# Assistive Technologies – Part 2

05-499/899 Fall 2024

Celebrating Accessibility

https://cmu-05-499.github.io

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# Administrivia

- HW2 review
- HW3 released today.
- HW3 due Thursday, Sept 24, 11:59pm
- Readings posted on Canvas/Announcements.

# Let’s Talk about Citations

- In HW2 Disability Deep Dive, we asked you to cite your sources.
- But we saw many answers that lacked citations or used them inappropriately.
- Let’s get on the same page about how to use citations.

# Citation Hygiene

## When should we cite?

- When quoting or paraphrasing someone else's words, ideas, research, etc.
- When presenting previously reported data, statistics, or findings
- To support your claims
- When using visuals or media that were created by someone else

## How should we cite?

- Use in-text citations to provide "pointers" to the full references; e.g., (Smith, 2024), [4], (Smith 2024, p. 50)
- At the end of your document, provide full citations for all cited references. Organize these references alphabetically or (if using numbered in-text citations) in the order the references are introduced.

# When Quoting or Paraphrasing

- **INCORRECT (no citation):** “Autism Spectrum Disorder (ASD) is a complex developmental condition involving persistent challenges with social communication, restricted interests and repetitive behavior…”
- **CORRECT:** “As stated by Smith et. al. [5], ‘Autism Spectrum Disorder (ASD) is a ….’ “
- **Also CORRECT**: “‘Autism Spectrum Disorder (ASD) is a …’ (Smith, 2013)”

# When presenting previously reported data or statistics

- **INCORRECT (no citation):** “The incidence of autism in the US is 1 in 36.”
- **CORRECT:** “The incidence of autism in the US is 1 in 36 (CDC, 2024).”

- **INCORRECT:** “As of 2023, approximately 6.7 million Americans … are living with Alzheimer’s. Worldwide, over 55 million people have dementia with Alzheimer’s comprising 60-70% of these cases [6].”
  - **What’s wrong?** Two different statistics are presented; placing the citation at the end makes it unclear which specific information is being supported by the citation.
- **CORRECT:** “As of 2023, approximately 6.7 million Americans are living with Alzheimer’s [6]. Worldwide, over 55 million people have dementia, with Alzheimer’s comprising 60-70% of these cases [6].”

# To support your claims

- **INCORRECT (no citation):** “Mobility disability refers to the inability of a person to … “
- **CORRECT:** “Mobility disability refers to the inability of a person to … (Jackson, 2024).”
  - Here, we place a citation after our sentence to indicate that the entire statement is sourced from the referenced material.

- **INCORRECT (no citation):** “As defined by the US medical establishment, deafness is… “
- **CORRECT:** “As defined by the US medical establishment (Hsin, 2024), deafness is… “
  - Placing a citation after “US medical establishment” specifically supports how the term, “deafness” is defined by the “US medical establishment”.

# When using visuals or media created by someone else


Figure 1. Figure description. Extracted from [1] without modification.

**References**


- [1] Correia-Caeiro, C., Guo, K., & Mills, D. (2017, November). Do dogs smile when happy–an objective and comparative study of dog and human facial actions in response to emotional trigger. In Proceedings of the 51st Congress of the International Society for Applied Ethology (pp. 193-193). Wageningen Academic.
- [2] ...

# Hearing

Hearing Aid

Assistive Listening Devices

TTY

Captioning

Speech Recognition

ASL Recognition

Video Conferencing

# Hearing Aid

Involve a microphone and “speaker” to sense environmental sounds (typically speech) and amplify the sound at appropriate frequencies.

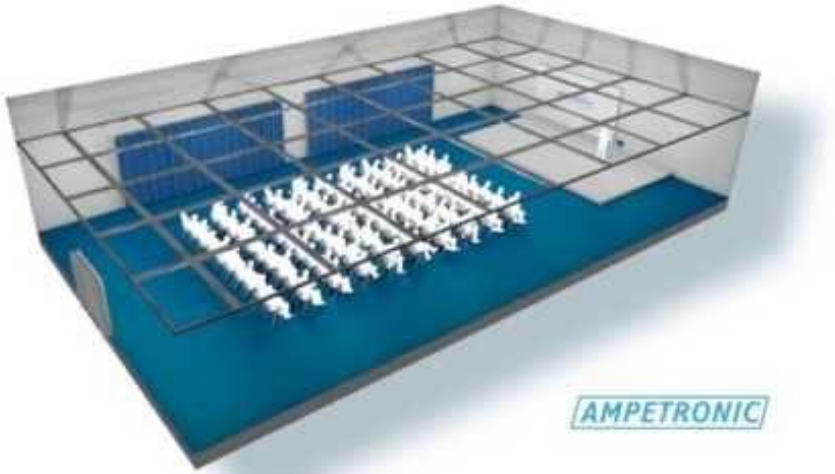
Hearing loss is not often experienced consistently across the speech frequency band. For instance, in aging, higher frequencies may be more impacted.

The “speaker” is  typically based on air waves or bone conduction.

# Assistive Listening Devices

## Personal Listening Devices

## Hearing Loop/Induction Loop



# Captioning

Probably familiar with closed captioning for Television and Movies

Real-Time Captioning can be provided in multiple ways

- Computer-Assisted Remote Transcription (CART)
- Automatic Speech Recognition

# Speech Recognition

- First speech recognition system from Bell Labs in 1952.
  - “Audrey” could recognize spoken numbers.
- Based on acoustics, linguistics: could recognize 1000 words by 1970s.
- Big leap in 1980s with Hidden Markov Models.
  - “Every time I fire a linguist, the performance of the system goes up.” - Fred Jelinek (IBM)
- Massive improvement in mid 2010s with deep learning
  - Word error rate dropped below 5% (better than people!)

# ASL Recognition

System that translates between sign language and English.

Lots of research systems that can recognize some nouns from some ways of signing.

However, no viable systems exist, but some startups are really trying:

OmniBridge, SignAll

Deaf community: Please do not attempt this without us. You're being audist.

# TTY - Teletypewriter and Telephone Relay Services

Early solution telephone-based communication

Text based communication

# Video Conferencing

2-way video call as early as 1930

1990s first desktop video conferencing

2000s begin smartphone based video calls

# Physical Mobility and Motor

Crutches and Braces
Grips and Reachers
Wheelchairs
Adaptive Inputs / Switches
Scanning Interfaces
Eye Gaze
Brain Computer Interfaces (BCI)
Remote Controlled Devices
Telepresence Robots

# Crutches and Braces

# Grips / Reachers

# Wheelchairs (Manual, Powered)


# Wheelchairs (Sports)

Basketball/Tennis



Rugby

# Adaptive Inputs/Input Modification

Mechanical

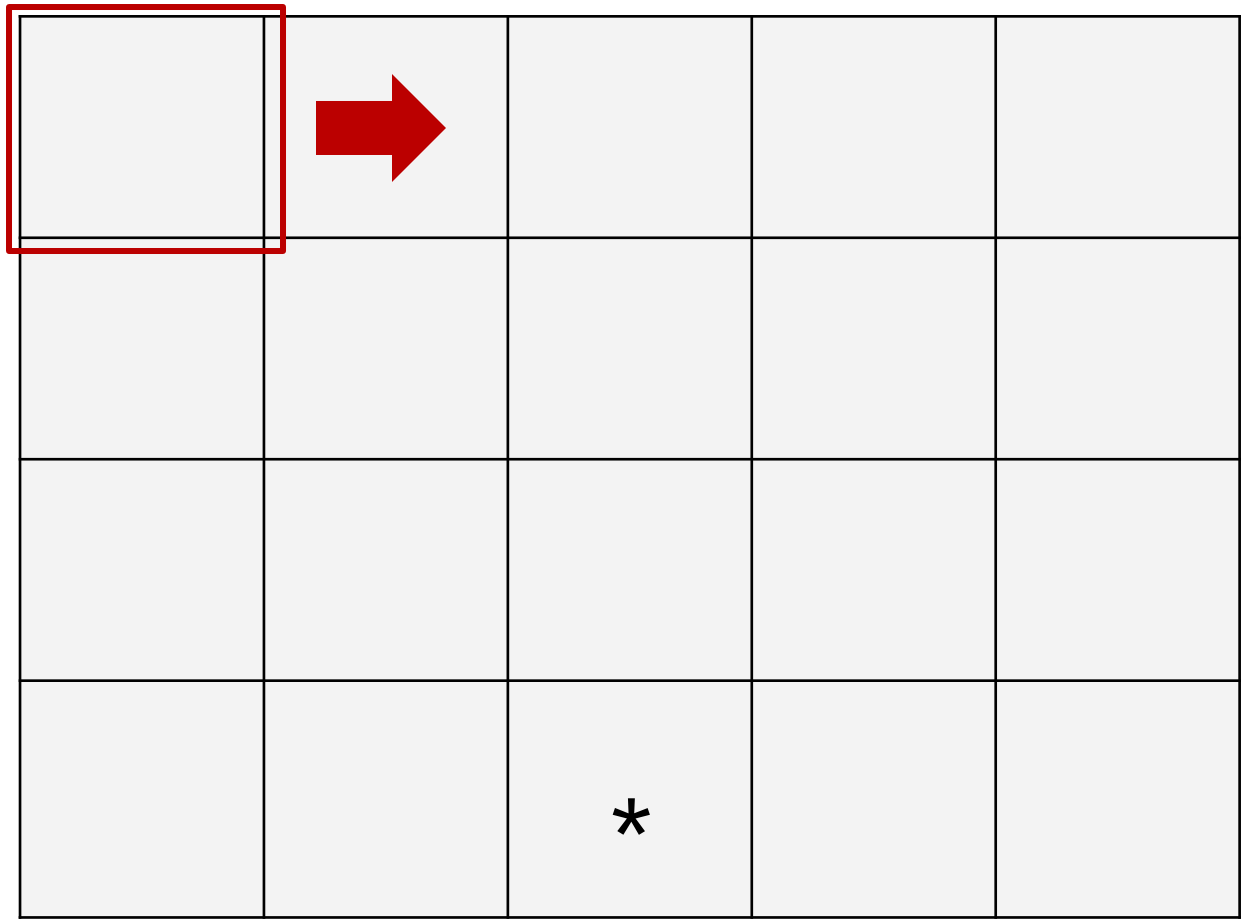
Proximity and Pneumatic

# Scanning Interfaces

Automatic

Stepped

Inverse Scanning



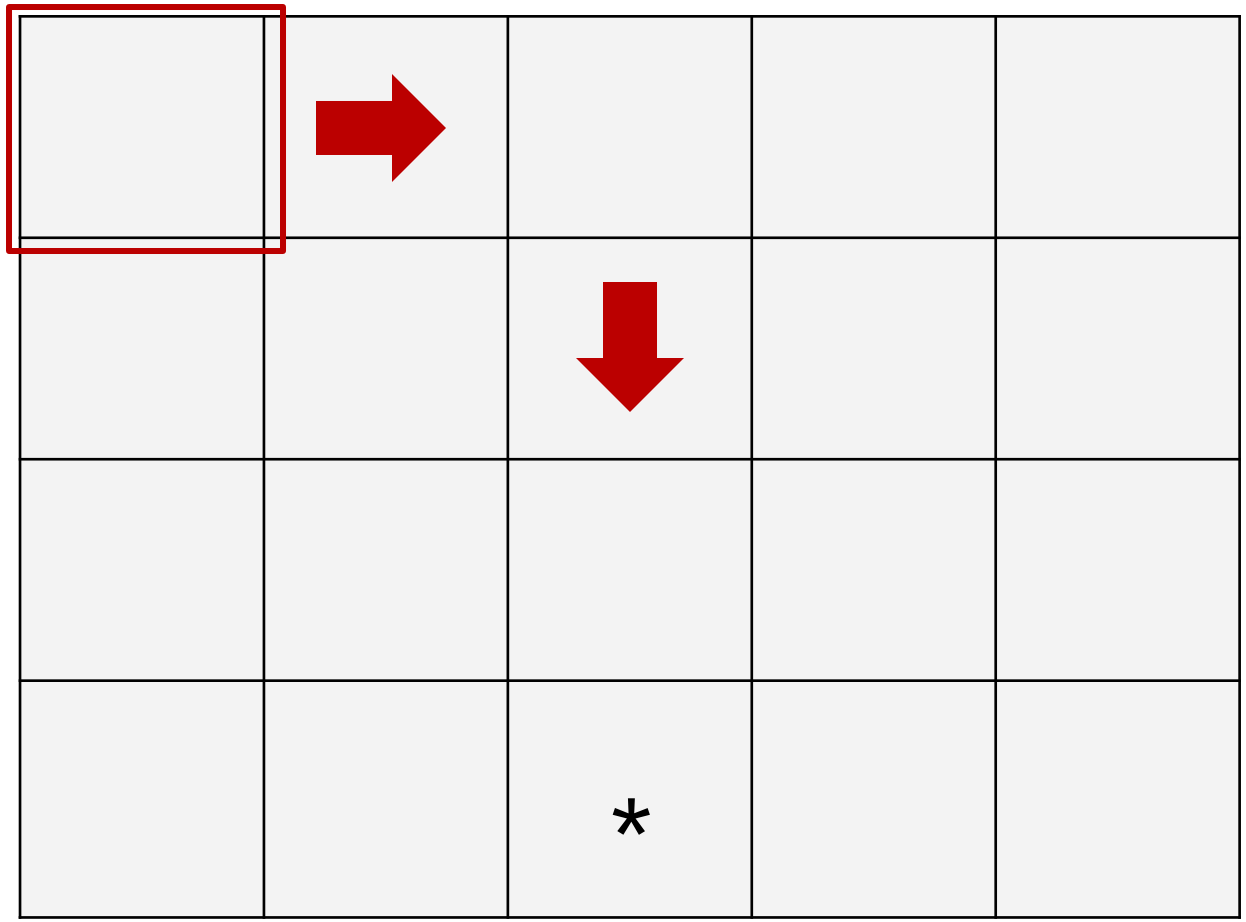
# Scanning Interfaces

Automatic

Stepped

Inverse Scanning

**Directed Scanning**



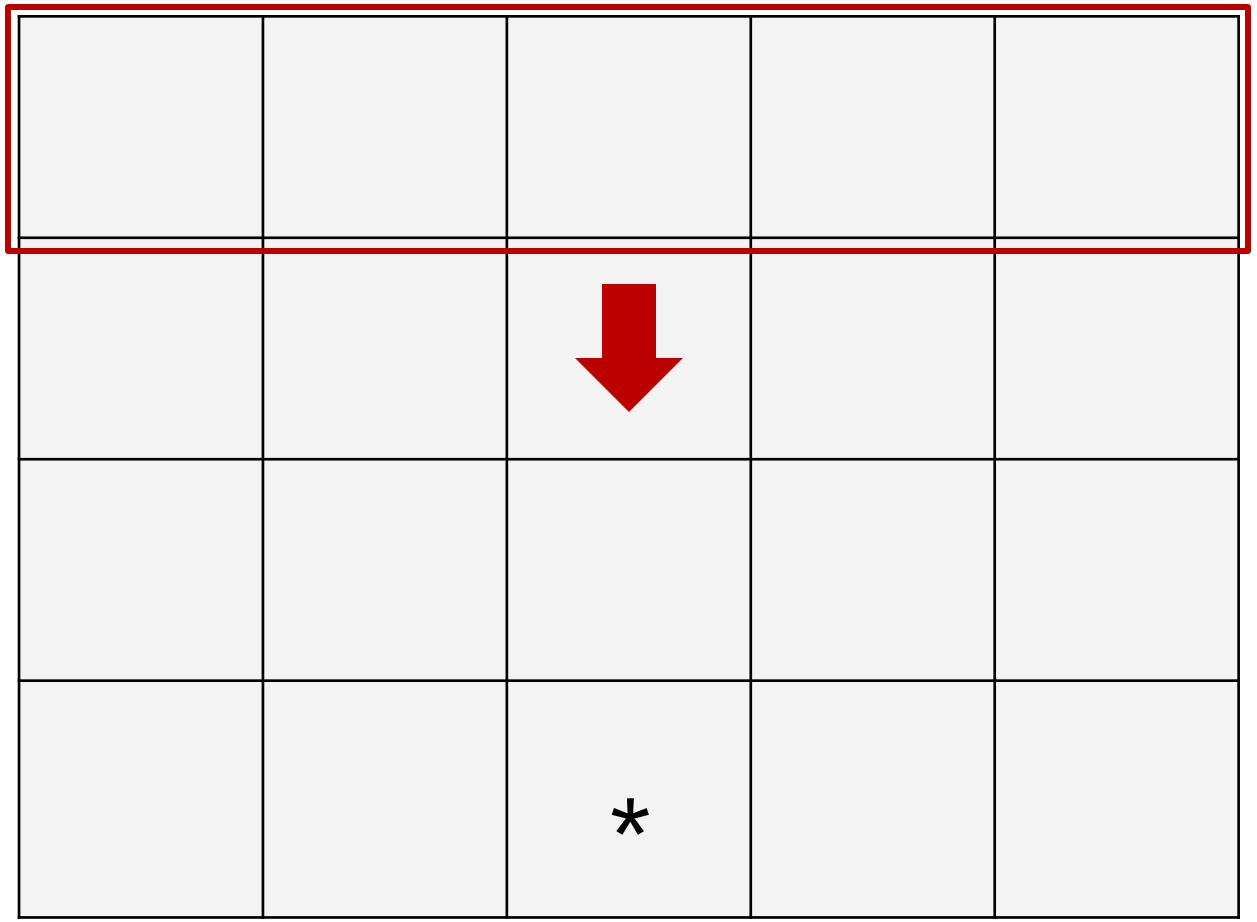
# Scanning Interfaces - By Group

Automatic

Stepped

Inverse Scanning

Directed Scanning



# Scanning Interfaces

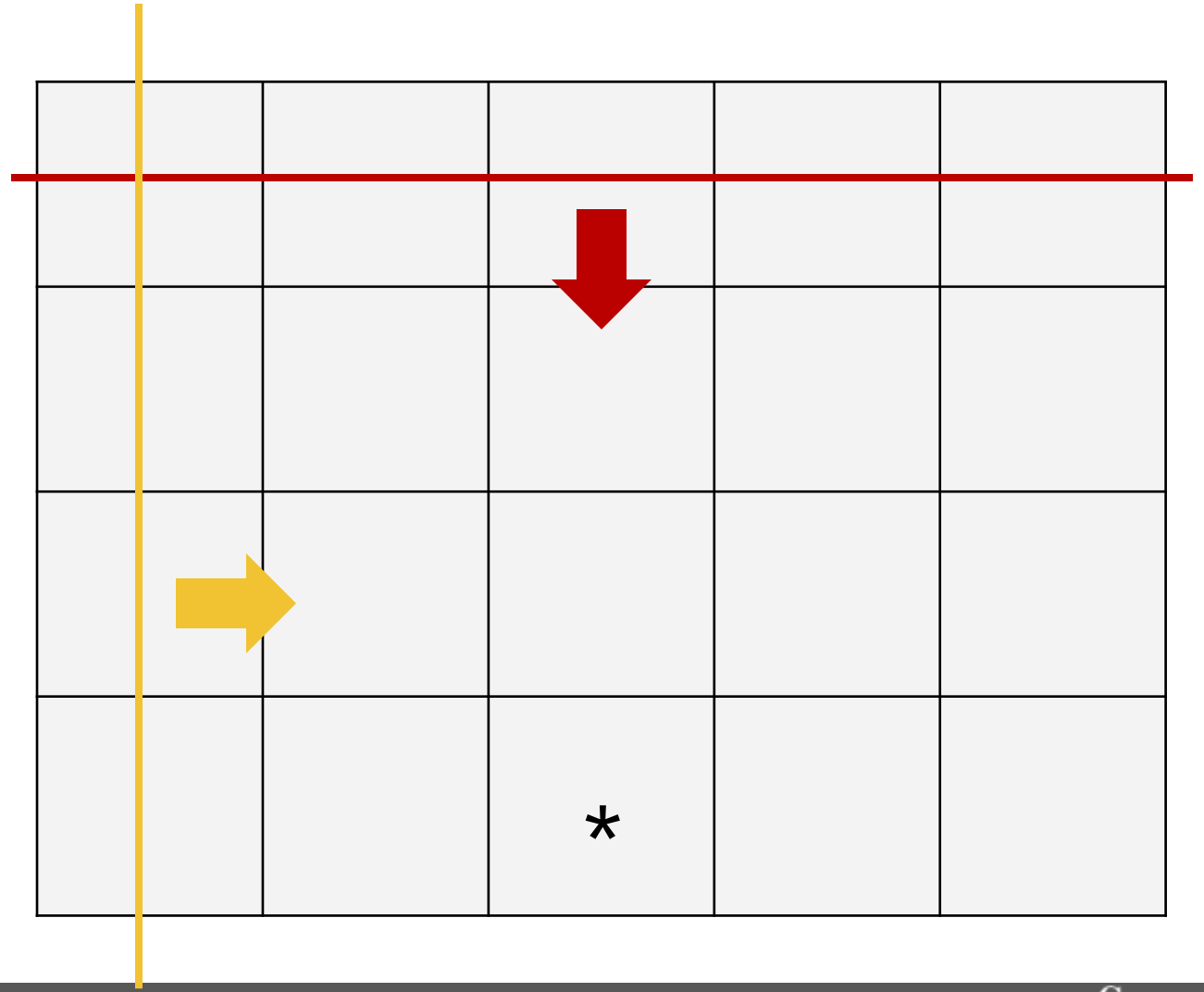
Automatic

Stepped

Inverse Scanning

Directed Scanning

**Cartesian Scanning**



# All together

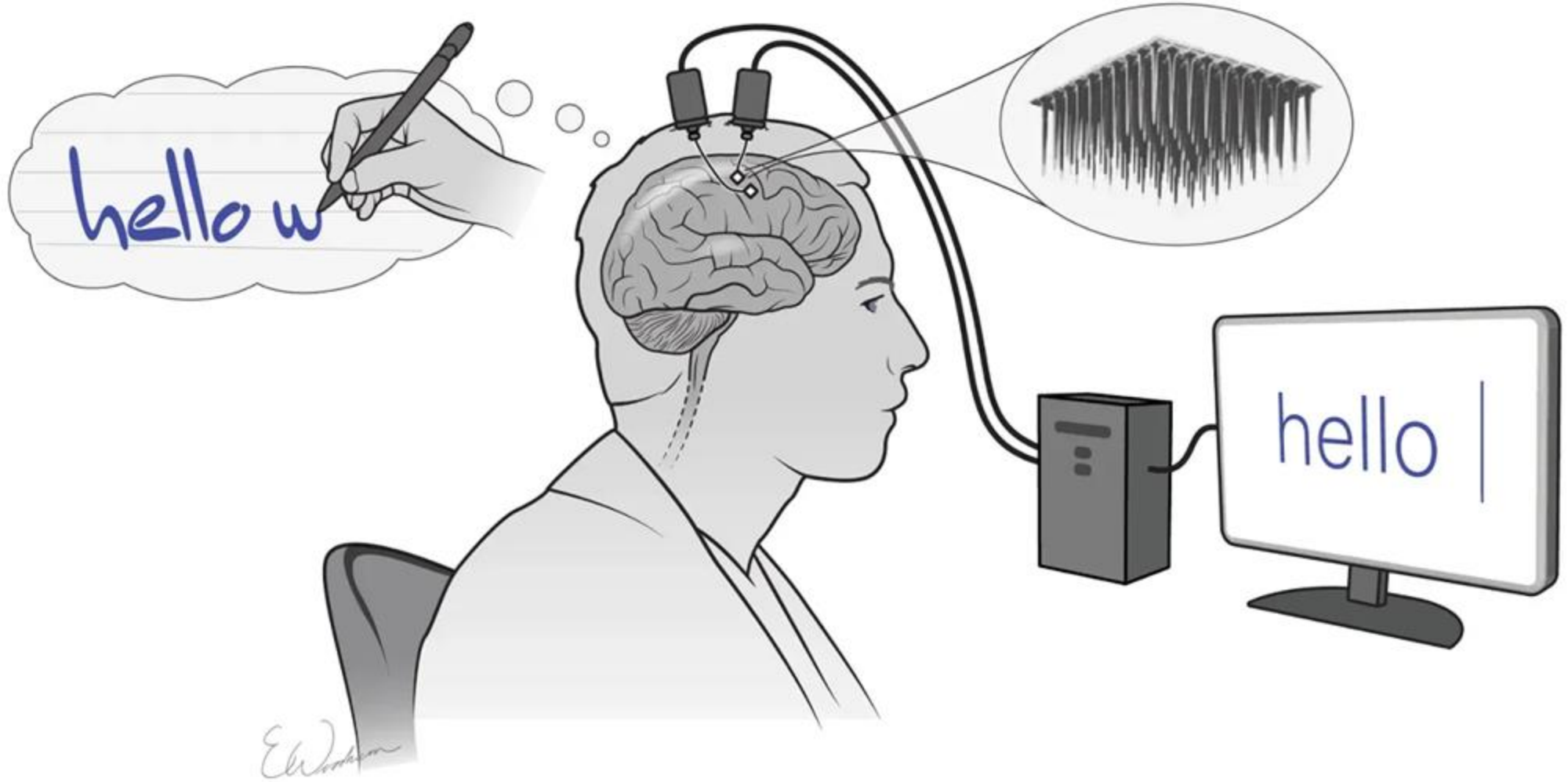
# Gaze Recognition

Shoots IR at your pupils and detects the position of the reflected light.

“Remote” eye trackers sit away from the head and must also do head tracking.

Watch out for the Midas Effect when using gaze for control.

# Brain-Computer Interfaces (BCI)



# Remote Controlled Devices

# Telepresence Robots

Allow you to remotely “be there” and travel around a physical space and interact with people via video call

# Participation Activity

- Pair up with a neighbor.
- Write your names on a sheet of paper.

- Your only means of using a computer is a BCI that lets you press a button.
  - It takes about 500 ms of mental effort to push the button.
  - You get fatigued if you have to push it more than 4 times a minute.
- Invent a UI to control a web browser so you can go to cnn.com and read the news.
- Write down your design and share with the class.

- Turn in your paper before you leave.

# Cognitive Impairments

Simplified English
Conversational Agents
Maps
Memory Aids
Pill Dispensers
Medic alerts
Security sensors
Plumbing sensors
Geofencing

# Simplified English

- Improves clarity and reduces ambiguity in documentation.
- Reduces cognitive load by avoiding complex sentence structures and jargon.
- Consistent phrasing
- User-friendly instructions, minimizing likelihood of misunderstanding
- Used in legal and academic settings for people with cognitive impairments.

# Simplified English Example

The applied science of Library and Information Science (LIS) has long emphasized understanding user behaviors in information-seeking processes, particularly in higher education environments where new information and research are generated. However, a notable gap exists in the literature regarding the information-seeking and information-use experiences of autistic and neurodivergent students and adults, impacting an interconnected network of relationships between researchers, librarians, LIS students, and postsecondary students seeking support and services. In LIS, research informs practice, and information-seeking is a cognitive and learning process, especially prescient in academic institutions. The failure to address the information needs of autistic, neurodivergent, and disabled people in LIS research and LIS curricula, which educates future librarians, impoverishes both practitioners and students. Drawing from personal experiences and empirical data, the author highlights the prevalence of neurodivergent students in higher education and investigates why, despite a growing awareness of neurodiversity, LIS research, scholarship, and program curricula largely overlook the specific needs of neurodivergent individuals. The article asks questions and proposes ideas for facing the consequences of an incomplete LIS education, addressing the necessity of introducing inclusive pedagogical practices in the academic library and getting honest about the field's cognitively biased scholarship because we cannot understand the information behavior landscape in all its neurobiological variations nor anticipate the future of information use and creation if we have bypassed neurodivergent and autistic minds.

# Simplified English Example

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# Simplified English Example

Why is this topic important?

Gatekeeping in information science research has excluded autistic college students and adults from representation in studies on the information behaviors of library users. We do not know how autistic students seek and use information, and librarians-in-training are not being formally trained to help neurodivergent students find the support and information they need to succeed academically. This topic is important because college librarians use library research to develop inclusive services. The absence of research communicates that neurodivergent students do not have unique needs or deserve accommodations in seeking and using information.

What is the purpose of this article?

This article aims to shed light on how overlooking the experiences and challenges of autistic students in accessing and finding the information they need is a barrier that library science needs to address in research and practice. Drawing from personal experience and available studies, the author seeks to raise awareness of the importance of libraries in a college student's experience and how library science, as a field, needs to focus on its neurodivergent and autistic students and users to be inclusive.

# Example #2

What perspectives does the author bring to this topic?

The author, an autistic individual with personal experience navigating higher education as a student, librarian, and researcher, brings a unique perspective to this topic.

What is already known about this topic?

There is growing awareness about neurodiversity in library studies overall. However, graduate library school programs are not adding courses to prepare librarians to help disabled, neurodivergent, and autistic students. There is little known about this research topic because researchers have chosen to study the information behaviors of cognitively typical college students, ignoring different cognitive neurotypes.

# Example #3

What does the author recommend?

The author asks questions and offers suggestions for addressing this gap, such as bringing disability, neurodiversity, and autism topics into the library school classroom and designing research studies that specifically focus on the voices and experiences of autistic students and adults.

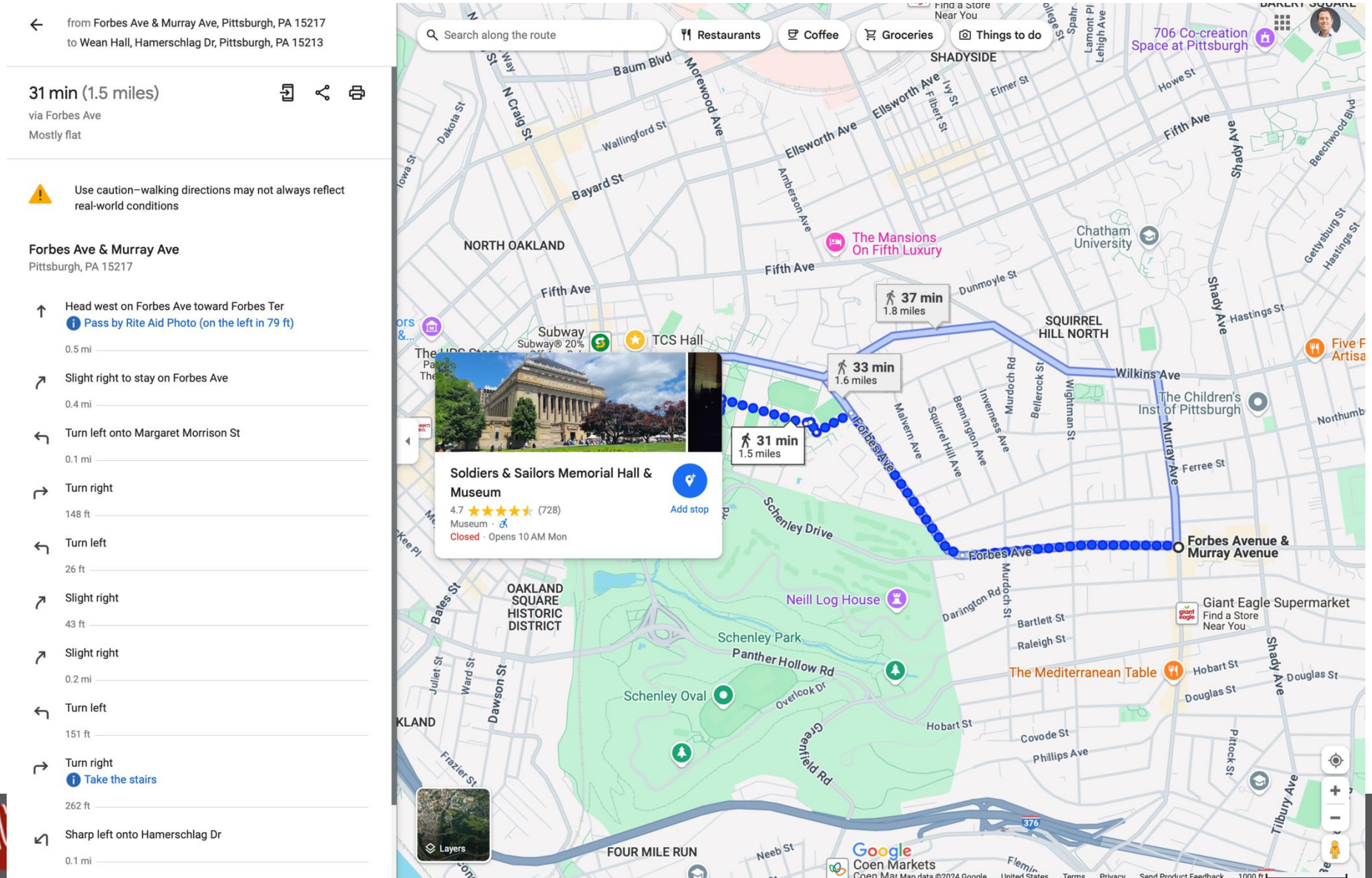
How will these recommendations help autistic adults now or in the future?

Adding disability and neurodiversity topics to the library school curriculum would help train future librarians. Researching how autistic college students use and search for information will give college librarians data that help them understand how to support, teach, and serve neurodivergent information seekers. Implementing these recommendations would help autistic students and adults receive more support and inclusion in every higher education environment.

# Conversational Agents


- Can perform one-instruction commands with minimal error correction.
- 3rd Party ecosystem of pluggable language modules.

# Maps


from Forbes Ave & Murray Ave, Pittsburgh, PA 15217
to Wean Hall, Hamerschlag Dr, Pittsburgh, PA 15213
31 min (1.5 miles)
via Forbes Ave
Mostly flat
Use caution–walking directions may not always reflect real-world conditions
Forbes Ave & Murray Ave
Pittsburgh, PA 15217
Head west on Forbes Ave toward Forbes Ter
Pass by Rite Aid Photo (on the left in 79 ft)
0.5 mi
Slight right to stay on Forbes Ave
0.4 mi
Turn left onto Margaret Morrison St
0.1 mi
Turn right
148 ft
Turn left
26 ft
Slight right
43 ft
Slight right
0.2 mi
Turn left
151 ft
Turn right
Take the stairs
262 ft
Sharp left onto Hamerschlag Dr
0.1 mi
Search along the route
Restaurants
Coffee
Groceries
Things to do
37 min
1.8 miles
33 min
1.6 miles
31 min
1.5 miles
Soldiers & Sailors Memorial Hall & Museum
4.7 (728)
Museum
Closed · Opens 10 AM Mon
Add stop
Forbes Avenue & Murray Avenue
SHADYSIDE
NORTH OAKLAND
SQUIRREL HILL NORTH
OAKLAND SQUARE HISTORIC DISTRICT
FOUR MILE RUN
Schenley Park
Schenley Oval
Neill Log House
The Mansions On Fifth Luxury
Chatham University
706 Co-creation Space at Pittsburgh
The Children's Inst of Pittsburgh
Giant Eagle Supermarket
The Mediterranean Table
Coen Markets
Layers

# Reminder Apps

## Reminder apps

From sources across the web

Microsoft To Do

Any.do

Google Keep

TickTick

Todoist

Reminders

Remember the Milk

Due - Reminders & Timers

Things 3

# Pill Reminders

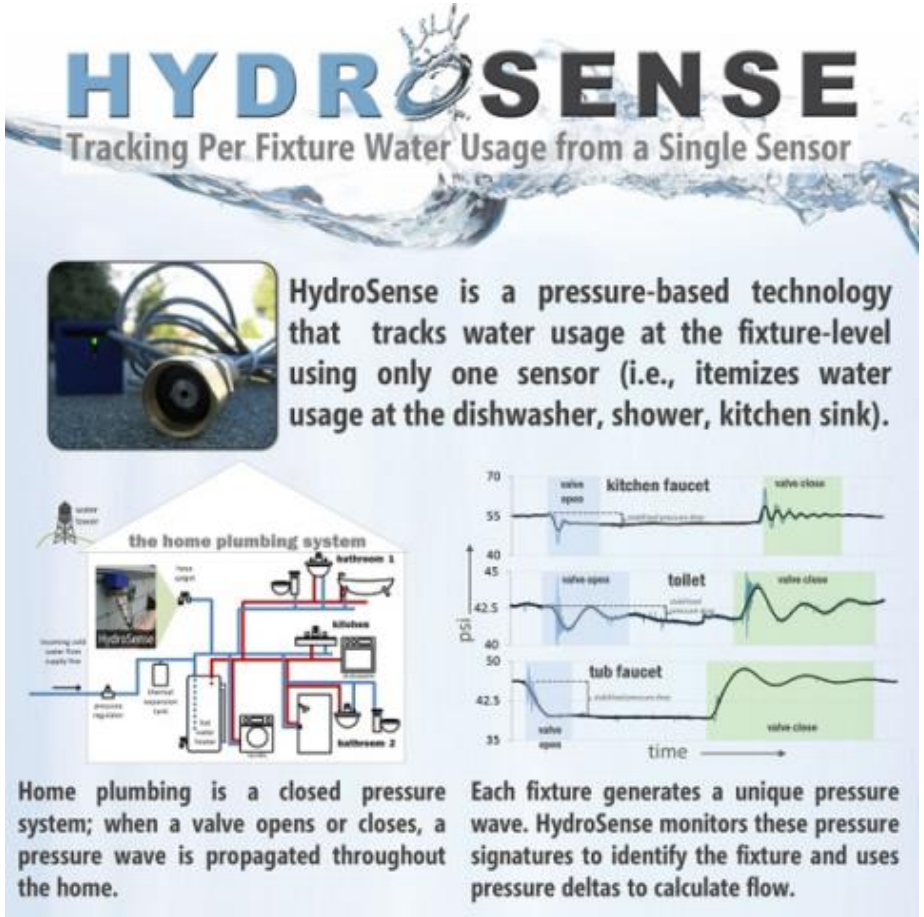
# Medic Alert Bracelet

# Security Sensors


Door sensor detects people on walk-about


GPS tracking watch + cellphone

# Plumbing Sensors




- "Did my loved one use the toilet today?"

# Discussion of Readings

- Discussion Leader: Logan Lewis

1. Alexander Fiannaca, Ann Paradiso, Mira Shah, and Meredith Ringel Morris. 2017. **AACrobat: Using Mobile Devices to Lower Communication Barriers and Provide Autonomy with Gaze-Based AAC.** In Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17). Association for Computing Machinery, New York, NY, USA, 683–695. https://doi.org/10.1145/2998181.2998215
2. Nina Tran, Richard E. Ladner, and Danielle Bragg. 2023. **U.S. Deaf Community Perspectives on Automatic Sign Language Translation.** In Proceedings of the 25th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '23). Association for Computing Machinery, New York, NY, USA, Article 76, 1 - 7. https://doi.org/10.1145/3597638.3614507
3. Highlights of USA/NZ wheelchair rugby match Tokyo 2020 Paralympics: https://youtu.be/hPJ-xmxClO4?si=QFEeUyqtTqJKUDD7

# Mini-Course Evaluation

- Take out a new piece of paper.
- DO NOT write your name on it.
- On one side of the paper, write 3 things that we're doing well in teaching this course.
- On the other side, write 3 things that we should try to improve in teaching this course.