NIVEDITHA MUTHUKRISHNAN

BIOMEDICAL ENGINEER

PERSONAL PROFILE

Experienced biomedical researcher with focus on wearable sensing, signal processing algorithms, and product development bolstered with passion in human-centered designs and experiments.

KINESIOLOGY - WEARABLE SENSORS - DATA ANALYTICS - NEUROREHABILITATION - BIOSTATISTICS

STRENGTHS

- Knowledge in wearable sensors for biomarker detection: motion, cardiovascular, ocular
- Active listener with strong communication skills
- Mentorship & resourcefulness
- Passion for sports, clinical and injury biomechanics
- Adaptability, inclusiveness & teamwork
- Agile & people-centric researcher

TOOLS

- **Data Collection and Processing:** Vicon Motion Capture, IMU-sensor processing, Gait mat processing, MATLAB, Python, Android Studio, Wireless EMG, Pressure Sensors, Instron Tensile Testing, Maxim boards, LabView, SPSS
- **Data Analysis and Interpretation:** MATLAB, Python-ML, SPSS, JMP, R, MS Excel
- **Others:** Textile testing, Stitching, COMSOL Modelling, DOE

LEADERSHIP

- **2021-22 - Director of Wellness -** Graduate and Professional Student Association, ASU
- **2019-21 - Treasurer** - BioEngineering Graduate Student Organization, ASU
- **2020-21 - Board Member** - Graduate Student Advisory Board Funding Policy and Processes Committee, ASU
- **2019-Curr -Founder** - Together We Live Better Mental Health Support Group Initiative, India
- **2019-20 - Media Contributor** - The Sustainability Review Online Magazine, ASU

CONTACT INFO

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WORK EXPERIENCE

HARDWARE ENGINEER INTERN, VERILY LIFE SCIENCES, SUMMER 2021

- Developed prototype using wearable sensors to measure ocular bio-signals
- Designed data-collection experiments to identify ocular biomarkers that are useful in clinical & behavioral diagnosis
- Applied signal processing methodologies and classification techniques to characterize ocular signals with >85% accuracy
- Presented business significance, product development roadmap to Verily's Devices team

ACADEMIC RESEARCH

CENTER FOR ADAPTIVE NEURAL SYSTEMS (ANS) ARIZONA STATE UNIVERSITY, 2018-22

Real-time Auditory Feedback based Wearable System for Movement Rehabilitation:

- Designing a real-time IMU-based wearable sensor system to measure and provide adaptive sound feedback of gait & posture for Parkinson's disease (PD) rehabilitation
- Developing clinical evaluation protocol and execution of human-subject experiments
- Collecting data using optoelectronic, pressure-sensitive and inertial measurement units
- Analyzing and data processing with/using biomechanical and ML models

Real-time Visual Feedback based Treadmill System for Movement Rehabilitation Training:

- Collected data from 7 PD participants using optoelectronic and inertial measurement units on a treadmill system
- Processed, analyzed and interpreted collected data with statistical models
- Demonstrated improvement in gait and posture asymmetry measures in 5 PD participants when trained with real-time visual feedback than those without feedback

Fall Risk Assessment in Parkinson's Assessment - Long-term At-home Monitoring

- Conducted gait, balance and cognitive assessments using instruments developed by rehabilitation experts in 12 participants
- Developed algorithms and pipelines for successful monitoring of Fall risks at-home

BIO-INSPIRED MECHATRONICS LAB ARIZONA STATE UNIVERSITY, 2017-18

Design & Evaluation of a Soft Robotic Exosuit for Knee to Improve Mobility

- Designed & tested body-conformal actuators made with textile to aid muscle weakness
- Collected and analyzed stair climbing & walking data performance in 15 young adults

THE GAIT AND BALANCE DISORDERS LAB ARIZONA STATE UNIVERSITY, 2017-18

Prediction of Reactive Stepping Foot during a Walking Perturbation in Parkinson's disease

- Developed a protocol to analyze the effect of a perturbation and a cognitive task in postural stability during treadmill walking among 16 PD participants
- Determined that the stepping foot correlates with the most-affected limb and has no effects on the dominant limb

ACADEMICS & AWARDS

Ph.D. IN BIOMEDICAL ENGINEERING ARIZONA STATE UNIVERSITY, 2018-22

Specialization - Wearable sensing, Biomechanics, Biosignal Processing, Neurorehabilitation

- Technical Lead - National Institute of Health eC3i Program - Summer 2021
- 2021-22 Graduate College Completion Fellowship, ASU
- 2021 Virginia Counts/Betty Irish Society of Women Engineers for Life scholarship
- 2020-21 Graduate Excellence Award, School of Biological and Health Systems Engineering
- 2020 IEEE Phoenix Section Student Scholarship Award

M.S. IN BIOMEDICAL ENGINEERING ARIZONA STATE UNIVERSITY, 2016-18

Specialization - Biomechanics and Soft-robotics

- 2018 Recipient of Master's Opportunity for Research Fellowship in Engineering

TEACHING & MENTORSHIP

2018-20-TEACHING ASSISTANT, COLLEGE OF ENGINEERING, ASU

- Developed course slides, delivered lectures, conducted lab sessions and evaluated assessments for 16 graduate students
- Graduate-level Courses: Bio-instrumentation, Modeling Neuromechanical Systems

2018-22-RESEARCH MENTOR, ANS LAB, ASU

- Mentored 3 graduate students and 1 undergraduate student for 2 semesters towards the completion of their capstone/applied projects.

PUBLICATIONS

- Muthukrishnan, N.; Abbas, J.J.; Krishnamurthi, N. A Wearable Sensor System to Measure Step-Based Gait Parameters for Parkinson's Disease Rehabilitation. Sensors 2020, 20, 6417
- Muthukrishnan, Niveditha, et al. "Cueing Paradigms to Improve Gait and Posture in Parkinson's Disease A Narrative Review." Sensors 19.24 (2019): 5468
- Sridar, Saivimal, Zhi Qiao, Niveditha Muthukrishnan, Wenlong Zhang, and Panagiotis Polygerinos. "A soft-inflatable exosuit for knee rehabilitation: Assisting swing phase during walking." Frontiers in Robotics and AI 5 (2018): 44.