





MITHUNJHA ANANDAKUMAR

amithunjha@gmail.com, mithunjha_anandakumar@fas.harvard.edu

+1 (617) 870 8948,    

RESEARCH INTERESTS

AI for healthcare

Machine learning (ML) & deep learning

Medical imaging

Interpretable ML

Computational medicine

Biosignal processing

EDUCATION

BSc. Engineering (Honours) in Biomedical Engineering

Aug 2017 - July 2022

Department of Electronic and Telecommunication Engineering,

University of Moratuwa, Sri Lanka.

Cumulative GPA : **3.98/4.2 (First Class Honours)**

Notable modules: *Medical image processing, Biotechnology, Biosignal processing, Advances in machine vision, Data structures & algorithms, Applied statistics, and Neural networks & fuzzy logic*

RESEARCH EXPERIENCE

Faculty of Arts and Sciences, Harvard University

July 2022 - present

Post baccalaureate fellow

The Center for Advanced Imaging, Harvard University

Sept 2021 - June 2022

Remote undergraduate researcher

Biomedical Research Group, University of Moratuwa, Sri Lanka

June 2021 - July 2022

Undergraduate thesis research student

Zone 24x7 (Pvt) Ltd, Sri Lanka

Oct 2020 - Mar 2021

Trainee associate research engineer

Centre for Biomedical Innovation, University of Moratuwa, Sri Lanka

July 2019

Research assistant intern

PUBLICATIONS

Preprints

- **M. Anandakumar***, J. Pradeepkumar*, S. L. Kappel, C. U. S. Edussooriya, and A. C. De Silva. (2022) "A knowledge distillation framework for enhancing ear-EEG based sleep staging with scalp-EEG data", arXiv. *Submitted to IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2023)*, Under Review. [[Paper](#)] [[Code](#)]
- J. Pradeepkumar*, **M. Anandakumar***, V. Kugathanan, D. Suntharalingham, S. L. Kappel, A. C. De Silva and C. U. S. Edussooriya. (2022) "Towards interpretable sleep stage classification using cross-modal transformers.", arXiv. *Submitted to IEEE Journal of Biomedical and Health Informatics*, Under Review. [[Paper](#)] [[Code](#)]
- N. Wijethilake, **M. Anandakumar**, C. Zheng, P. T. C. So, M. Yildirim and D. N. Wadduwage, (2022) "DEEP²: deep learning powered de-scattering with excitation patterning" arXiv. [[Paper](#)]
- J. Pradeepkumar*, **M. Anandakumar***, V. Kugathanan*, A. Seeber and D. N. Wadduwage. (2021) "Physics augmented U-Net : a high frequency aware generative prior for microscopy", bioRxiv. (Manuscript under preparation for extension of this work). [[Paper](#)]

Peer reviewed conference papers

- M. Afham*, U. Haputhanthri*, J. pradeepkumar*, **M. Anandakumar**, A. De Silva and C. U. S. Edussooriya (2022) "Toward accurate cross-domain in-bed Human pose estimation", In IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) (pp. 2664-2668). [[Paper](#)]

- J. Pradeepkumar, **M. Anandakumar**, V. Kugathasan, T. D. Lalitharatne, A. C. De Silva and S. L. Kappel (2021) “Decoding of hand gestures from electrocorticography with LSTM based deep neural network”, *In Proceedings of International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. [[Paper](#)]

Theses

- **M. Anandakumar** , J. Pradeepkumar, D. Suntharalingham, V. Kugathasan, S. L. Kappel, C. U. S. Edussooriya, and A. C. De Silva. (2022) “Interpretable multi-modal sleep monitoring system using ear-EEG and EOG”. [[Thesis](#)]

* denotes joint lead authors.

HONORS AND AWARDS

- Dean’s list for 7 semesters.
- Second runner-up at video and image processing cup (2021) at IEEE international conference on image processing (ICIP) conference.
- IEEE SMC Winners at BR41N.IO hackathon (2020) at IEEE system, man, cybernetics (SMC) conference.
- Second runners-up of Data storm v2.0 (2021) Sri Lanka’s premier advanced analytics competition.
- Champions of Brainstorm (2019), Sri Lanka’s premier biomedical engineering design competition.
- Champions of Mora ventures 5.0 (2019), organized by University of Moratuwa, Sri Lanka.
- Champions of SLIoT hackathon (2019), Sri Lanka’s premier IoT design competition.
- Runners-up of HackX start-up competition (2019) organized by the University of Kelaniya, Sri Lanka.
- Runners-up of IEEE innovation nation (2019) organized by IEEE Sri Lankan section.
- Mahapola Merit Scholarship (2017) for best performance in nationwide university entrance examinations.

RESEARCH PROJECTS

Deep learning based image reconstruction for DEEP-TFM

Research project with Harvard-MIT collaboration (ongoing)

The aim of the project is to develop a deep learning based image reconstruction approach for DEEP-TFM (De-scattering with excitation patterning temporal focusing microscopy) images: 1) with a minimal number of excitation patterns and 2) when the forward model of the system (physics of microscopy) is not known during network training.

Advisor: Dr. Dushan N. Wadduwage (Wadduwage Lab, Harvard University)

AI for histopathology

Research project with Wadduwage Lab, Harvard University (ongoing)

The aim of the project is to develop a deep learning algorithm to efficiently scan whole slide images, such that it would mimic how pathologists examine a slide (by zooming into only a few selected regions to look at key features). The ultimate goal of the project is to reduce storage requirements, computation requirements, and redundancy in stored data and accelerate the scanning process.

Advisor : Dr. Dushan N. Wadduwage (Wadduwage Lab, Harvard University)

Protein structure generation

Research project with So Lab, Harvard University (ongoing)

The aim of the project is to develop a generative model that can generate protein structures of variable length, toward the application in de novo protein design.

Advisor : Dr. Sergey Ovchinnikov (So Lab, Harvard University)

Interpretable multi-modal sleep monitoring system using ear-EEG and EOG

Undergraduate thesis project

The aim of the project was to develop an interpretable transformer-based automatic sleep stage classification algorithm using ear-EEG and EOG signals, and a user-friendly signal acquisition system for a sleep study. I developed a cross-modal knowledge distillation approach to improve the performance of ear-EEG.

Advisors : Dr. Anjula C. De Silva (University of Moratuwa), Dr. Chamira U. S. Edussooriya (University of Moratuwa), and Dr. Simon L. Kappel (Aarhus University, Denmark)

Privacy-preserving in-bed human pose estimation

The aim of the project was to adapt state-of-the-art domain adaptation methods for in-bed human poses estimation under heavy occlusion and different illumination conditions.

Advisors : Dr. Chamira U. S. Edussooriya (University of Moratuwa).

**Paper accepted for oral presentation at ICASSP 2022.*

Decoding of hand gestures from electrocorticography with LSTM based deep neural network

A self-initiative project

The aim of the project was to decode hand gestures using electrocorticography (ECoG) signals from an epileptic patient with an LSTM-based deep neural network. I developed a novel statistical-based channel selection algorithm to extract important channels from the recordings.

Advisors : Dr. Thilina D. Lalitharatne (Imperial College London, UK), Dr. Simon L. Kappel (Aarhus University, Denmark) and Dr. Anjula C. De Silva (University of Moratuwa).

**Paper accepted for oral presentation at EMBC 2021.*

Real-time blood potassium level monitor for dialysis patients

A self-initiative project

The aim of the project was to design an AI-powered non-invasive and real-time blood potassium level monitoring device using electrocardiogram (ECG) signals. I developed a machine learning algorithm to predict blood potassium levels from ECG signals.

**Won many country-wide idea-pitching competitions and hackathons*

Selected course projects

- Line intensity profile analysis of medical images using slicer [\[Code\]](#)
- Image registration using ITK [\[Code\]](#)
- Brain tumor segmentation on BRATS2018 dataset [\[Code\]](#)
- Radiomics-aided diagnosis of PDAC based on plain CT images [\[Code\]](#)
- Implementing a custom multi-core processor on FPGA for matrix multiplication [\[Code\]](#)
- Implementing an end-to-end IoT platform for calorie tracking [\[Code\]](#)
- Designing a fingertip pulse sensor
- Designing a heartbeat amplifier

TECHNICAL STRENGTHS

Programming	Python, MATLAB, Verilog
Software tools	ImageJ, Slicer, L ^A T _E X, Git
Libraries	Tensorflow, Pytorch, Keras, NumPy, ITK/VTK, OpenCV, Scikit-Learn

PROFESSIONAL SERVICES AND VOLUNTEERING

Teaching experience as teaching assistant

2022 Spring: EN2550 Fundamentals of image processing and machine vision

2022 Spring: EN3900 Seminar

IEEE Engineering in Medicine and Biology Student Chapter at University of Moratuwa

Council member 2021/22

Editor 2020/21

Education director 2019/20

Served as invited reviewer at ECCV 2022 - L2ID workshop

Invited talk at center for ear-EEG group, Aarhus University, Denmark on the undergraduate thesis project.

References available upon request