Disha Sardana, Ph.D.

Human-Computer Interaction, Augmented Reality, UX Research

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Summary

- ➔ 6+ years of experience designing, developing, and testing innovative approaches for analyzing complex datasets in 3D immersive environments using mixed reality – head-mounted augmented reality devices, motion capture, and spatial audio technologies
- ➔ 8+ years of experience in academic research labs, conducting literature reviews, and running fast-paced user research studies. Hands-on lab experience, leading multiple scientific studies from start (i.e., designing, prototyping) to finish (i.e., analyzing data, communicating results) in a collaborative, interdisciplinary setting

Skills

RESEARCH

User Studies • Usability Testing • Hypothesis Testing • Mixed-Methods Research • Human Participant Research • Experimental Design • Interviews • Surveys • Ethnography Field Research • Thematic Analysis • Augmented & Virtual Reality

PROGRAMMING

Languages:

Python • R • MATLAB

Tools/ Devices:

HoloLens 2 • Magic Leap 1 • C# • Javascript • Unity3D • Git • Visual Studio • Miro • Figma • Max/MSP • Qualtrics

Experience

DOCTORAL RESEARCHER

Jan 2019 – May 2023 | Center for Human-Computer Interaction at Virginia Tech (CHCI at VT)

Relevant links: Demo I | Demo II | Creativity + Innovation Day-Article | Student Spotlight

- ➔ Developed and tested an approach for embodied data exploration of multi-dimensional datasets in an immersive **mixed reality (MR)** environment using HoloLens 2
- ➔ Demonstrated the proof-of-concept at a science fair (ICAT Creativity + Innovation Day 2019) and gathered user feedback from a diverse general audience (over **20 users**)
- ➔ Designed, planned, and ran fast-paced research studies with **34 participants** to evaluate the strengths and limitations of analyzing data in a 3D immersive environment compared to a non-immersive WebGL desktop environment based on accuracy and task completion times of specific visual analytics tasks
- ➔ Recommended user-centered design principles for doing data analytics in an MR environment based on frames of reference by assessing user performance, presence, rank order, physical comfort, and subjective user feedback
- ➔ Designed, conducted, and analyzed 90-minute in-person research sessions with **55 participants** to quantify the impact of audio on augmenting visual data analysis in MR environments
- ➔ Performed thematic analysis on the collected data and compared task metrics such as the number of patterns identified by users, their confidence level, task responses, NASA-Task Load Index, and System Usability Scale (SUS) questionnaire between audio-visual and visual-only scenarios
- ➔ Conducted a user study at a space weather conference (CEDAR 2023) and collected data from **43 space science experts** to broaden the demographics in order to more rigorously quantify and assess the potential impact of XR technologies on educational and analysis tools and techniques
- ➔ Mentored Masters-level graduate students and managed group research teams with empathy, resilience & efficiency

LEAD UX RESEARCHER ON AN NSF-FUNDED PROJECT

Aug 2017 – Jul 2020 | Institute for Creativity, Arts, and Technology at Virginia Tech (ICAT at VT)

Relevant links: Spatial Audio Data Immersive Experience (SADIE) - NSF Funded Project | wvtf-article | VT News

- ➔ Designed a new motion-tracking glove to enable user interaction with immersive sound environments utilizing **motion capture systems**
- ➔ Programmed the logic to recognize 3-dimensional gestures (such as pinch, zoom, etc.) from real-time coordinates of various glove elements

- Tested and debugged the system by conducting beta-testing with around **40 users**
- Conducted in-person user studies with over **150 users** to study the human perception of sound in an immersive multi-layered auditory environment
- Performed hypothesis testing and **statistical analysis** (including t-test and ANOVA) on user data, leading to four publications in prestigious audio-related conferences

Projects

AN INTERACTIVE AUGMENTED REALITY BOARD GAME

Jan 2019 - Dec 2019 | Center for Human-Computer Interaction at Virginia Tech (CHCI at VT)

Relevant links: Best Poster Award | Game Design

- Designed and prototyped an "Interactive Augmented Reality (AR) Board Game for Recruiting Prospective Students" as an innovative marketing strategy to promote playful information delivery and collective decision-making
- Achieved product design through compelling narratives and visual representations of user personas, and various research methods such as focus groups, semi-structured interviews, formative evaluation, and usability studies
- Led the development of the AR component of the mobile application using Vuforia & Unity3D based on user needs
- Communicated research data and actionable insights to the stakeholders at the university
- Work won the **best poster award** at the CHCI Student Symposium, Blacksburg, VA, in May 2019

STUDY OF GEOMAGNETIC SOLAR STORMS USING MACHINE LEARNING

Aug 2015 - May 2018 | Center for Space Science and Engineering Research at Virginia Tech (Space@VT)

Relevant links: Best Presentation Award

- Presented a study of large solar storms occurring from 2000-2018 to quantify their effects on the Total Electron Content (TEC) in the ionosphere over the U.S. sector
- Studied the strength of influence of various storm parameters on the TEC using tree-based **machine learning** techniques, such as random forest, which included filtering, visualizing, and processing large datasets
- Used AWS, Python, and scikit learn to build a pipeline to fetch and ingest ionospheric data (order of 10s of GBs) to train and test machine learning models
- Work won the **student presentation award** at the AMS 98th Annual Meeting (2018)

Honors

- Selected as a reviewer for the **NASA Open Science 101 curriculum** and a panelist for the **Transform to Open Science (TOPS)** community panel held at NASA Headquarters, Washington D.C., on October 14, 2023.
- Received an honorable mention for "Clear Articulation of Hypotheses and Metrics" for the **IEEE VAST Challenge 2022**
- Awarded **NSF scholarship** for the Student ThinkTank at the International Conference on Auditory Display in 2018 & 2019
- Received a student presentation award at the AMS 98th Annual Meeting (2018) for **exceptional research & presentation**

Leadership

- **President** | CHCI Student Council, Inaugural Chapter at Virginia Tech, 2022-2023
- **Co-Founder & Vice-President** | Kala - Indian Classical Music Society at Virginia Tech, 2018-2023
- **Graduate Liaison** | Creativity + Innovation (C+I) at Virginia Tech, 2020-2021
- **Event Coordinator** | Virginia Tech Eta Kappa Nu (IEEE-HKN) Honor Society, 2018-2019
- **President** | Indian Students Association at Virginia Tech, 2015-2019

Education

Virginia Tech, Blacksburg, VA, USA — May 2023
Doctor of Philosophy (Ph.D.) - Interdisciplinary (Human-Centered Design) - GPA: 3.88/4.0

Virginia Tech, Blacksburg, VA, USA — May 2018
Masters of Science (M.S.) - Electrical Engineering (Electromagnetics) - GPA: 3.85/4.0

Selected Publications [Full List on Google Scholar]

- **Sardana, D.**, Chandrashekhar, N. D., Gračanin, D., Matković, K., & Earle G. D., "Iterative Design of an Immersive Analytics Environment," in **HCI International 2023**.
- **Sardana D.**, "Embodied Data Exploration in Immersive Environments: Application in Geophysical Data Analysis," **Dissertation (2023)**, Virginia Tech.