List of Research Topics

Assignment to submit:
"Write down a list of three research topics that interest you. For each topic, write 1-2 paragraphs describing what the open issues are that warrant research. Cite your resources. List CS professors who may agree to be your advisor for the topic.

Submit doc or pdf file."

Research Topic 01: Digital Nudging & its implications

(Google Scholar Search: Digital Nudge)

Standard designs of digital interfaces can be overwhelming, confusing, and hindering access to information, often presenting significant barriers for individuals with lower digital literacy and neurodivergent users (e.g., those with ADHD, Autism Spectrum Disorder).

While behavioral nudge theory, famously used in physical contexts like the Bangladesh handwashing campaign (promoting habits through subtle cues like footprints), has shown promise in digital domains (e.g., finance, health), its specific application to support fundamental digital interaction and learning for these underserved populations is not well-established.

Research questions include the following:

A. What specific types of digital nudges are most effective and acceptable for guiding users with varying levels of digital literacy or specific neurodevelopmental profiles through complex online tasks?
B. How can these digital nudges assist people with any level of digital literacy, especially targeting the needs of the elderly population, neurodivergent population, etc.?
C. Can we use AI/LLM to develop design guidelines and frameworks for creating effective digital nudges for a significant contribution to accessible and inclusive HCI design?

Cited Resources:

- Nudge: Improving Decisions About Health, Wealth, and Happiness. Yale University Press. Thaler, R. H., & Sunstein, C. R.
- 23 Ways to Nudge: A Review of Technology-Mediated Nudging in Human-Computer Interaction.
  Caraban, A., Karapanos, E., Gonçalves, D., & Campos, P.
- Digital Nudging: Altering User Behavior with Interface Design.
  Mirsch, T., Lehrer, C., & Jung, R.
- HCI and people with disabilities: a framework for innovation.
  Morris, M. R., Caves, K., Czarnuch, S., & Kientz, J. A.

Research Topic 02: (Generating visual stories from children's artworks)
(Google Scholar Search: use of AI in visual storytelling from human drawings)

Children draw pictures to get the best of their imagination and unique storytelling abilities. While they produce a lot of artworks, it can be an interesting case study to generate a coherent visual/text-based story from a series of drawings with some textual given prompts.

While prior work like StoryDrawer explores real-time child-AI drawing collaboration, and other research investigates AI for generating visuals from text prompts (Ali & Parikh, 2021) or its general role in digital storytelling (Fernandes et al., 2024; Han & Cai, 2023), there's a specific underexplored opportunity in using a child's completed drawing as the primary input for AI systems to interpret and expand upon for visual storytelling.

Research questions include the following:

A. How can we generate better visual narratives using AI that can generate visuals stylistically consistent with or complementary to the child's original artwork rather than producing generic or entirely different outputs that have barely any relation to the actual children's work?
B. How can we ensure this collaborative storytelling process between child and AI is intuitive and engaging? Evaluating the success of such a process is another challenge here in terms of creative and artistic perspectives. For example, guiding the AI in transforming and extending their static drawings into a sequence of images or animations along with texts that reflect their intended story while maintaining the child's sense of authorship and creative control.

Cited Resources:

- StoryDrawer: a child–AI collaborative drawing system to support children's creative visual storytelling.
  Zhang, C., Yao, C., Wu, J., Lin, W., Liu, L., Yan, G., ... & Wang, H.
- Design implications of generative AI systems for visual storytelling for young learners.
  Han, A., & Cai, Z.
- ArtAI4DS: AI Art and Its Empowering Role in Digital Storytelling. In Interactive Storytelling. ICIDS 2023
  Fernandes, T., Nisi, V., Nunes, N., & James, S.
- Telling creative stories using generative visual aids.
  Ali, S., & Parikh, D.

Research Topic 03: (Inclusive LLM for Autistic Population)
(Google Scholar Search: ”autism" AND "language preference" AND "disability")

With the uprising of large language model (LLM) tools as emerging AI technology, there is a significant gap between promised outcomes and deliverables regarding AI responses sensitive to people with Autism. Hence, I wish to pursue the above intersectional research on Disability and inclusion, Human-Computer Interaction, and Accessibility & AI (LLMs) for Autistic people.

The goal is to create a dataset that is capable of generating inclusive and non-ableist responses for Autistic people and then fine-tune the LLM tools using that dataset. In summary, the intention is to improve LLM outcomes and provide the Autistic community with better responses.

Research questions include the following:

A. In the existing LLM landscape, what are the harmful stereotypes and biases against autistic individuals, and how can the fine-tuned data be diversified to mitigate these biases and promote inclusive representations of disability?
B. How can LLMs be fine-tuned to identify and interpret ableist language for autistic individuals while avoiding the nuance of ableism?
C. What are the potentially effective strategies for evaluating datasets intended to fine-tune the LLMs to ensure that technologies designed for the communities align with their needs, preferences, and communication styles**?**

Cited Resources:

- How Toxicity Classifiers and Large Language Models Respond to Ableism
  M Phutane, A Seelam, A Vashistha
- Exploring Large Language Models Through a Neurodivergent Lens: Use, Challenges, Community-Driven Workarounds, and Concerns
  B Carik, K Ping, X Ding, EH Rho
- " I wouldn't say offensive but...": Disability-Centered Perspectives on Large Language Models
  V Gadiraju, S Kane, S Dev, A Taylor, D Wang, E Denton, R Brewer
- “It's the only thing I can trust”: Envisioning Large Language Model Use by Autistic Workers for Communication Assistance
  JW Jang, S Moharana, P Carrington, A Begel
- Identifying and Improving Disability Bias in GPT-Based Resume Screening
  K Glazko, Y Mohammed, B Kosa, V Potluri, J Mankoff

Faculty who might agree to the above project ideas:

- Yasmine Elglaly
- Brian Hutchinson
- Moushumi Sharmin