

# SHARADHI BHARADWAJ

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## EDUCATION

**Carnegie Mellon University (CMU)**, Pittsburgh, PA

May 2023

Master of Science in Biomedical Engineering – Research Track

GPA - 3.84/4.00

Summer 2022 BME Research Excellence Award

BME Graduate Student Ambassador

Relevant Courses: Biomedical Optical Imaging, Fundamentals of MRI and Neuroimaging Analysis, Bioimage Informatics, Introduction to Machine Learning for Biomedical Engineering, Medical Robotics, Methods in (Bio)Medical Image Analysis\*, AI Applications in Biomedical Engineering\*

\*current

**BMS College of Engineering (BMSCE)**, Bangalore, India

Aug 2020

Bachelor of Engineering in Medical Electronics

CGPA - 9.03/10.00

Third Rank holder

Relevant Courses: Signals and Systems, Digital Signal Processing, Biomedical Signal Processing, Medical Imaging Modalities, Medical Image Analysis, Linear Algebra, SoC for Biomedical applications, Clinical Data Analytics

## RESEARCH EXPERIENCE

**Wood Neuro Research Group, Department of Biomedical Engineering, CMU**

Pittsburgh, PA; PI: **Dr. Sossena Wood, Ph.D.**

Aug 2021-current

Project 1: Assessing cognition in patients with Sickle Cell Disease (SCD) using Multimodal Neuroimaging Analysis

- Designed experimental paradigms on psychtoolbox to assess cognition and hemodynamics in patients with SCD
- Developed pipelines for analyzing fNIRS (functional Near Infrared Spectroscopy) and fMRI (functional Magnetic Resonance Imaging) data on MATLAB
- Conducting practice experiments to analyze cognition in patients with SCD
- Calculated cortical volumes and thickness - comparing healthy controls to patients with SCD in a total of 101 subjects
  - Compared healthy controls to patients with SCD, healthy controls to patients with severe SCD, healthy controls to patients with mild SCD, and patients with mild SCD to patients with severe SCD
  - Found significant differences in the parietal, frontal and temporal regions based on the SCD phenotype
- Collaborated in assessing the diffusion and white matter health – comparing healthy controls to patients with SCD in a total of 101 subjects
  - Compared fractional anisotropy, axial, mean, and radial diffusivity in patients with SCD and healthy controls
  - Found significant reduction ( $p < 0.05$ ) in fractional anisotropy and axial diffusivity in patients with SCD when compared to healthy controls
  - Found radial diffusivity was significantly increased in patients with SCD when compared to healthy controls; found both increased and decreased MD values in patients with SCD compared to healthy controls

Project 2: Developing racially inclusive optical technology

- Collected fNIRS data to determine the effect of melanin content from 8 subjects to aid in developing racially inclusive optical technology
- Analyzed tissue oxygen saturation, signal-noise ratio, absorption coefficient, and reduced scattering coefficient of subjects

**Dr. Jayavardhana Gubbi, Ph.D., Tata Consultancy Services, Indian Institute of Science**

Bangalore, India

Dec 2019-Jul 2020

Project: EEG Analysis for Mental Arithmetic Task

- Examined EEG signals in time, frequency, and time-frequency domains using python
- Inspected the mean, variance, energy, power, and RMS of signal in time domain to be used for classification
- Calculated the Spectral Entropy, Intensity Weighted Mean Frequency features in the frequency domain
- Conducted wavelet analysis, wavelet packet analysis of EEG signal
- Classified 38 subjects into good and poor mental arithmetic calculators using machine learning algorithms
- Achieved an accuracy of 87% with the Support Vector Machine algorithm

## INTERNSHIP EXPERIENCE

**Niramai Health Analytix Pvt Ltd, Bangalore, India**

**Intern QARA (Quality Assurance and Regulatory Affairs)**

Dec 2020-Jul 2021

- Developed processes for document control, product label release, and human resource management; Developed overall processes to implement Quality Management System (QMS) for Medical Devices
- Constructed and assisted ISO 13485:2016 audit and supported by managing documentation
- Contributed to FDA 510k filing with product labelling documents
- Conducted companywide QMS training sessions for employees and implemented improvements in existing processes by creating process flowcharts
- Collaborated to develop security policy and procedures for the company

- Annotated manually fetal heard sounds to serve as a gold standard for developing algorithms
- Compared characteristics of Digital Stethoscope and Contact Microphone for fetal heart sound acquisition
- Discovered force applied to abdomen using stethoscope affects the quality of fetal heart sounds acquired, with the optimal force being 0.4N to 0.6N

Mentor: Dr. Manish Arora, Ph.D.

### **PUBLICATIONS AND ABSTRACT PROCEEDINGS**

Lakshmi, G. S., Bhaskaran, A., **Bharadwaj, S. U.**, & Arora, M. (2020, July). Effect of Contact Force on Foetal Heart Sound Recordings. *In 2020 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT) (pp. 1-5). IEEE.*

**Bharadwaj, S.**, Santini, T., Disu, J., D., K., Oluwole, B., Novelli, E., Ibrahim, T.S., and Wood, S., "Analyzing Cortical Thickness and Volume in patients with Sickle Cell Disease using 7T-MRI", In Proc. of the 32nd International Society of Magnetic Resonance in Medicine Annual Meeting, Toronto, Canada; 2023,3-8, June. (accepted).

Meinert-Spyker, E., Santini, T., **Bharadwaj, S.**, Novelli, E., Ibrahim, T.S., and Wood, S., "Patients with sickle cell disease have altered brain fractional anisotropy, axial, mean and radial diffusivity quantified by 7T MRI", In Proc. of the 32nd International Society of Magnetic Resonance in Medicine Annual Meeting, Toronto, Canada; 2023,3-8, June. (accepted).

**Bharadwaj, S.**, Santini, T., Oluwole, B., Novelli, E., Ibrahim, T.S., and Wood, S., "Investigating accelerated brain aging in Sickle Cell Disease", In Proc. of the 29th Organization for Human Brain Mapping Annual Meeting, Montreal, Canada; 2023,22-26, July. (accepted).

Meinert-Spyker, E., Santini, T., **Bharadwaj, S.**, Novelli, E., Ibrahim, T.S., and Wood, S., "Sickle cell disease (SCD) subtype and sex analysis of diffusion metrics on 7T MRI", In Proc. of the 29th Organization for Human Brain Mapping Annual Meeting, Montreal, Canada; 2023,22-26, July. (accepted).

### **ACADEMIC PROJECTS**

**Effects of Cityscapes and Nature scapes on brain region activity using fMRI (CMU)** Jan 2022-May 2022

- Designed an experiment on psychtoolbox; Obtained structural, and functional MRI scans of our peers
- Analyzed fMRI scans and observed 36% of the post-central gyrus is activated for nature and not city

**Assistive Hanger for people with upper extremity impairment (CMU)** Aug 2021-Dec 2021

- Secured Finalists title at RESNA 2022 Student Design Challenge
- Designed an assistive hanger with a lock mechanism to assist people with upper limb impairment; Utilized laser cutting machine to laser cut hanger

**Early Detection of Heart Failure using Machine Learning (CMU)** Aug 2021-Dec 2021

- Analyzed different machine learning algorithms to detect heart failure like the random forest, and SVM
- Achieved prediction accuracy of 78.3% with random forest and 73.3% with SVM

**A vision-based system to detect potholes and uneven surfaces to assist blind people** Aug 2019-Jan 2020

- Designed walking aid using a laser-grid and camera to detect uneven surfaces and potholes
- Utilized Hough Transform to analyze continuous images acquired by the camera and calculated the number of lines in hough transform when there were no obstructions in the path (10 – 17) and with obstructions (25 – 45)

### **TEACHING EXPERIENCE**

#### **Graduate Teaching Assistant**

Course: CMU 42683- Introduction to Machine Learning for Biomedical Engineers Aug 2022-Dec 2022

- Conducted weekly office hours and assisted students in understanding problem sets and course concepts
- Graded homework assignments based on Machine Learning concepts

Skills: Python, Machine Learning

Course: CMU 42203- Biomedical Engineering Laboratory Jan 2022-May 2022

- Graded weekly assignments, lab reports, and lab notebooks on biomechanics, biomaterials, and bioinstrumentation
- Provided feedback on lab reports and notebooks for undergraduate students

Skills: MATLAB

### **SKILLS**

**Application Software** - MATLAB, Embedded C, COMSOL, Pspice, Simulink

**Programming Languages** - Python, C ++, R programming

**Psychology toolboxes** – Psychtoolbox, PsychoPy

**Neuroimaging Devices** - NIRS, EEG, MRI

**Laboratory Skills** - FSL Software, MRICron, ITKSnap, Freesurfer, CRO

**Physiological Devices** - Pulse Oximeter, Respiratory belt, Biopac Blood Pressure device, Oxiplex (fNIRS), Artinis (cwNIRS)