AKSHITH ULLAL

573-529-6843 akshithullal@gmail.com www.linkedin.com/in/akshithullal https://akshith-ullal.github.io/web/

EDUCATION

Vanderbilt University Nashville, TN
Ph.D. in Electrical and Computer Engineering *2018-Present*
Thesis: A Framework for Naturalistic Interaction and Collaboration in Remote Mixed/Augmented Reality
Advisor: Dr. Nilanjan Sarkar

University of Missouri - Columbia Columbia, MO
M.S. in Electrical and Computer Engineering *2015–2018*
Thesis: Non-Invasive Monitoring of Vital Signs using Recliner Chairs
Advisor: Dr. Marjorie Skubic , GPA: 3.81/4.0

Visvesvaraya Technological University Belagavi, India
B. Tech. in Electronics and Communication Engineering *2011-2015*
GPA: 3.7/4.0

WORK EXPERIENCE

Robotics and Autonomous Systems Lab, Vanderbilt University Nashville, TN
Graduate Research Assistant *Aug 2018 – Present*

- Developed a multiobjective optimization framework for redirecting humanoid kinematic structure motion with pose preservation between remote environments in AR/VR using Unity, C# and HoloLens 2.
- Developed a mesh deformation-based method to generate locomotion trajectories of users between remote environments of any irregularly shaped topology in AR/VR.
- Developing a machine learning-based naturalistic gait locomotion for an avatar based on the given input speed.
- Developed an AR telepresence system where users can remotely interact with other users and objects in their mutual environment through their photorealistic avatars. The application was developed using Unity, C#, Python, AWS and Photon networking engine and was tested on 60 participants with statistically significant results.
- Classified sleep stages in children with Rett Syndrome, based on physiological features using a SVM machine learning model with 85.1% accuracy.
- Developed a multimodal machine learning based stress detection classifier for older adults with 75% detection accuracy. The classifier model can be used to dynamically adjust the difficulty levels in closed loop HCI intervention systems for older adults.

Center to Stream Healthcare in Place, University of Missouri Columbia, MO
Graduate Research Assistant *Aug 2016 – May 2018*

- Developed an accelerometer sensor system for recliner chairs that can noninvasively extract heart and respiration rates from the occupants' ballistocardiogram signals using a deep regression network.
- Tested the sensor system with 45 older adult subjects having an average age of 78.8 years. The average heartbeat and respiratory error rate was 3.6% and 6.25% respectively.

Biomedical Signal Processing Lab, IIT Indore Indore, India
Summer Research Intern *May 2017 – Aug 2017*

- Developed a deep neural network to classify seizure vs seizure-free EEG signals based on the features obtained from Variational Mode Decomposition (VMD) of the signals.
- Invited to write a book chapter for the developed automated VMD based seizure classifier in *Deep learning, machine learning and IoT in biomedical and health informatics, CRC Press*.

Uniq Technologies Chennai, India
Application Developer Intern *May 2014 – July 2014*

- Developed a code using NS-2(Network Simulator 2) that compares AODV (Ad-hoc On-Demand Vector and DSDV (Destination Sequenced Vector Routing) with different node configurations.
- Simulated TCP and UDP protocols using NS-2 with emphasis on their bit rates.

Mangalore Refineries and Petrochemicals Limited (MRPL) Mangalore, India
Instrumentation Intern *Dec 2013 – Jan 2014*

- Involved Analyzed and helped in the maintenance and working of the Distributed Control System (DCS) and Programmable Logic Controller (PLC) systems used in the fail-safe mechanisms of the refinery.
- Conducted in-plant studies of wireless transponders, pyrometers, pressure gauges and gas detectors used during running, maintenance and repair operation of the refinery.

PATENTS AND SELECT PUBLICATIONS (Full list: https://scholar.google.com/citations?user=2ihJFWwAAAAJ&hl=en)

Patents

A1 US Patent (Under review): System and Method for Efficient Redirection of User Interactions and Gestures between Remote and Local Environments in Augmented Reality **(US18/522,011)**.

A2 US Patent (Under review): System and Method for Efficient Mapping of User Locomotion between Remote and Local Environments in Augmented Reality **(US18/522,027)**.

A3 US Provisional patent: Non-wearable Heartrate, Respiratory Rate and Motion Monitoring System (**US62/481,968)**.

Publications

P1 **Ullal, A**., Tauseef, M., Watkins, A., et al. " An Iterative Participatory Design Approach to Develop Collaborative Augmented Reality Activities for Older Adults in Long-Term Care Facilities." To appear in the *ACM Conference on Human Factors in Computing (CHI),* 2024.

P2 Watkins, A., **Ullal, A**., Sarkar, N. "Every "Body" gets a say: An Augmented Optimization Metric to Preserve Body Pose during Avatar Adaptation in Mixed/Augmented Reality." To appear in the *IEEE Transactions on Visualization and Computing*.

P3 **Ullal, A.**, and Sarkar, N."A Piecewise Approach to Mapping Interactions between Room-scale Environments in Remote Mixed/Augmented Reality." In *2023 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW)*, pp. 663-664. 2023.

P4 **Ullal, A.**, and Sarkar, N. "Mapping of Locomotion Paths between Remote Environments in Mixed Reality using Mesh Deformation." In Proceedings of the *28th ACM Symposium on Virtual Reality Software and Technology,* pp. 1-2. 2022.

P5 **Ullal, A.,** Watkins, C., Sarkar, N. "A Dynamically Weighted Multi-Objective Optimization Approach to Positional interactions in Remote-Local Augmented/Mixed Reality." In *2021 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR)*, pp. 29-37,2021.

P6 Fan, J., Mion, L.C., Beuscher, L., **Ullal, A.**, et al. "SAR-connect: A socially assistive robotic system to support activity and social engagement of older adults." *IEEE Transactions on Robotics,* 38*(2),* pp. 1250-1269, 2021.

P7 Nie, G., **Ullal, A.,** et al. "An Immersive Computer-Mediated Caregiver-Child Interaction System for Young Children with Autism Spectrum Disorder." *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 29, pp.884- 893, 2021.

HONORS AND AWARDS

- Best student paper award IEEE Artificial Intelligence and Virtual Reality (AIVR) 2021
- Top 4 finalist Best paper award IEEE AIVR 2021
- Graduate Student Travel Grant, Vanderbilt University to present at the IEEE Virtual Reality (VR) 2023 conference.
- Graduate Student Travel Grant, Vanderbilt University to present at the IEEE AIVR 2021 conference.
- Deaton Scholar, The Brady and Anne Deaton Institute
- Curators Grant-in-Aid scholarship, University of Missouri

FUNDING AND GRANTS

- Helped write a National Science Foundation (NSF) Smart and Connected Communities (S&CC) grant **# 2225890 "Reducing Loneliness for Long Term Care Older Adults through Collaborative Augmented Reality"** based on my thesis with my advisor Dr. Nilanjan Sarkar as PI and my dissertation committee member Dr. Lorraine Mion as Co-PI that was funded for **$2.25 million**.
- Helped write a National Institute of Health (NIH) R21 grant **# 1R21AG078480-01 "Reducing Loneliness of Older Adults in Long Term Care Facilities through Collaborative Augmented Reality"** based on my thesis with my advisor Dr. Nilanjan Sarkar as PI and my dissertation committee member Dr. Lorraine Mion as Co-PI that was funded for **$433,495**.

SERVICE

- **Academic reviewer** for IEEE Virtual Reality (VR), IEEE Robot and Human Interactive Communication (ROMAN) conferences.
- **Academic reviewer** for ACM Conference on Human Computing Factors (CHI), ACM Symposium on Eye Tracking Research and Applications (ETRA), Proc. of ACM Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), European Conference on Information Systems (ECIS), AAAI Conference on Web and Social Media (ICWSM).

SKILLS

Programming	C/C++, C#, Python, MATLAB, Simulink, PHP, Java, HTML, CSS
Modelling Software	SOLIDWORKS, COMSOL Mulitphysics
Graphical Software	Unity, Unreal, Blender, Maya, Adobe Photoshop
Machine Learning	Deep Learning by Couresera, Tensor Flow, Pytorch
Operating Systems	Windows, Linux