From Practice to Perception: How Blind People Use and Understand Generative AI

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Generative AI (GenAI)

- A type of artificial intelligence that can create new content, such as text, images, music, or code.
- Works by learning patterns from large amounts of existing data.
  - Then uses that knowledge to generate new content based on user prompts or instructions.

Generative AI (GenAI)

Common examples

- Chatbots
- Text generators
- Code assistants
- Image creation tools
- Image description tools

Midjourney

Research on GenAI Use

- Inaccurate responses can limit reliability and lead to unsafe use [Budhiraja ‘24; Amoozadeh ‘24]
- Users may develop erroneous mental models of GenAI tools [Zhang ‘24; Liao ’24]

How do blind people use and understand GenAI tools?

1. Rudaiba Adnin and Maitraye Das. 2024. "I look at it as the king of knowledge": How Blind People Use and Understand Generative AI Tools. In *Proceedings of the International ACM SIGACCESS Conference on Computers and Accessibility, (ASSETS '24)*.
2. Maitraye Das, Alex Fiannaca, Meredith Ringel Morris, Shaun Kane, and Cynthia Bennett. 2024. From Provenance to Aberrations: Image Creator and Screen Reader User Perspectives on Alt Text for AI-Generated Images. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI '24)*.

Method

- Interviews and observation with 19 blind screen reader users

- Participants used
  - GenAI chatbots e.g., ChatGPT, Gemini, Claude
  - Image description tool e.g., Be My AI

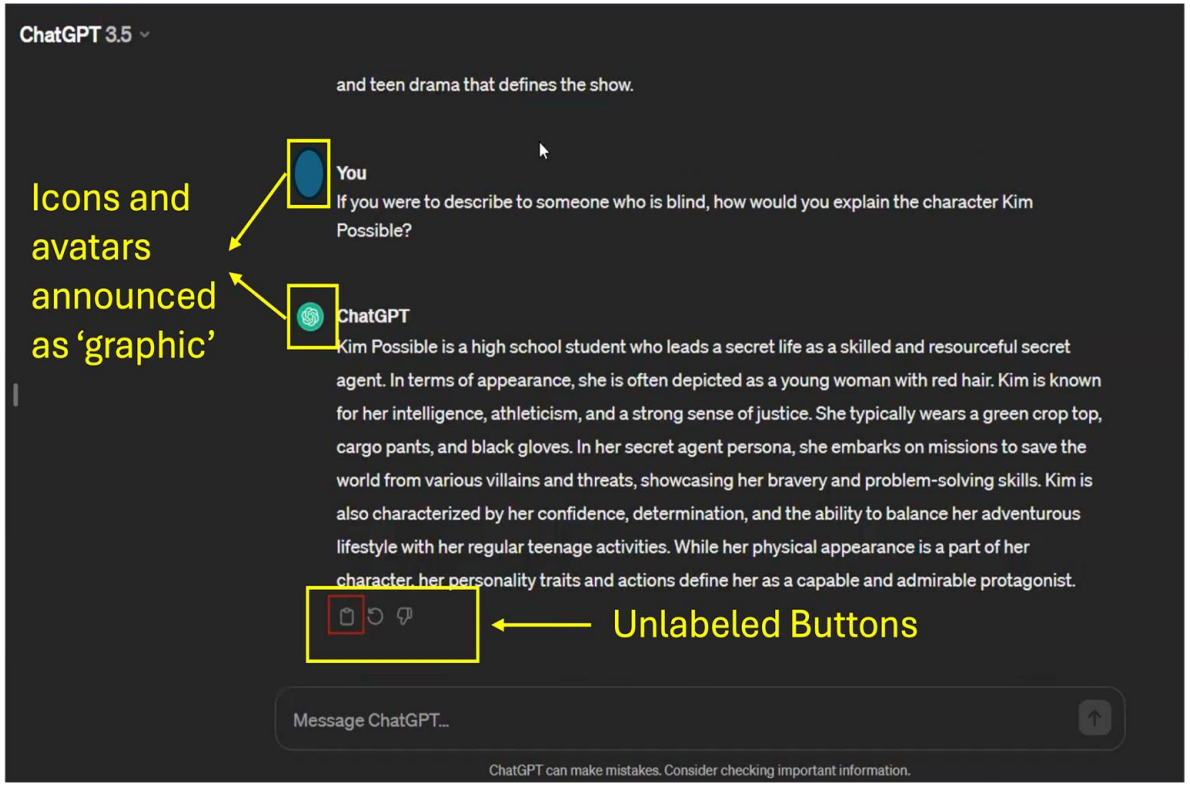
Findings

- Accessibility issues in GenAI tools
- Use cases of GenAI
- Inaccuracies and idiosyncrasies of GenAI
- Users’ mental models of GenAI
- Biases and Harms of GenAI

Accessibility issues in GenAI tools

- Buttons to copy, regenerate, and upvote/downvote responses unlabeled

- Lack of heading and landmarks makes it hard to navigate using screen readers
  - Users find workarounds like pressing G key to jump between prompts and responses



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Use cases of GenAI

- Creating content
  - copywriting materials, emails, course outlines, resumes, cover letters, recommendation letters, computer programs, stories, poems, songs
- Spellchecking, fixing grammar, translating
- Information search
  - TV shows, products for shopping, accessibility guidelines
- Brainstorming
  - tactile activities to throw a birthday party
  - managing a PR (public relations) vertical for a college fest as a blind person,
  - a weight loss program…

Benefits of using GenAI

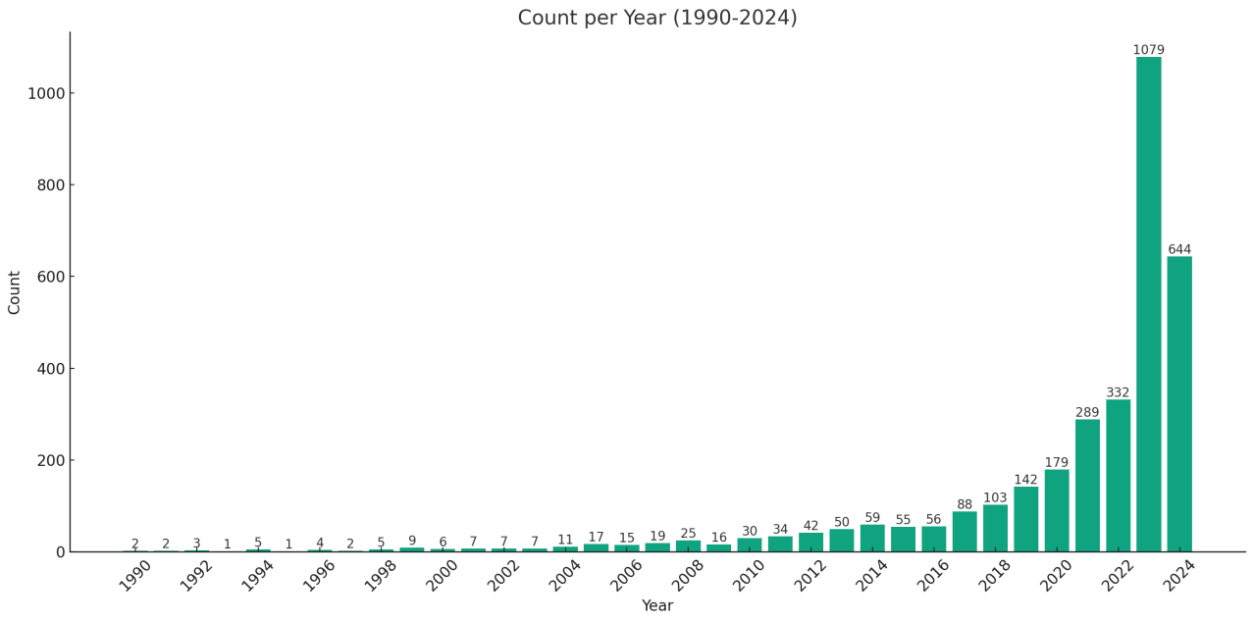
- Efficient and time-saver

- Visual question answering
  - *“I’ve actually just grown used to the Be My AI descriptions because some people just don’t know how to describe things to blind people.”*

- Helps learning new things without ‘fear of judgement’
  - *“Trying to teach myself code has been a nightmare. Then again, I’ve never been able to find people who have time or patience to teach me how to do it either... And I’ve learned more from ChatGPT in the past year than I’ve learned in the past 20 years.”*

But AI-generated content is “robotic”

- Formulaic, redundant, overuse of big words, verbose, flowery…
- Need to modify so that the content do not seem AI-generated
- Some avoid using GenAI
  - “*Because it’s actually more work*”



Source: https://www.linkedin.com/pulse/genai-delving-tackling-trust-issues-reece-sophocleous-v37ff/

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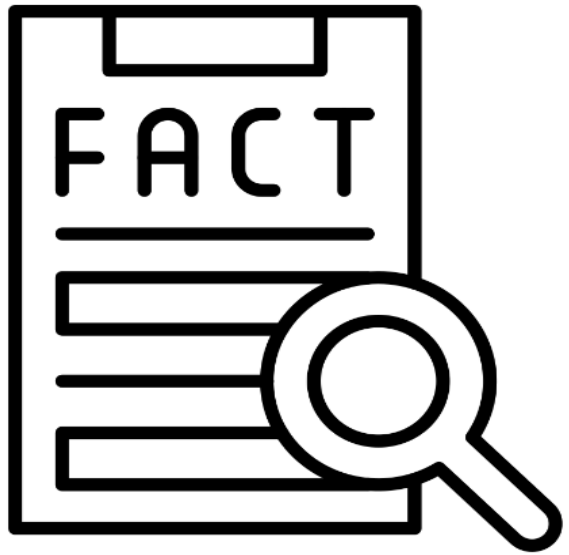
GenAI hallucinations

Be My AI: The picture shows a man walking in the park with a guide dog. The man is holding **a white cane in his left hand and the dog leash in his right hand**... The dog appears to be a black Rottweiler with a red collar... The setting is peaceful and suggests a quiet and natural environment.

Managing inaccuracies

- Trust GenAI “99%” or “99.999%” time
  - Responses are “detailed enough”
  - Source references are cited
  - Due to the “independence” afforded by GenAI over sighted assistance
- Check for accuracy only if
  - Financial, health-related, or professional contexts
  - GenAI response “seems fishy”



Verifying information

- Alternative more trustworthy sources
  - Search engines or reputable websites

- Check if it generates the same response if the question is repeated
  - At different times to the same GenAI tool, creating new chat thread
  - Other equivalent GenAI tools like ChatGPT vs Gemini

Verifying information

“**Deductive reasoning**” by repeated prompting

Ethan: “You sure it’s a Rottweiler?”

Be My AI: Asserted that it’s Rottweiler.

Ethan: “Prove to me that it’s a guide dog.”

Be My AI: Not sure if it’s a guide dog

Improving response quality

- Blind users tended to blame the quality of their text prompts or uploaded images for inaccurate or poor-quality GenAI responses
  - Example: one participants thought Be My AI confused the left and right hands because the image was not uploaded correctly
  - *“If I get a bad response, I gave it a bad prompt. It’s my fault.”*

Prompt engineering

- Crafting specific and detailed prompts
- Follow-up questioning to remind GenAI of the original tasks when it started making assumptions
    - But sometimes follow-up questioning degraded quality if the chat thread got bigger than 5-10 messages.

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Mental model

- Users' conceptual understanding of complex systems based on their experience interacting with those systems

  - Without a clear understanding, individuals often form their own simplified mental models of how a system works that do not always correspond to the system's actual functionalities.

  - Flawed mental models of GenAI tools can lead to unsafe use, over-reliance, disclosure of sensitive topics and privacy risks.
    [Liao et al. 2024, Zhang et al. 2024]

Google search on steroids

- GenAI tools pull up information from the internet either by directly searching and/or using a search engine like Google or Bing
    - Even the versions that did not have internet search capability like ChatGPT 3.5
- Somewhat flawed mental model

Keyword-based query into a massive database

- *“An LLM (large language model) is basically an infinite amount of data essentially that’s been fed into a computer. That computer can then parse for information that you’re looking for. So, if you ask a question, it goes back into its system and sees—Has that question been asked before? Can I string information together?—to give that person an answer.”*

- Flawed mental model. Causes over-trusting.
  - “*Honestly, I look at it as the king of knowledge. . . So, if ChatGPT doesn’t know what to say, I’m just not gonna find what I’m looking for because it ain’t there.”*

Word-generating machine

- GenAI predicts the next likely word given an input sequence of words
  - *“When I throw a sentence into it. . . it spits out connected words that kind of go in the direction of the prompt. There is clearly no overarching intelligence in there. It just comes up with words that string together and they kind of sound vaguely intelligent based off what you’re trying to ask it.”*

- Relatively accurate mental model
  - Participants had programming or worked in technology sector

Stores and reuses prompts

- Chat histories are stored in the massive database and reused for keyword-based query

- Somewhat flawed mental model
  - GenAI tools have a mechanism of taking user feedback through upvoting or downvoting of responses
  - But those buttons were unlabeled, so many participants did not know their existence. They instead thought their prompts are stored.

More in-depth AI

- Compared to
  - Other voice assistants like Alexa, Siri, Google Home
  - Image description apps like Seeing AI, Tap Tap see

- Because GenAI tools provide
  - comprehensive information
  - in a more conversational way

Like a human

- Anthropomorphized metaphors
  - *“a writing assistant, secretary, notetaker, editor, personal proofreader, best friend, and mentor kind of thing that never judges.”*

- Developing trust and comfort with GenAI’s idiosyncrasies
  - *“I’m treating it like a partner in getting things done... At the beginning, you’re getting used to each other’s quirks... By the time you’ve been working together for a while, you know how each other work, what you can trust and what you can’t.”*

But still a computer, not a human

- Cannot solve mathematical, logical problems or nuanced reasoning

- Cannot provide high-quality creative content
  - *“This is not an idea generating machine. . . If I wanted it to write about the quests that the characters [in a story] undertook, it’s going to regurgitate very common themes from classic lit. . . It’s not going to come out with a new one out of whole cloth that’s gonna turn anyone into a bestseller author. . . It does not have a human spark of creativity, doesn’t think outside the box.”*

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Produces ableist and ageist content

- Inspiration porn: Describing a blind person as courageous or resilient
- Expresses pity for disability: “I’m sorry, you’re blind.”
- Stereotypical content: *“I asked ChatGPT to give a compliment about being old to my mother for her birthday card. . . but it made a couple of negative comments about being old.”*

Potential reasons of ableist content

- Dataset includes content written by nondisabled people

- *“We call them artificial intelligence, but they are ultimately based on humans and humans have internal biases. And the disabled community and the community of minorities face bias every day. And so, these artificial intelligence models that are being built, when they are searching the internet, their sources are going to be impacted by bias... racism, ableism, and so on.”*

Harms of GenAI

- Propagation of misinformation and disinformation
  - Deepfake videos and images impersonating people
  - Voice cloning

- Privacy issues
  - Unclear how GenAI tools store information, for what purposes and how long, and how that information will be used later

Implications

For Blind users and GenAI developers

Balancing Intertwined GenAI harms

Blind users were cognizant of GenAI harms but did not want outright ban on GenAI for the many accessibility benefits it brings.

- Example: Be My AI stopped describing images with people's faces due to privacy violation
  - But this revoked blind users' access to understand images of their close friends and family

Rethinking Information Verification in GenAI

- Factors behind verification decision
  - Context of use
  - Stakes
  - ***Verifiability***
    - How to make it easier for blind users to verify information?
  - ***Believability***
    - How to encourage constructive skepticism among blind users to move away from over-trusting?