Disha Sardana, Ph.D.

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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, running user research studies and doing data analysis. 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

EDUCATION

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

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

EXPERIENCE

FedTech, Crucible Ignitor Program **Nov 2024 – Present**
Fellow

- The Crucible Ignitor Program is a partnership between **NavalX** and **FedTech** to solve critical dual-use challenges through innovation in the West Coast region. The program offers participants the opportunity to work with federal- or university-created lab technologies.

Don't Use This Code (DUTC), LLC, Remote **Aug 2024 – Present**
Open Science Ambassador

- Organized and facilitated virtual open science skills training sessions for large audiences under the **NASA grant** - Transform to Open Science Training (TOPST) initiative
- Developed and reviewed engaging content and interactive materials to enhance participants' understanding of open science principles
- Ensured the successful delivery of training sessions to a broad community of researchers by analyzing data from pre-session and post-session surveys
- Promoted open science practices at meetings and conferences
- Shared perspectives on the DUTC blog and engaged in the speaker series about open science

NASA Student Airborne Research Program (SARP) 2024, Southern California **May 2024 – Aug 2024**
Coding Mentor

- As a coding mentor for rising 4th-year senior undergraduates in the earth sciences of the NASA SARP 2024 program, taught many types of coding problems, adapting to different students' learning styles
- Gave classroom lectures on the fundamentals of scientific programming and worked one-on-one with 24 students to assist them with acquiring NASA earth science flight and satellite datasets and writing data analysis and visualization code for their individual research projects
- Taught machine learning concepts to advanced students' group and helped students develop skills in cloud computing, version control, and open scientific software

NASA Transform to Open Science (TOPS) 2023, NASA Headquarters, Washington D.C. **Nov 2023**
Panel Reviewer

- 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 November 14, 2023

Virginia Tech, Blacksburg, VA **Jan 2019 – May 2023**
Doctoral Researcher

- Developed and implemented an interactive data exploration system in a mixed reality (MR) environment using HoloLens 2
- Designed, planned, and ran 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, to improve visual and interaction design
- 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 experiments with **55 participants** to quantify the impact of audio on augmenting visual data analysis in MR environments
- Conducted a user study at a **space weather conference** (CEDAR 2023) and collected data from **43 space science experts** to broaden the demographics to more rigorously quantify and assess the potential impact of XR technologies on educational and analysis tools and techniques
- Showcased the prototype at a science fair (ICAT Creativity + Innovation Day 2019) and gathered user feedback from a diverse general audience (over **20 participants**)
- Mentored MS-level graduate students and managed group research teams with empathy, inclusivity & transparency

Virginia Tech, Blacksburg, VA **Aug 2017 – Jul 2020**
Data Experience Researcher

- Lead graduate researcher on an NSF-funded project that focused on the sonification of geospatial datasets and how sound can help detect patterns and outliers in datasets – NSF Award Abstract #1748667
- 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
- Conducted in-person user studies with over **150 participants** 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

Virginia Tech, Blacksburg, VA **Aug 2015 – May 2018**
Machine Learning Engineer

- For M.S. thesis, presented a study of large solar storms occurring from 2000-2018 to quantify their effects on the Total Electron Content (TEC), a key indicator of the state of 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 time-series ionospheric data (order of 10s of GBs) to train and test machine learning models
- Analyzed and visualized the effects of various other natural phenomena, such as time of day, changing seasons, and solar eclipses, on the TEC in the ionosphere
- Work won the **student presentation award** at the AMS 98th Annual Meeting (2018) for exceptional research

Indian Institute of Technology, Delhi**,** India **Jan 2014 – May 2015**
Research Intern

- Developed an Acquisition and Tracking Method for an Optical Inter-Satellite Communication Link, as part of a project sponsored by the Indian Space Research Organization (ISRO)
- Derived analytical results to calculate contact time between a Geostationary Equatorial Orbit (GEO) and a Low Earth Orbit (LEO) satellite, for different orbits of the LEO
- Studied the principles of satellite imagery, and calculated total data burden involved in imaging all of India, using the technical specifications of a specific LEO

- Demonstrated application of results by calculating the required data transmission rate for transferring imaging data between a specific LEO/GEO pair within a single contact window

RELEVANT PROJECTS

Virginia Tech, Blacksburg, VA – Data Sonification, Python, Unity 3D – Solar Eclipse Data Sonification

- Created a binaural mix of 16 channel ambisonics-encoded sound files, by sonifiying the data coordinates of the solar eclipse path in the United States that occurred on August 21, 2017
- Studied how natural phenomena can be sonified and understood through sound and spatialization techniques
- Procured the eclipse path coordinates from the NASA website and read this data into a MAX/MSP patch. In MAX/MSP, used 3rd-order ambisonics and provided the longitude and latitude coordinates of the eclipse path as azimuth and elevation for the ambisonics-encoder

Virginia Tech, Blacksburg, VA - Unity 3D, UX Research – An Interactive Augmented Reality Boardgame

- 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 market research, 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

TECHNICAL SKILLS & EXPERTISE

Research [Portfolio]: Quantitative & Qualitative Research, Statistical Analysis, Machine Learning, Hypothesis Testing, Survey Design, Interviews, Field Research, Augmented/Virtual Reality (AR/VR), Human Participant Research, Human-Computer Interaction, Human Factors, User Studies, User Experience Design, User Data Analysis, Experimental Design
Programming: Python, R, MATLAB, C#, JavaScript
Tools & Devices: HoloLens 2, Magic Leap 1, Unity3D, Git, Visual Studio, Miro, Figma, Max/MSP, Qualtrics

LEADERSHIP

- **Workshop Lead** – NASA 4th Eddy Cross-Disciplinary Symposium**,** Golden, Colorado, Oct 2023
- **President** – Center for HCI 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
- **President** – Indian Students Association at Virginia Tech, 2015-2019
- **Event Coordinator** – Virginia Tech Eta Kappa Nu (IEEE-HKN) Honor Society, 2018-2019

HONORS

- Invited as a guest speaker at the Department of Psychology & the Center for Cognitive Science (**RuCCS**), Rutgers University, to share research and talk about the power of interdisciplinary research in December 2024
- 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 November 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 Think Tank at the International Conference on Auditory Display in 2018-19
- Received a student presentation award at the AMS 98th Annual Meeting (2018), chosen by the **National Space Weather Science and Technical Activities Commission (STAC)** for exceptional research & presentation

- One of 20 people selected and fully sponsored from a global pool of applicants to attend the 10th Annual Incoherent Scatter Radar School at the Arecibo Observatory, Puerto Rico, in 2017

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 International Conference on Human-Computer Interaction 2023 (p. 86-100).
- Splechtna, R., Hulka, T., **Sardana, D.**, Chandrashekar, N. et al., "Interactive Exploration of Complex Heterogeneous Data: A Use Case on Understanding City Economics," in Proceedings of the 18th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications – IVAPP 2023 (p. 214-221).
- **Sardana, D.**, Kahu, S., Gračanin, D., & Matković, K., "Multi-modal Data Exploration in a Mixed Reality Environment Using Coordinated Multiple Views," in International Conference on Human-Computer Interaction 2021 (p. 337-356).
- Debchoudhury, S., **Sardana, D.**, & Earle, G. D., "The relative importance of geomagnetic storm signatures on the total electron content perturbations over the continental US," in the Journal of Geophysical Research: Space Physics, 2021.
- **Sardana, D.**, Joo, W., Bukvic, I. I., & Earle, G. D., "Perception of Spatial Data Properties in an Immersive Multi-layered Auditory Environment," in Proceedings of the 15th International Audio Mostly Conference (AM 2020). Association for Computing Machinery, New York, NY, USA, 30–37.
- **Sardana, D.**, Joo, W., Bukvic, I. I., & Earle, G. D., "Introducing Locus: A NIME for immersive exocentric aural environments," in Proceedings of the International Conference on New Interfaces for Musical Expression 2019.

REVIEWER

- Panel reviewer for one of the NASA Research Opportunities in Space and Earth Sciences (ROSES) 2024 solicitations
- Reviewer for the National STEM Challenge 2024: https://nationalstemchallenge.com/2024
- Reviewer for the NASA Open Science 101 curriculum: https://github.com/nasa/Transform-to-Open-Science/blob/main/docs/Area2_Capacity_Sharing/Open-Science-101/curriculum_leads.md
- Reviewer for panels and workshops submissions at the CMD-IT/ACM Richard Tapia Celebration of Diversity in Computing Conference (TAPIA), 2024, San Diego, USA, and for technical submissions and posters at TAPIA, 2023, Dallas, USA
- Reviewer for the full papers at the International Conference on Computer Graphics, Visualization and Computer Vision (WSCG) in 2024 & 2022
- Reviewer for a journal paper at the International Journal of Human-Computer Studies (IJHCS), 2023
- Reviewer for the full papers at the New Interfaces for Musical Expression (NIME), 2022, Auckland, New Zealand and the short papers at NIME, 2021, Shanghai, China
- Open reviewer for alt.chi submissions at the ACM Conference on Human Factors in Computing Systems (CHI), 2022, New Orleans, USA and reviewer for the late-breaking works at CHI, 2020, Hawai'i, USA
- Reviewer for the full papers at the International Conference on Auditory Display (ICAD), 2019, Newcastle, UK