

AI-Powered Assistive Technologies

05-499/899 Fall 2024

Celebrating Accessibility

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

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Administrivia

- HW3 due Thursday, Sept 24, 11:59pm
- Thanks for all the feedback!

Course Changes

1. Canvas will only be used for grades.
2. All course communication will now be on Slack.
3. We will post the metadata for readings on the course website.
 - They will include links to publicly available papers.
 - Privately available papers will still be linked from the website but the PDFs themselves will live in Canvas.
4. We will include citations on our slides.

More Course Changes

1. Participation Activities will now be allocated 15-20 minutes.
2. Reading Discussions will now be allocated 20 minutes.
3. In general, we'll talk in more depth about fewer things.

Cognitive Impairments

Conversational Agents

Maps

Pill Dispensers

Security sensors

Plumbing sensors

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
25 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

706 Co-creation Space at Pittsburgh

SHADYSIDE

NORTH OAKLAND

SQUIRREL HILL NORTH

OAKLAND SQUARE HISTORIC DISTRICT

FOUR MILE RUN

Soldiers & Sailors Memorial Hall & Museum
4.7 ★★★★★ (728)
Museum
Closed Opens 10 AM Mon

31 min 1.5 miles

33 min 1.6 miles

37 min 1.8 miles

Layers

Google

Coen Markets

Open Map More data ©2024 Google

Pill Reminders



Medic Alert Bracelet



Security Sensors




Door sensor detects people on walk-about




GPS tracking watch + cellphone

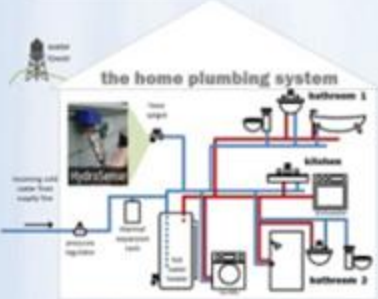
Plumbing Sensors




Tracking Per Fixture Water Usage from a Single Sensor



HydroSense is a pressure-based technology that tracks water usage at the fixture-level using only one sensor (i.e., itemizes water usage at the dishwasher, shower, kitchen sink).



the home plumbing system



Home plumbing is a closed pressure system; when a valve opens or closes, a pressure wave is propagated throughout the home.

Each fixture generates a unique pressure wave. HydroSense monitors these pressure signatures to identify the fixture and uses pressure deltas to calculate flow.

- “Did my loved one use the toilet today?”

Cognitive Differences

Social Robots

LLMs for Social Advice

Social Robots

Provide assistance to people through social interaction

Using social mechanisms like forming relationships, expressing emotion, recognizing nonverbal behaviors, and conveying personality



Social Robots

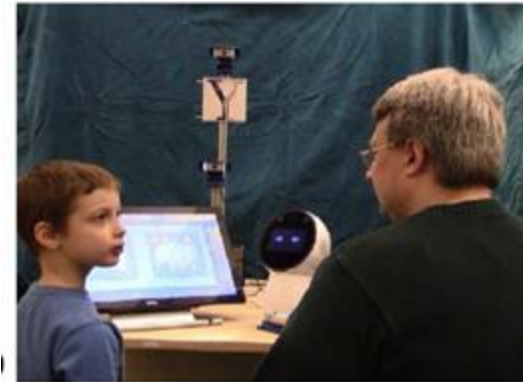
How can robots facilitate social-emotional interactions with autistic children?

- Goals are to improve engagement, attention, joint attention, spontaneous imitation, turn-taking, empathy, initiation of physical contact



Pleo for Prosody

Interact with robot who expresses emotion through movement and non-verbal sounds.



Jibo Social robot

Emotional storytelling with caregiver and robot. Focus on perspective-taking and sequencing.



Keepon

Exchanges encourage joint attention and demonstrate autistic kids' motivation to share mental states with others.

Study of LLMs for Social Advice

Study by PhD student JiWoong Jang

JiWoong Jang, Sanika Moharana, Patrick Carrington, and Andrew Begel. **"It's the only thing I can trust": Envisioning Large Language Model Use by Autistic Workers for Communication Assistance.** In the *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems*. Honolulu, Hawaii. May 2024. [[pdf](#)]



Autism @ Work

Autistic Employees Need Resources

Support Options: job coaching, speech and language pathologists (SLPs)

Important to have advocate / champion(s)

Limitations: affordability, availability

→ Unlikely most will have access

Relevant Citations

Leven, D. (2020). Invisible Social Identity in the Workplace. (Doctoral dissertation, Northeastern University).

David B. Nicholas, Darren Hedley, Jena K. Randolph, Dora M. Raymaker, Scott M. Robertson, & Jonathan Vincent (2019). An Expert Discussion on Employment in Autism. *Autism in Adulthood*, 1(3), 162–169.

Carlton J. Fong, Joshua Taylor, Aynura Berdyeva, Amanda M. McClelland, Kathleen M. Murphy, & John D. Westbrook (2021). Interventions for improving employment outcomes for persons with autism spectrum disorders: A systematic review update. *Campbell Systematic Reviews*, 17(3).

Autistic people are turning to ChatGPT

reddit AUTISM comments

↑ 67 ↓

Success ChatGPT is a gamechanger for people on the spectrum

(self.autism)
submitted 3 months ago by SACBH

Has anyone else been using it to write or rewrite things that in the past might have been challenging to write in a way that is not open to misinterpretation or might come across us blunt or insensitive?

As one example, if I had to write an email along the lines of the one below I may previously have stressed about getting the wording right for days and possibly not sent it. Also on reddit I frequently write something that is clear in my mind but clearly most people read in a completely different way, getting ChatGPT to rewrite with the instruction to eliminate ambiguity is nothing short of awesome.

Example question -

I'm mildly autistic and I particularly have trouble writing emails that are correctly interpreted by neurotypical people. Can you please help me write an email to my boss sensitively and diplomatically explaining the following without highlighting Autism...

- I feel I am deserving of a pay rise based on my productivity

Our Research Questions

1. What are the reasons for autistic workers to turn to LLMs for social communicative advice?
2. What is the advice like?
3. How is it versus human advice?

Results: Attitudes towards LLMs

- Liked
 - Formatting, clarity, willingness to explain in detail, convenience, non-judgmental
 - Assumed context - didn't question user intentions
 - Supported Neurotypical "worldbuilding"
- Disliked
 - Potential for privacy concerns
 - Assumption of Neurotypicality

Overall

- Critical Lack of Available Resources
 - Few received at work, some consulting friends/family, many with none
- Strong Preferences for LLMs
 - vs Human & in general (Qual & Quant)
 - 9/11 ($\approx 81\%$) would continue use
- Conversational Niceties a Huge Plus
 - Structured output, politeness well received

Evaluating LLM Advice

- A specialized job coach (NPP, LPC) evaluated transcripts of LLM advice.
 - Substantial commonalities with advice in practice
 - LLM Advice defaulted to Neurotypical assumptions (even after correction)
 - Blurring of employer and user-centric advice
 - Optimistic attitude, failure to plan for contingencies
- Stressed the value of a near real-time outlet for advice, given availability concerns.
- Biggest concern from assumption of context

Participation Activity

- Partner with a neighbor.
- Take out a piece of paper and write your names on it.
- We have two viewpoints here.
 - **Whose experience should an LLM privilege, autistic people or service providers?**
- Write down one positive and one negative reason for each option.
- Each pair should then pair up with another pair (4 people)
 - Discuss your thoughts. Do you agree or disagree?
- Share with the class. Turn in your paper at the end.

No Readings Today!