

Pavithran Pattiam Giriprakash

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EDUCATION

Cleveland State University (GPA: 3.91/4.0)

Cleveland, OH

Master of Science: Biomedical Engineering

Aug. 2019 – Aug. 2021

- Relevant coursework : Biomedical signal processing, medical imaging
- Volunteering: Student Volunteer (Viking Expeditions), Notetaker (Disability services), Student Mentor (Believe in Ohio).

Anna University (GPA: 8.8/10.0)

Chennai, India

Bachelor of Engineering: Biomedical Engineering

Aug. 2015 – May 2019

- Relevant coursework : Object oriented programming and data structures, transforms and partial differential equations, probability and random processes, digital signal and image processing, pattern recognition and neural networks.
- Organizations: IEEE Engineering in Medicine and Biology Society (IEEE EMBS), ICBSII 2018 organizing committee.

RESEARCH AND WORK EXPERIENCE

Lou Ruvo Center for Brain Health, Cleveland Clinic

Las Vegas, NV

MRI research engineer

Nov. 2021 – Present

- Utilized Empirical Mode Decomposition, an adaptive time frequency analysis technique and identified a lower energy and high frequency shift in the Alzheimer's disease based on the instantaneous log energy and period profiles extracted from nearly orthogonal modes called Intrinsic mode functions covering the frequency range 0.01 – 0.07 Hz using Hilbert spectrum.
- Formulated a dynamic functional connectivity pipeline that estimated the dynamic brain states using k-means clustering based on Euclidean distance and an adaptive EMD based sparse regularized inverse covariance derived from graphical LASSO.
- Observed anti-synchrony in the brain states of MCI and significant differences in the conditional probability of state transition between brain states across MCI and Alzheimer's disease and the eigen decomposition derived steady state distribution.
- Performed interpretable ML analysis and analyzed the relationship between fMRI derived 2D spatial features extracted from a FastICA algorithm based on tanh nonlinearity and fluency scores using local model agnostic measures like SHAPley and permutation importance derived from a 3-fold cross validated Randomforest regression model in Python.
- Spearheaded the database management of high dimensional MR imaging data of 200+ subjects using a standalone DICOM server and programmed scripts in bash and Python for data anonymization and denoising based on random matrix theory.
- Currently improving a lab grown deep learning based denoising pipeline for multivariate rsfMRI timeseries using a composite architecture involving a novel time-dependent layer, 3D-CNN based spatial filters and 1D-CNN based temporal filter layers.

INVent Lab, CCIPLD, Case Western Reserve University

Cleveland, OH

Graduate research assistant

Jan. 2020 – Aug. 2021

- Applied data characterization algorithms and extracted 1560 2D radiomic features (Haralick, Laws, Gabor, and Gradient families) from expert annotated bowel CT scans in over 150 Chron's disease (CD⁺ and CD⁻) patients using MATLAB.
- Formulated a feature selection scheme based on Maximum relevance and minimum redundancy (mRMR) followed by a hyperparameter tuned Randomforest classifier in MATLAB that reproducibly diagnosed Crohn's disease of the terminal ileum from CT scans of varied dosage (full, half) and reconstruction strategies with validation AUCs of 0.78 and 0.6.
- Collaborated with other lab members and developed a CT reconstruction and dose invariant image analysis pipeline based on feature stability and reproducibility (ICC) in MATLAB that improved the diagnostic efficiency of the model by 56% which resulted in a MICCAI paper and a first author journal that is under review.

Sri Sivasubramaniya Nadar College of Engineering

Chennai, India

Undergraduate research Assistant

Jan. 2018 – May 2019

- Spearheaded the subject recruitment, performed cognitive assessment tests (MMSE) and assisted in the data collection of 32 channel task EEG for 15+ dyslexic kids performing a customized visuo-spatial attention task developed using Psytoolkit.
- Implemented an EEG denoising pipeline for ocular artifacts using discrete wavelet transforms and extracted the relative power ratio and spectral coherence as features using a Blackman-Harris Window based power spectrum estimation in LabVIEW.
- Identified reduced theta band activity and disruptions in Brodmann areas 18, 42 in dyslexics during task performance in the functional connectivity maps and phase delay in the temporal (T3-T6) and parietal lobes (P3, P4) in the polar plots.

LEADERSHIP EXPERIENCE

Viking Expeditions (VE)

Local service chair

Cleveland, OH

Apr. 2020 – May 2021

- Represented VE and engaged in successful collaboration with over 10 local organizations in the Cleveland area, fostering valuable partnerships that led to the active participation of more than 50 students across a series of 4 volunteer events.
- Spearheaded the Prep Track within VE and co-managed a GroupMe handle that brought in 30 new members in 4 months.

iCorps@Ohio 2021

Entrepreneurial lead II (EnteroQuant)

Cleveland, OH

Jun. 2020 – Nov. 2020

- Conducted 100+ interviews with 60+ clinicians spread across 30 organizations and 6 countries and co-developed a business model for an AI based decision support system that was projected to increase the clinical remission in CD patients by 15%.
- Established 10 market-based value propositions and 3 revenue streams using the lean business model that would potentially help gastroenterologists fast-track the treatment of CD and bring down the costs due to ineffective treatment by \$3 billion.

SKILLS AND RESEARCH INTERESTS

Skills: Computational neuroscience, medical image analysis, unsupervised algorithms, dimensionality reduction, machine learning, multivariate data analysis, deep learning, TensorFlow

Programming and software: Programming (MATLAB, Python, shell scripting, Python libraries (NumPy, scikit-learn, pandas, seaborn, matplotlib, nibabel), LabVIEW); Neuroimaging libraries (Freesurfer, ANTs, SPM); Task development (Eprime).

AWARDS AND HONORS

- Received **\$5000 Monte Ahuja Scholarship** for holding **first rank** in the **Department of Chemical and Biomedical Engineering** at Cleveland State University during the first year of my master's degree.
- Received a sum of **\$1000** as a **scholarship** in Fall 2020 for my service as the **Local Service Chair** in the executive board of the **Viking Expeditions**, a student organization at Cleveland State University.
- Secured the **gold medal** and a **scholarship of ₹72500** for securing a **cumulative GPA of 9.08/10** in the **Biomedical Engineering** department during my junior year.
- Awarded **silver medal** and a **scholarship of ₹43500** for securing a **cumulative GPA of 8.9/10** in the **Biomedical Engineering** department during my freshmen year.
- Awarded **first class distinction medal** for securing **rank 8 out of 1948 students** with a **4 year GPA of 8.8/10** across 571 institutions in Biomedical Engineering for the graduating class of 2019.

PUBLICATIONS

1. **Pattiam Giriprakash, P.**, Cieri, Filippo., et al (2023). Alzheimer's detection using dynamic functional connectivity and machine learning based on Empirical Mode Decomposition. Organization for Human Brain Mapping (OHBM) 2024. (Preparation for submission).
2. **Pattiam Giriprakash, P.**, Cieri, Filippo., et al (2023). Analysis of time varying energy period profiles using Hilbert Huang Transform in resting state fMRI for Alzheimer's disease. International Society of Magnetic Resonance in Medicine (ISMRM) 2024. (Submitted and under review).
3. Chirra, P*, **Pattiam Giriprakash, P***, Rizk, A., Kurowski, J., Viswanath, S. (2023). Systemic identification of radiomic features resilient to annotation and acquisition variations for diagnosis of active Crohn's disease on CT enterography. Radiology AI (Submitted and under review, * denoting equal contribution).
4. Sadri, A. R., Esfahani, S. A., Chirra, P., Antunes, J., **Pattiam Giriprakash, P.**, Leo, P., . . . Viswanath, S. E. (2021). SPARTA: An Integrated Stability, Discriminability, and Sparsity Based Radiomic Feature Selection Approach. *Medical Image Computing and Computer Assisted Intervention – MICCAI 2021 Lecture Notes in Computer Science*, 445-455. doi:10.1007/978-3-030-87199-4_42
5. **Pavithran, P.**, Arunkumar, K., Seshadri, N. G., Singh, B. K., Mahesh, V., & Geethanjali, B. (2019). Index of Theta/Alpha ratio to quantify visual - spatial attention in dyslexics using Electroencephalogram. *2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS)*. doi:10.1109/icaccs.2019.8728482
6. Sushmitha, S., Tanushree Devi, B., Mahesh, V., Geethanjali, B., Arun Kumar, K., & **Pavithran, P. G.** (2020). Virtual reality therapy in prolonging attention spans for adhd. *Advances in Biomedical Engineering and Technology*, 391–400. https://doi.org/10.1007/978-981-15-6329-4_32
7. Arun Kumar, K., **Pavithran, P. G.**, & Bagyaraj, S. (2020). Design and development of command prompt assist device for locked in syndrome patients. *Smart Healthcare for Disease Diagnosis and Prevention*, 7–13. <https://doi.org/10.1016/b978-0-12-817913-0.00002-x>