

Amir Hossein Daraie – CV

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Personal Profile

I am a Ph.D. student at the **Biomedical Engineering** Department at **The Johns Hopkins School of Medicine** and a M.Eng. student at the **Applied Mathematics and Statistics** at Johns Hopkins University. During my first year of Ph.D., I invented a comprehensive inter-cranial EEG monitoring tool that can (i) detect clinical and subclinical seizure events, (ii) categorize seizures, and (iii) localize the seizure onset location. I also work on epilepsy seizure prediction, brain stimulation, and seizure network analysis using graphical models. I received my bachelor's degree in biomedical engineering and minored in electrical engineering (control) at **Tehran Polytechnique**, Tehran. I worked as a research intern at Donders Centre for Cognitive Neuroimaging, Netherlands. At the **Donders Sleep & Memory Lab**, under the supervision of **Prof. Martin Dresler**, I developed soft- and hardware solutions for home-based sleep recordings and sleep modulation using single-electrode EEG and machine learning algorithms. I have several years of experience as a **software developer and embedded system designer** in international robotics competitions, RoboCup.

Education

- 2022-Pres. Ph.D. in Biomedical Engineering** - Johns Hopkins University
Advisors: Dr. Sridevi V. Sarma, Dr. Adam S. Charles, Dr. Joon Yi-Kang (MD)
Area of research: Epilepsy Monitoring and Treatment
- 2022-Pres. MSc in Applied Mathematics and Statistics** - Johns Hopkins University
Area of focus: Statistics and Statistical Learning
- 2018-2022 BSc in Biomedical Engineering** - Amirkabir University of Technology
Minor in **Electrical Engineering**
GPA: 3.8/4
Score: 18.42 via 120 credits

Honors and Awards

- Best poster presentation award at the 1st International Conference on AI in Epilepsy Breckenridge, Colorado, USA *March 2023*
- Summer Undergraduate Research Scholarship from Donders Institute for Brain, Cognition, and Behaviour, Centre for Cognitive Neuroimaging, *July 2021*
- Ranked 3rd based on GPA out of all 110 bachelor students of Biomedical Engineering Department at *Amirkabir University of Technology entered at 2018*
- Granted admission from Talented Student Office of Amirkabir University of Technology for studying electrical engineering as second degree
- Iran's National Elites Foundation (INEF) Fellowship [2016-2021]: Recognized as scientific elite
- 1st Place in international robotics competition, *RoboCup 2019, Sydney, Australia*
- 1st Place in international robotics competition, *RoboCup 2017, Nagoya, Japan*

- 2nd Place in international robotics competition, *RoboCup 2016, Leipzig, Germany*
- Best Electronics Circuit Design Award in international robotics competition, *RoboCup 2015, Hefei China*
- 1st Place in SuperTeam Challenge in international robotics competition, *RoboCup 2015, Hefei, China*
- 1st Place in the main competition at national robotics competition, *RoboCup IranOpen 2017, Tehran, Iran*
- 2nd Place in the main competition at national robotics competition, *RoboCup IranOpen 2016, Tehran, Iran*
- 4th Place SharifCup Line Follower Robots, *Sharif University of Technology 2015*

Publications

- Esfahani, M. J., **Daraie, A. H.**, Zerr, P., Weber, F. D., Dresler, M. Dreamto: an open-source dream engineering toolbox for sleep EEG wearables. *SoftwareX* - <https://doi.org/10.1016/j.softx.2023.101595> (2023).
- Esfahani, M. J., ..., **Daraie A H**, ..., Dresler, M. Citizen neuroscience: wearable technology and open software to study the human brain in its natural habitat. *European Journal of Neuroscience* - <https://osf.io/preprints/psyarxiv/4mfcd> (2023).
- Hayes, M., **Daraie A H**, ..., Crone, N. Network excitability of stimulation-induced spectral responses helps localize the seizure onset zone. *Journal of Clinical Neurophysiology* (In publication, 2023).

Patents

- **Daraie, A. H.**, Sanchez, L. A., Sarma, S. V. Method and Apparatus for Detecting Epileptic Seizures in Intracranial EEG Monitoring via Tracking Entropy of Dynamic Network Brain Models Coefficients. *Provisional Patent* (2023).

Teaching

Spring

Intercession **EN.580.123**, Statistical Foundations of Neural Data Science
2024 *Instructor and course coordinator*

Fall **EN.580.633**, Introduction to Computational Medicine: The Physiome
2023 *Teaching Assistant*

Fall **EN.580.336**, Distinguished Seminar Series in Computational Medicine
2023 *Seminar Coordinator and teaching assistant*

Summer **EN.601.220**, CS220 Intermediate Programming
2023 *Course Assistant*

Summer **EN.585.725.81**, Biomedical Engineering Practice and Innovation
2023 *Teaching Assistant*

Works and Experience

July 2021 - **Donders Institute**, Kapittelweg 29, 6525 EN Nijmegen, Netherlands
Dec 2021 *Research Intern*

Under the supervision of Professor Martin Dresler, I developed software for home-based sleep recordings and sleep modulation with a focus on lucid dream induction, and sleep staging with single-channel EEG using Python.

Technologies: Machine Learning (SVM, LightGBM) · Deep Learning (CNN, LSTM) · Single channel EEG measurement · Polysomnography · User Interface development with Qt framework in Python.

June 2014 - RoboCup Federation

Sep 2019 *Software programmer, embedded system designer, and team leader*

I developed software and hardware for an autonomous rescue robot. My work experience include: programming and implementing different navigation algorithms in robots and mentored over 10 students, how to program in C++ and design PCB with Altium Designer.

Technologies: ARM Cortex-M3 processor · CodeVisionAVR C Compiler · SolidWorks Software

Selected Projects

■ ZmaxCoDo EEG Analyzer

- Developed a stand-alone software for an EEG wearable device with Python.
- Real-time sensory stimulation.
- Real-time spectrogram and periodogram analysis.
- Online automatic sleep scoring with SVM, random forest, gradient boosting, CNN, and LSTM.

Advisor: Dr. Martin Dresler

■ *Powerful Again: A rehabilitation platform for patients with spinal cord injury*

- Body segmentation with RGB cameras, infrared projectors, and detectors.
- Real-time gesture recognition and body skeletal detection.
- Adaptive training for patients with different levels of spinal injuries.

Advisors: Dr. Soroush Sadeghnejad, Dr. Mohammad Ali Ahmadi-pajouh

■ Simulating a pulse-coupled neural network (PCNN) model of mammalian cortex with Izhikevich model

- Simulated a network of spiking neurons.
- Fourier analysis of spiking time series.
- Simulated collective dynamics and rhythms similar to those of the mammalian cortex in the awake state.
- Adaptive training for patients with different levels of spinal injuries.

Advisor: Dr. Mehrdad Saviz

■ Visualization of preparatory activity in the ALM and the CN

- Visualized neural activity recorded in the paper: A cortico-cerebellar loop for motor planning. Nature 56.
- Analyzed neural dynamics in lower dimensional feature space from correlational structure across 64 channels of data.
- Visualized state-space trajectories via PCA.

Advisor: Dr. Mehrdad Saviz, Dr. Mike Cohen (Remote)

Software Engineering Skills

■ Programming Languages

Python - PyTorch, Sklearn, Pandas, Numpy, Matplotlib

MATLAB, R

C, C++

■ Web Development

HTML5, CSS3/SASS, JavaScript/jQuery

Apache Web Servers

■ Miscellaneous

Unity 3D, Unreal Engine 4 - graphics programming for VR & AR

Altium Designer - PCD design and FPGA

SolidWorks - 3D modeling and CAD

CVS, DARCS, git - source version control

Languages

- Persian – Native
- English – Professional (TOEFL Score: 100)
- German – Intermediate (B2.2)

References

Name Sridevi Sarma, Ph.D.
Company Johns Hopkins University
Position Associate Professor, Advisor
Contact sridevi.sarma@gmail.com

Name Joon-Yi Kang, MD
Company Johns Hopkins School of Medicine
Position Assistant Professor, Advisor
Contact jkang50@jhmi.edu

Name Martin Dresler, Ph.D.
Company Radboud University
Position Associate Professor, Advisor
Contact martin.dresler@donders.ru.nl

Name Adam Charles, Ph.D.
Company Johns Hopkins University
Position Assistant Professor, Co-advisor
Contact adamshch@gmail.com