Sanchita **Kamath**

HUMAN-COMPUTER INTERACTION AND GENERATIVE AI RESEARCHER

(x)Ability Lab, University of Illinois, Urbana-Champaign

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Researching in human-centered design in techniques of implementing Generative Artificial Intelligence and immersive technologies

Summary

Ph.D. student in Information Sciences at the University of Illinois Urbana-Champaign, specializing in HCI and Generative AI, with a passion for creating accessible technology solutions. Seeking to contribute to projects by leveraging expertise in immersive technologies for the blind and visually impaired, and innovative use of Generative AI in data visualization. Dedicated to advancing accessibility and inclusivity in software design through interdisciplinary research.

Link to portfolio

Education

University of Illinois, Urbana-Champaign — *Illinois, United States of America*

PH.D. IN INFORMATION SCIENCES — *Aug. 2023 - Present*

- Advisor: Dr. JooYoung Seo
- Focus: Utilizing immersive technologies and Generative AI for enhancing accessibility for blind and visually impaired individuals.
- Researching methods in which multi-modal interfaces can be implemented for Data Visualization Paradigms for Blind and Visually Impaired Individuals.
- GPA: 4.0/4.0 on the first two semesters of Doctoral Studies

Manipal Academy of Higher Education - Dubai Campus — *Dubai, United Arab Emirates*

B.TECH IN COMPUTER SCIENCE AND ENGINEERING - GRADUATED SUMMA CUM LAUDE — *Sept. 2019 - Jul. 2023*

- Advisor: Dr. Sophia Rahaman
- Undergraduate Thesis - *The Privacy Concerns of Older Adults when Interacting with Voice Agents within a Smart Home Environment – a Preliminary Scoping Analysis*
  Curated a model for a Conversational Agent catering to the needs of Older Adults and provided recommendations for the modification of current systems for ameliorated Older Adult Engagement.
  Addressed privacy concerns of older adults in smart home environments, emphasizing user-friendly voice and touch interface prototypes.
  GPA: 9.86, 9.91, 9.83, 9.67, 9.86, 9.5, 9.8, 10
  CGPA – 9.80/10

Publications and Presentations

JOURNAL ARTICLES

Dubey S., Subramanian G., Shukla V., Dwivedi A., Puri K., Kamath S., "Blockchain technology: a solution to address the challenges faced by the international travellers", OPSEARCH, Springer, July 2022, doi:10.1007/s12597-022-00597-x.

Kamath S., Sethi D., Nazir M. I. J., ""Is that my reflection?" - An Affect-Aware Intelligent Mirror Employing Enhanced Conversational Contextualization", IEEE Transactions on Human-Machine Systems, [SUBMITTED].

CONFERENCE PUBLICATIONS

Seo, J., O'Modhrain, S., Xia, Y., Kamath, S., Lee, B., Coughlan, J. M., "Designing Born-Accessible Courses in Data Science and Visualization: Challenges and Opportunities of a Remote Curriculum Taught by Blind Instructors to Blind Students", In R. S. and A. Firat Elif E. and Laramee (Ed.), EuroVis 2024 - education papers, The Eurographics Association, doi: 10.2312/eved.20241053.

Rahaman S., Ashok V., Kamath S., "Technology as a Tool to Enhance Development of Skillset in Autistic Individuals: Specific to Female Gender", 9th International Congress on Information and Communication Technology (ICICT 2024), 2024.

Kamath S., Sethi D., "Serious Games and Accessibility – an Exploratory Analysis", 11th International Conference on Serious Games and Applications for Health, 2023, [ACCEPTED].

Marmorato P., Swami R., Kamath S., Asikaer N., Molyneaux H., Munteanu C., Stobert E., "Contextualizing Privacy for Older Adults in Canada", In Proceedings of Symposium on Applications of Contextual Integrity (CI '23), ACM, USA, 2023.

Kamath S., Rahaman S., "Self-Dependency Amelioration and Dignity Revival for South-East Asian Older Adults – using Technology as a Means and Method", 9th International Conference on Information and Communication Technologies for Ageing Well and e-Health (ICT4AWE 2023), April 2023, doi: 10.5220/0011957900003476.

Puthukkattu S. S., Poojary R., Kamath S., "An Energy Audit-based Case Study on varied Organizations", 2023 International Conference on Renewable and Sustainable Energy - 2023 Advances in Science and Engineering Technology (ASET) International Conferences, 2023. doi: 10.1109/aset56582.2023.10180612.

Anand A., Jimoh A., Poojary R., Dudhe R., Kamath S., "Design and Testing of a Solar Powered Automated Fruit and Vegetable Sorter", VLSI, Signal Processing, Power Electronics, IoT, Communication and Embedded Systems (VSPICE), 2022. doi: 10.1007/978-981-99-4444-6-16.

Kamath S., Martin A., Poojary R., "Effectuating Communication for the Deaf and Hard-of-Hearing: An Ethnographic Review", The International Conference on Electrical and Computing technologies and Applications, pp. 80-83, 2022, doi: 10.1109/ICECTA57148.2022.9990196.

Kamath S., Rahaman S., "Engagement of Senior Citizens in a Family Setting to Help Revive Dignity: A Study", 8th International Conference on Information and Communication Technologies for Ageing Well and e-Health (ICT4AWE 2022), January 2022, doi: 10.5220/0011074800003188.

Kamath S., "Science Fiction Prototyping In English as a Design Thinking Tool to Inspire the Future", 4th Applied Linguistics and Language Teaching International Conference, March 2022, ISBN: 978-9948-791-44-7.

Kamath S., "Active and Participatory User Contribution to Inclusive Design for Net Zero Homes in UAE", ZEMCH International Conference Proceedings, 2021, ISSN 2652-2926.

POSTER PRESENTATIONS

Kamath S., Martin A., "HVAC Systems", ASHRAE, Poster Competition, Team Res Novae.

Research Experience

(x)Ability Lab
UIUC, USA

RESEARCH ASSISTANT
Aug. 2023 - Present

- Working within the MAIDR Project as a Project Manager and Human-Computer Interaction Researcher and conducting user testing to conduct in-depth user research, under the IMLS Grant for Dr. JooYoung Seo. This project integrates and leverages the capability of Large Language Models and subsequent personae and templates generated to explain STEM related graphs and charts to Blind and Low Vision Individuals.
- Actively leading the development of an innovative VR ping-pong game hosted on the Unity Engine, tailored for visually impaired individuals, ensuring strategic direction in every aspect of its creation. This innovative project aims not only to enhance sports training but also to revolutionize fitness monitoring, ensuring a comprehensive and inclusive approach to physical well-being and athletic proficiency.

Technologies for Ageing Gracefully Lab, University of Waterloo
Ontario, Canada

STUDENT RESEARCHER
Feb. 2023 - Jul. 2023

- Explored the privacy concerns of older adults in smart home environments, focusing on voice-controlled agent interactions and conducted research on voice interaction, socio-technical elements, and interactive system design.
- Devised strategies to mitigate technological anxiety among older adults, creating user-friendly voice and touch interface prototypes by investigating user experience challenges, adoption barriers, and overall acceptability of Voice User Interfaces (VUIs), utilizing advanced methods like Reddit response analysis to gain deeper insights into user perspectives and experiences.
- Performed an extensive review of the technological landscape of VUIs, assessing market trends and advancements.
- Produced the layout of a responsive conversational agent (VUI) specifically catered to the needs of older adults through HCI research methods.

Manipal Academy of Higher Education - Dubai Campus
Dubai, United Arab Emirates

TEACHING ASSISTANT
Apr. 2022 - Feb. 2023

- Conducted Problem-Solving Using Computers (PSUC) Course Lab (Fall '22)
- Conducted Relational DataBase Management System (RDMS) Course Lab (Spring '22) for forty-six students.
- Assisted in MTech Thesis Projects -
- Blockchain in the donation industry for creating transparent transactions.
- Blockchain in the construction industry.

OpenUAE Research Group, University of Sharjah
Sharjah, United Arab Emirates

REINFORCEMENT LEARNING RESEARCH INTERN
Jul. 2022 - Sep. 2022

- Digital Twins in the sector of Aviation: Executed a Systematic Literature Review, analyzing around 80 research papers to elucidate the concept. This comprehensive study was presented to the General Civil Aviation Authority of the United Arab Emirates, aiming to inform and guide their digital integration strategies.
- Robotic Process Automation in FOREX Trading: Innovated a trading algorithm using Reinforcement Learning to automate FOREX trading, mapping event spaces for effective decision-making. Additionally, established evaluation metrics for the algorithm to ensure its optimal performance and implementation standards.

Pucho Inc.   *Remote - based in Delhi, India*

UX Researcher   *Jul. 2021 - Sep. 2021*

- Performed qualitative persona creation for the financially disadvantaged demographic, providing valuable insights for user-centric design, involving the articulation of their struggles and reflections, essential for empathetic and effective solution design.
- Led the interface design for overcoming language barriers in pan-India trials, emphasizing inclusivity, and accessibility. This included the development of Voice User Interfaces (VUIs) specifically designed to cater to the needs of the Blind and Visually Impaired (BVI) community.
- Storyboarded user experiences to understand accurate health information transmission in a 'mayhem' environment fraught with misinformation during the COVID-19 pandemic.

Academic Service

Google Women Techmakers, Google (MENA and Global)   *United Arab Emirates*

WTM Ambassador   *Jun. 2022 - Aug. 2023*

- Led a mentorship initiative for female students, dedicated to bridging the gender gap in technology.
- Held interactive sessions and industry-focused events, designed to empower these students with the skills and confidence needed to excel in their professional journeys, committing to fostering diversity, inclusion, and female leadership in the technological community.

Manipal Academy of Higher Education - Dubai Campus, UAE   *Dubai, UAE*

Student Career Services Co-Ordinator   *Sep. 2020 - Aug. 2023*

- Spearheaded the coordination of student placements within the Computer Science Engineering & IT Department, playing a pivotal role in aligning students' academic pursuits with professional opportunities.

Google Developer Student Club, MAHE Dubai   *Dubai, UAE*

GDSC Mentor   *Jun. 2022 - Jun. 2023*

- Served as a mentor for the GDSC '22 Lead at MAHE - Dubai Campus, guiding the club's leadership.
- Organized study sessions, events, hackathons, and workshops to provide a dynamic platform for students, fostering their involvement in technological advancements.

Google Developer Student Club, MAHE Dubai   *Dubai, UAE*

GDSC Lead   *Jun. 2021 - Jun. 2022*

- Delegating and managing tasks through collaboration to ensure influence and promotion of the Club, as a Founding Member of GDSC MAHE-Dubai Campus.
- Academia: Instantiated Community Service Pedagogically by helping other students within the university learn.

Internships

Sentient Labs   *United Arab Emirates*

UX Engineer and Designer   *Jul. 2022 - Aug. 2022*

- Responsible for research on Unmanned Surface Vehicles (USVs), articulating its need and Design Requirements.
- Analyzed research data collected on USVs to understand fallacies and methodologies adopted in development.

Ojo   *Remote - Dubai, UAE*

Student Brand Ambassador   *May. 2020 - Aug. 2020*

- Completed tasks and conducting User Research by interviewing students of varied ages, to improve the platform's impact.
- Worked with multiple project members and students to generate solutions to build the software to guide students in their careers through guided user studies.
- Created a user-centered business model as a group project, by understanding business needs and future goals, to help manage the furthering of the start-up towards its goal.

Projects

RESEARCH PROJECTS

Autistic Education Study   *Mar. 2023 - Jun. 2023*

- Created a fine motor skills development, ethics and behavior learning application for autistic children.
- Conducted User Research and SLR for current methods employed for autistic learning.
- Conducted interviews to understand the process of learning for autistic students to help understand what technological intervention should and would mean for them.

Role of Upbringing, Education, Culture and Society in shaping opinions   *Mar. 2022 - May. 2022*

- Conducted Data Cleaning, Formatting and Visualization on the Open-Source General Social Survey.
- Identified trends in data and correlations between Ethnicity, Geographical Location and Overall Happiness along with the extent of influence of factors such as Gender, Degree, Family Size and Marital Status on the reported Happiness of the survey participants.

DEVELOPMENT PROJECTS

TripBot - Conversational Interface to Provide Actionable Independent Travel Insight to Blind and Low Vision (BLV) People
Jan. 2024 - Present

- Solely responsible for the integration of LLMs into the conversational agent capable of providing accurate environmental condition information to BLV individuals.
- Aiming to Fine-Tune and leverage LLaVA to provide continuous instruction and Orientation and Mobility (O&M) aid to BLV individuals.
- Currently conducting pilot testing with BLV people to understand the robustness of the system and parameters of detail required to direct a fine-tuning approach to incorporate BLV individuals' perceptions of LLM responses by using a preference strength algorithm.

Investigating the potential of Immersive Technologies in Spatial Learning for Blind and Low Vision Individuals
Sept. 2023 - Present

- Prototyping a VR ping-Pong Game that encourages play between sighted and BLV individuals, and aiming to motivate physical activity by 'occupying' individuals through game-play, and setting achievement unlocks. This game aims to reduce cognitive load on individuals by relying on rule-learning through practice and 'muscle-memory'.
- Leading dynamic and spatial sound development associated with the virtual ball, based on force, trajectory and proximity.
- Generating a novel haptic feedback mechanism, administered through a haptic glove, that changes intensity and frequency to provide a secondary mode of information transmission.

RLHF Voice-based Conversational Agent on Intelligent Reflective Surfaces
Mar. 2023 - Present

- Conceptualized and engineered a smart mirror with a voice agent, pioneering mood analysis via emotion recognition and speech feature analysis using Python, JavaScript and Node.js.
- Implemented an RNN model for speech analysis; output of which is inputted into novel RLHF algorithm based on POMDP which dynamically acts on fluctuations in user emotion.
- Orchestrated the technical creation and empirical research; devising the conversational interface and examining the dynamics between emotion recognition, cognitive engagement, and attention metrics.
- Integrated the Mistral and LLaMA-uncensored model into the emotion agent to cater to a vector space of emotions, providing low-risk advice for mood alleviation in individuals.
- Created a system that has a strong capacity to motivate users succinctly - however is prone to Hallucination (in terms of information related to hobbies of the individuals it directs a 'sad' individual to), the elimination of which is the current focus.
- Currently aiming to conduct information behaviour studies of user interaction with the mirror, which has updated features based on a initial pilot study conducted on the early prototype and through the wizard of oz technique.

IoT-based door locking system in a Smart Living Environment
Mar. 2022 - Dec. 2022

- Developed an advanced door locking system that recognizes the user's face for automatic opening, enhancing accessibility and convenience.
- Initiated the creation of a guidance robot for the Blind and Visually Impaired (BVI), which would understand unknown environments and provide navigational guidance.

M. Hostels
Dec. 2021 - Jun. 2022

- Developed a Dynamic Pricing Algorithm through parametric articulation to set prices for rooms based on time, date and nature of booking.
- Created Digital Wireframes and High-Fidelity Prototypes to initiate development.

Won Best Project title

AI-Based Natural Disaster Analysis System - IBM Externship
Jul. 2021 - Oct. 2023

- Created a flask application/CNN model for image analysis and comparison with a database to predict presence of a natural disaster.

Optima
Apr. 2021 - Jun. 2021

- Defined the concept for interface design and created Digital Prototypes. Responsible for including accessibility features into design for the BVI.
- Produced a working android application for timeslot distribution.

HARDWARE PROJECTS

Smart Shoe
Mar. 2023 - Present

- Measuring the pressure that users set on either foot to pin-point if the same has any detrimental effect on the knee.
- Factoring in the effect of injury by measuring differential through getting weight difference exerted by each foot.
- Created the entire software design for the Shoe, including a Deep Learning Algorithm capable of dynamically shifting feet pressure based on user stance and designed the basic hardware circuit.

OctaBin
Mar. 2022 - Jun. 2023

- Led the team in Application Development, to generate software that has an inbuilt reward system to encourage waste management and pinpoint bin locations.
- Worked on the hardware for the bin for dynamic spacing and sorting.

ViBrain
Jun. 2021 - Aug. 2021

- Conducted research to develop a device for the Deaf and Hard-of-Hearing (DHH) using bone conduction technology, to reduce a gap in lifestyle.

Sustainable Housing
Sep. 2019 - Dec. 2019

- Created floor plans for housing using ancient Indian science called "vastu".

Awards

2024	**Irwin Lois Wells Fellowship**, Graduate College, UIUC	*USA*
2023	**Wilkinson Scholarship Fund**, Graduate College, UIUC	*USA*
2023	**Illinois Distinguished Fellowship**, Graduate College, UIUC	*USA*
2023	**Academic Excellence Award**, MAHE Dubai	*Dubai, UAE*

Committees

| 2021 | **Student Outreach Manager**, Society of Innovators and Entrepreneurs, MAHE (SIE) | *Dubai, UAE* |
| 2020 | **Student Champion**, Expo 2020 | *UAE* |

Competitions

| 2023 | **Third Place**, IEEE Innovation Competition for OctaBin – a Smart Automated Waste Sorter which employs concepts such as dynamic spacing and object recognition. | *Sharjah, UAE* |
| 2023 | **Presenter**, IEEE Student Day - Presented a Poster and Smart Shoe prototype capable of measuring differential foot pressure. | *Sharjah, UAE* |

Languages Learnt

Python, Java, C, C++, R

mySQL, NoSQL

HTML/CSS, JavaScript, ASP.NET

Design Software

AdobeXD, FIGMA, Canva, Sketch