Jinani Sooriyaarachchi, PhD

Montreal, Canada ◇ https://jinani.ca/

OBJECTIVE

Postdoctoral researcher at the National Research Council Canada with extensive training in computational neuroscience and machine learning. Proficient in communicating effectively with technical and non-technical audiences. Passionate and well-experienced in machine learning, neural data analysis and Brain-Computer Interface (BCI) applications.

EDUCATION

PhD - Computational Neuroscience and Machine Learning *2021/09 - 2025/02*
Department of Physiology-McGill University, Canada - GPA: 4.0
- Doctoral Thesis: A system identification approach to study the cortical state contributions to response variability of visual cortex neurons
- Contributions: Project conceptualization, electrophysiology data curation, methodology development, data analysis and visualization (single- and multi-unit activity, local field potentials), development and evaluation of machine learning models, research publications, and presentations
- Scientific presentations: 6 oral, 5 international and 11 national presentations
- Awards: 5 fellowships and 3 best presentation awards, 1 hackathon

Deep Learning Interactive Training - Neuromatch Academy *2022/07 - 2022/08*
- Project: A model-to-brain mapping : DNNs in modeling the ventral visual pathway

MSc in Physiology (Thesis)- Fast-tracked to PhD *2020/09 - 2021/08*
Department of Physiology-McGill University, Canada - GPA: 4.0

BSc. Engineering (Hons)- Biomedical Engineering *2014/12 - 2018/12*
University of Moratuwa, Sri Lanka - GPA: 3.94
- Achievements: First Class honours and Dean's List inclusion in 8/8 semesters
- Final year project: Non-invasive blood glucose measurement using hybrid techniques

SKILLS

Programming: Advanced level in Python (data analysis and visualization - pandas, numpy, scipy, matplotlib, seaborn packages), MATLAB, conda, git

Neural data processing: Electrophysiology data curation, analysis and visualization (LFP, multi- and single-unit activity), multi-channel recordings, spike-sorting (kilosort and spike-sorter software), proficient in EEG signal processing, familiar with fMRI, MEG, and EMG signal processing

Machine Learning Techniques: Supervised and unsupervised learning, deep learning, neural networks, transfer learning, dimensionality reduction, network architectures, regularization, optimization and learning techniques, machine learning frameworks (Tensorflow, Keras, PyTorch, Scikit-Learn)

Research Skills: Experiment design, large-scale data analysis (both temporal and frequency domain), statistical analysis, hypothesis testing, participant recruitment, scientific communication

Project Management and Leadership Skills: Leading and mentoring multidisciplinary teams of biomedical engineers and computer scientists, mentoring STEM undergraduates

HACKATHON EXPERIENCE

Project EmoNeuro Platform - natHACKS 2024 - Neuro Alberta Tech
- An EEG-based technology that translates real-time emotional fluctuations into adaptive music output.
- Contributions: Project conceptualization, EEG pre-processing and analysis, feature extraction and

selection, development and evaluation of machine learning models (GRU, SVM, MLP, Random Forest), technical presentation [Project Link] [Github Link]

PUBLICATIONS

[1]. **J. Sooriyaarachchi**, S. Seneviratne, K. Thilakarathna and A. Y. Zomaya, "MusicID: A Brainwave-based User Authentication System for Internet of Things", in IEEE Internet of Things Journal [Link]

[2]. **Jinani Sooriyaarachchi**, Changan Zhan, Curtis L. Baker Jr., "Cortical state contributions to response variability in the early visual cortex: A system identification approach", doi: https://doi.org/10.1101/2024.09.17.613530 [Link] [Github Link]

[3]. Nguyen P*, **Sooriyaarachchi J* (* shared first author)**, Huang Q, Baker CL Jr (2024) "Estimating receptive fields of simple and complex cells in early visual cortex: A convolutional neural network model with parameterized rectification", PLOS Computational Biology 20(5): e1012127 [Link] [Github Link]

[4]. K. D. Pathirage, P. Roopasinghe, **J.J. Sooriyaarachchi**, R. Weththasinghe and N. D. Nanayakkara, "Removing subject dependencies on Non-Invasive Blood Glucose Measurement using Hybrid Techniques", 2019 41st Annual International Conference of the IEEE EMBC [Link]

WORK EXPERIENCE

Postdoctoral Researcher - National Research Council, Canada *2025/04 - present*
- Developing a computer vision based multi-modal cognitive and health assessment technology

Consultant - Neuro-AI: AAVAA, Montreal, Canada *2022/12 - 2023/03*
- Developed a machine learning approach to accurately denoise EEG in a BCI device.
- Implemented a machine learning algorithm (based on UMAP and Louvain clustering techniques) to cluster eye blinks in a commercial-grade BCI application.
- Implemented an algorithm to calibrate eye blink signals extracted from EEG.

Research Assistant: Center for Biomedical Innovation, Sri Lanka *2020/01 - 2020/09*
- Developed an IMU-based gait analysis system (Matlab and ShimmerIMU-based).
- Conducted experiments and gait analysis with scoliosis patients and the national cricket team.
- Managed a multidisciplinary project team, recruited and trained research employees.

Senior Executive - Software Engineer: Axiata Digital Labs, Sri Lanka *2019/01 - 2019/10*
- Developed and installed a server monitoring/alarming system at CAT telecom-Thailand.
- Developed a system to authenticate users purchasing SIM cards at Dialog telecom-Sri Lanka.
- Collaborated with CAT telecom-Thailand and Huawei-China.

Research Trainee: DATA61-CSIRO, Australia *2017/08 - 2018/01*
- Developed a machine learning-based (Random Forest classifier in one-vs-rest and multiclass settings) biometric authentication system using music-induced EEG.
- Wrote and managed the ethics approval for collecting EEG from human subjects.
- Managed time to deliver an accurate authentication system (higher than 95% accuracy) in less than six months and published the research in IEEE-Internet of Things journal.
- Collaborated with a group of researchers at the University of Sydney and UNSW.

HONOURS AND AWARDS

[1]. **2024 NeuroSphere Neurotech Hackathon Challenge Award** *2024/11*
Awarding organization: NeuroSphere-HBHL [3000CAD]

[2]. **Fonds de recherche du Québec – Santé (FRQS) doctoral fellowship** *2022/06 - 2026/06*
Awarding organization: Fonds de recherche du Québec, Canada [84000CAD]

[3]. **Best poster presentation - Physiology graduate research day** *2024 and 2021*
Awarding organization: Department of Physiology, McGill University [50CAD]

[4]. **The Applied AI Institute Award for best presentation-MAIN22** *2022/12*
Awarding organization: The Applied AI Institute, Canada [400CAD]
[5]. **Faculty of Medicine and Health Sciences Internal Fellowship** *2022/09 - 2023/09*
Awarding organization: Faculty of Medicine, McGill University [12000CAD] -Declined
[6]. **Max E. and Jane K. Childress Entrance Fellowships in Physiology** *2021/09 - 2022/09*
Awarding organization: Department of Physiology, McGill University [38000CAD]
[7]. **Max Stern Recruitment Fellowship in Physiology** *2020/09 - 2021/09*
Awarding organization: Department of Physiology, McGill University [27000CAD]
[8]. **Runners up in IEEE-WIE-Robotics Competition** *2016/09*
Awarding organization: University of Moratuwa, Sri Lanka

SCIENTIFIC PRESENTATIONS

[1]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical state contributions to response variability in the early visual cortex: A system identification approach", Montreal AI and Neuroscience (MAIN), Oct 2024
[2]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex", Graduate Research Day - Department of Physiology, McGill University, May 2024
[3]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex", The New VISTAs in Vision Research (CVR23), Dec 2023
[4]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex", Society for Neuroscience Annual Meeting (SFN23), Nov 2023
[5]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex", McGill Ophthalmology Grand rounds talk, Nov 2023
[6]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex", Annual computational neuroscience conference (CNS23), July 2023
[7]. **J. Sooriyaarachchi**, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex" - McGill Ophthalmology Research Day, May 2023
[8]. **J. Sooriyaarachchi**, C. Baker, "Cortical state effects on receptive field responses of early visual cortex neurons", Graduate Research Day - Department of Physiology, McGill University, May 2023
[9]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical State Effects Vary Across Different Neuronal Subclasses in the Primary Visual Cortex", Biological and biomedical engineering symposium (BBMESS), May 2023
[10]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical state effects on responses of primary visual cortex neurons: A system identification approach", Brain Repair and Integrative Neuroscience (BRaIN) seminar talk, Feb 2023
[11]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Improved accuracy in estimating responses of early visual cortex neurons with CNNs incorporating cortical state dynamics.", Montreal AI and Neuroscience (MAIN), Dec 2022
[12]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical state effects on receptive field responses of early visual cortex neurons", Society for Neuroscience Annual Meeting (SFN22), Nov 2022
[13]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical state effects on responses of primary visual cortex neurons: A system identification approach.", Vision Health Research Network (VHRN), Nov 2022
[14]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical state effects on responses of primary visual cortex neurons: A system identification approach.", Active vision symposium (University of Rochester), May 2022
[15]. **J. Sooriyaarachchi**, C. Baker, "Cortical state effects on receptive field responses of early visual cortex neurons", Graduate Research Day - Department of Physiology, McGill University, May 2022
[16]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Cortical state effects on responses of primary visual

cortex neurons: A system identification approach.", Montreal AI and Neuroscience (MAIN), Nov 2021
[17]. **J. Sooriyaarachchi**, C. Zhan, C. Baker, "Brain state effects on responses of early visual cortex neurons: A system identification approach", Society for Neuroscience Annual Meeting (SFN21), Nov 2021
[18]. **J. Sooriyaarachchi**, C. Baker, "Receptive Field Estimation of Primary Visual Cortex (V1) Neurons: A System Identification Approach Incorporating Cortical State" - McGill Ophthalmology Research Day, Oct 2021
[19]. **J. Sooriyaarachchi**, C. Baker, "Incorporating Brain States in V1 Receptive Field Estimation", Graduate Research Day - Department of Physiology, McGill University, May 2021
[20]. **J. Sooriyaarachchi**, M. Athif, L.K.Rathnayaka, "Real-time EEG signal capturing with BIOPAC system", Brain-Computer Interface (BCI) workshop – IEEE Engineering and Biology Society- University of Moratuwa Sri Lanka, Jun 2018

TEACHING-RELATED EXPERIENCE

Co-supervisor - Capstone projects for the CS4-1 Course *2021*
School of Computer Science - University of Sydney, Australia
- Interacted with students during weekly office hours and provided project guidance.
- Introduced machine learning tools and feature extraction techniques relevant to project requirements.
- Evaluated projects, tested code repositories and results and graded capstone projects.

Assignment Grader - PHGY314 *2020 - 2021*
Department of Physiology, McGill University

LEADERSHIP

Mentor - Scientista Program *2024*
McGill University, Canada - Mentoring STEM undergraduate students

Control Board External Relations Manager and Project manager *2015 - 2016*
AIESEC Colombo-South - University of Moratuwa, Sri Lanka

Department Representative *2015*
Biomedical Engineering - University of Moratuwa, Sri Lanka

Junior and Senior Prefect *2010 - 2013*
High School: Sujatha Vidyalaya, Matara, Sri Lanka

VOLUNTEERING

Project CEAD-Malaysia *2015*
- Volunteered at University of Science in Malaysia under AIESEC exchange program.
- Taught science and mathematics to under-privileged students.

Project HODIYA-Sri Lanka *2016*
- Project manager: Recruited and managed over 25 international AIESEC volunteers.
- Helped under-privileged kids and school students.