

# FNU SIDHARTH

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## Education

### University of Washington, Seattle, WA

Sep. 2023 – Mar. 2025

Master of Science - Electrical and Computer Engineering (Focus areas : Machine learning and Signal Processing)

GPA: 3.9/4

**Coursework:** Digital Signal Processing\*, Automatic Speech Recognition\*, Statistical learning, Machine learning, Computer Vision, Deep learning

### College of Engineering Trivandrum, India

Aug. 2019 – May 2023

Bachelor of Technology - Electronics and Instrumentation Engineering with a minor in Mathematics

GPA : 9.4/10

**Relevant Coursework:** Deep learning, Computer Architecture, Digital Signal Processing, Advanced linear algebra, Abstract Linear algebra and Number theory, Functional Analysis, Stochastic Processes, Data Structures and Algorithms, Mathematical Optimisation

## Technical Skills

**Languages:** Python, C++, C, Bash scripting, SQL, Verilog

**ML Frameworks:** PyTorch, Tensorflow, OpenCV, SciPy, NumPy, Pandas, scikit-learn, Matplotlib, Kaldi, SOX, NLTK, Speechbrain, gpuRIR, pyroomacoustics

**Softwares:** Praat, Audacity, MATLAB, git, LTspice

## Research Experience

### Mobile Intelligence Lab, University of Washington, Seattle

March. 2024 – Present

Graduate Student Researcher (Advisor : **Dr. Shyam Gollakota, Malek Itani**) **Tech Stack: Python, NumPy, Pandas, PyTorch**

Seattle, USA

- Developing self-supervised foundation model for spatial audio using PyTorch, planned for finetuning on beamforming and DoA estimation
- Implementing channel masking and prediction techniques to enable spatial audio conversion across different microphone configurations
- Investigating model generalization to broader spatial audio tasks like source separation and localization
- Leveraging self-supervised pretraining on generic spatial tasks to improve data efficiency

### Herron lab, University of Washington, Seattle [[Code](#) ]

Sep. 2023 – Present

Graduate Student Researcher (Advisor : **Dr. Jeffrey Herron.**) **Tech Stack: Python, MATLAB, NumPy, Pandas**

Seattle, USA

- Devised a statistical approach to identify the subcortical regions associated with acute pain in humans using electrophysiological signals
- Implemented advanced pre-processing techniques in MATLAB, including Independent Component Analysis (ICA) and wavelet decomposition, to effectively remove noise and artifacts from ECoG recordings
- Optimized the CSP algorithm in Python by incorporating subject-specific spatial filtering and selecting features with high discriminative power for pain classification
- Achieved a precision and recall of **70%** using the Random Forest algorithm to classify pain into binary states based on Common Spatial Patterns (CSP) of power spectra from six frequency bands

### LEAP lab, Indian Institute of Science (IISc) [[Code](#) ] [[Paper : INTERSPEECH 2023](#)]

Dec. 2022 – May 2023

Audio research intern (Advisor : **Dr. Sriram Ganapathy.**) **Tech Stack: Python, Kaldi, Bash, Praat, Audacity, SOX**

Bangalore, India

- Developed and evaluated speaker and language diarization systems for multilingual, multi-speaker environments with code-mixing
- Collaborated with a **team of ten** to pre-process conversational audio signals using Audacity and Praat, fine tune Speech Activity Detector (SAD) based on x-vectors, and cluster the speakers using AHC and SC with VB-HMM for refining boundaries
- Achieved a Diarization Error Rate (DER) of **28.04** for speaker diarization and **37.72** for language diarization baselines on the DISPLACE Challenge dataset, showcasing the effectiveness of the proposed algorithm
- Presented these findings at the ISCA INTERSPEECH 2023 conference

## Selected Projects

### Emotion detection from EEG using transfer learning [[Code](#) ] [[Paper : IEEE EMBC 2023](#)]

Aug. 2022 - Dec. 2022

- Directed a **team of three** to build a novel emotion detection framework using transfer learning and signal processing techniques using PyTorch
- Implemented pre-processing steps for noise reduction and artifact removal of EEG signals using MATLAB
- Extracted Mean Phase Coherence (MPC) and Magnitude Squared Coherence (MSC) using time-frequency analysis and graph based measures in Python and adapted a pre-trained ResNet-50 model for emotion classification
- Achieved **three percent improvement** in classification accuracy compared to the existing state-of-the-art methods and presented the findings at the prestigious IEEE Engineering in Medicine and Biology Society Conference (EMBC) in 2023

### MEL\_GRAPH-GCN for bird call classification

Aug. 2022 - Dec. 2022

- Devised an efficient model for classifying bird species from audio recordings, particularly focusing on overlapping audio scenarios
- Employed mel-spectrograms and applied time augmentation (1.5s) to enhance audio data representation, improving model robustness and generalization
- Utilized a combination of Convolutional Neural Networks (CNN) and Graph Convolutional Networks (GCN) for classification, with birds represented as nodes and directed edges indicating transitions between species
- Achieved an outstanding macro F1 score of **0.85**, which is similar to state-of-the-art

## Relevant Publications

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1. Baghel, S., Ramoji, S., **Sidharth**, , H. R., Singh, P., Jain, S., Roy Chowdhuri, P., Kulkarni, K., Padhi, S., Vijayasenan, D., Ganapathy, S. (2023) The DISPLACE Challenge 2023 - DIarization of SPeaker and LAnguage in Conversational Environments. Proc. INTERSPEECH 2023, 3562-3566, doi: 10.21437/Interspeech.2023-2367
2. **S. Sidharth**, A. A. Samuel, R. H, J. T. Panachakel and S. Parveen K, "Emotion detection from EEG using transfer learning," 2023 45th Annual International Conference of the IEEE Engineering in Medicine Biology Society (EMBC), Sydney, Australia, 2023, pp. 1-4, doi: 10.1109/EMBC40787.2023.10340389
3. J. T. Panachakel, R. H, S. P. K, **S. Sidharth** and A. A. Samuel, "CSP- LSTM Based Emotion Recognition from EEG Signals," 2023 IEEE International Conference on Metrology for eXtended Reality, Artificial Intelligence and Neural Engineering (MetroXRINE), Milano, Italy, 2023, pp. 289-294, doi: 10.1109/MetroXRINE58569.2023.10405666
4. K. Sana Parveen, J. T. Panachakel, H. Ranjana, **S. Sidharth** and A. A. Samuel, "EEG-based Emotion Classification - A Theoretical Perusal of Deep Learning Methods," 2023 2nd International Conference for Innovation in Technology (INOCON), Bangalore, India, 2023, pp. 1-6, doi: 10.1109/INOCON57975.2023.10101002

## Research Talks

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### 1. Emotion detection from EEG using transfer learning

- **Conference:** 45th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)
- **Venue:** Sydney, Australia

## References

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### Dr. Jeffrey Herron

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### Dr. Shikha Baghel

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### Dr. Shreyas Ramoji

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### Dr. Sriram Ganapathy

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