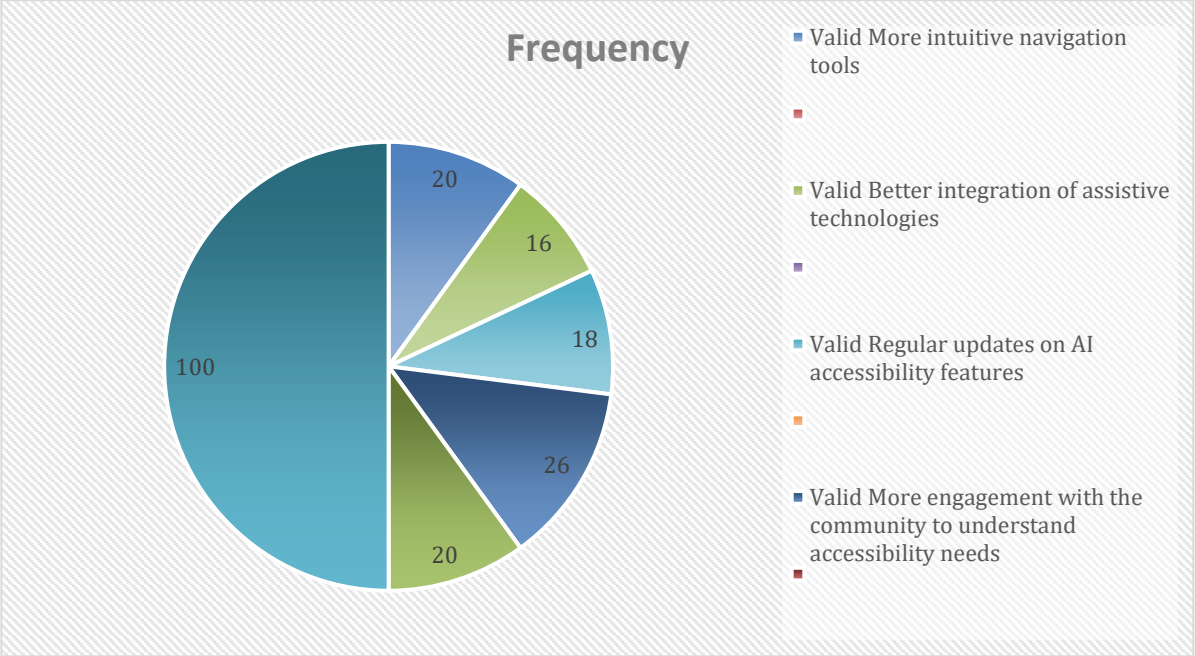
- Excellent
- Good
- Neutral
- Poor
- No opinion



The data shows a general lean towards positive perceptions of AI in improving accessibility on social networking platforms, with nearly half of respondents expressing satisfaction. However, the **18%** rating the features as poor indicates that there are still barriers or inefficiencies to be addressed. The **37%** who are neutral or have no opinion reflect either a lack of awareness or engagement with AI-driven accessibility features, which may signal the need for better communication and demonstration of these features to users.

4. What are your expectations from social networking sites in terms of future accessibility improvements through AI?

- More intuitive navigation tools
- Better integration of assistive technologies
- Regular updates on AI accessibility features
- More engagement with the community to understand accessibility needs
- Futuristic association on AI



The data shows that users value both immediate improvements, such as community engagement and more intuitive tools, as well as forward-looking approaches with AI. Social networking platforms could focus on improving community involvement and consistently updating AI-driven accessibility features while also planning for future AI advancements.

CONCLUSION

AI Accessibility Features Show Promise There is enough evidence that AI is making social networking more accessible for visually and hearing-impaired users. Many people reported having good experiences while using the social networking site by using AI accessibility features. However, there seems to be a mixed response suggesting that a section of this lot still needs improvement.

A large number of respondents do not use them or think them useless; thus, there is enormous potential for improvement in regard to usability, usefulness, and promotion. Respondents want the features of AI continually improved upon and to be better connected with communities to better serve their needs. Integration of users' response for subsequent improvement will be key to fine-tuning AI efficiency in accessibility.

This, therefore, means that while AI is an excellent tool for making accessibility practical, it needs to be evolved further to suffice diverse user demands.

REFERENCES

1. Ghafoor, K., Ahmad, T., Aslam, M., & Wahla, S. (2024). Improving social interaction of the visually impaired individuals through conversational assistive technology. *International Journal of Intelligent Computing and Cybernetics*, *17*(1), 126-142.
2. Kumar, A., & Nagar, D. K. (2024). AI-Based Language Translation and Interpretation Services: Improving Accessibility for Visually Impaired Students. *As the editors of Transforming Learning: The Power of Educational*, 178.
3. Kumar, V., Barik, S., Aggarwal, S., Kumar, D., & Raj, V. (2024). The use of artificial intelligence for persons with disability: a bright and promising future ahead. *Disability and Rehabilitation: Assistive Technology*, *19*(6), 2415-2417.
4. Gandhewar, N., & Mohan, S. (2022). Accessibility in disability: revolutionizing mobile technology. *Intelligent Systems for Rehabilitation Engineering*, 151-173.
5. Sinha, A., & Kumar, T. (2024, January). An Inclusive Approach to Addressing Challenges for the Speech and Hearing Impaired. In *International Conference on Smart Computing and Communication* (pp. 469-481). Singapore: Springer Nature Singapore.
6. Bekeš, E. R., Galzina, V., & Kolar, E. B. (2024, May). Using human-computer interaction (hci) and artificial intelligence (ai) in education to improve the literacy of deaf and hearing-impaired children. In *2024 47th MIPRO ICT and Electronics Convention (MIPRO)* (pp. 1375-1380). IEEE.
7. Chemnad, K., & Othman, A. Digital accessibility in the era of artificial intelligence—Bibliometric analysis and systematic review.
8. Dokania, H., & Chattaraj, N. (2024). An assistive interface protocol for communication between visually and hearing-speech impaired persons in internet platform. *Disability and Rehabilitation: Assistive Technology*, *19*(1), 233-246.