Clark Hall 317
Baltimore MD 21218
ldesilv2@jhu.edu
personal website
Google Scholar Github
Linkedin Twitter

Laknath Ashwin De Silva

I am a PhD candidate in the Department of Biomedical Engineering at Johns Hopkins University where I am advised by Prof. Joshua Vogelstein, Prof. Pratik Chaudhari (UPenn), and Prof. Carey E. Priebe. I broadly work on {machine, deep} learning, with an aspiration of bridging the gap between machine and natural intelligence. My doctoral research focuses on learning under non-stationary distributions and out-of-distribution (OOD) generalization, with applications in large language models, computer vision, and biomedical data science.

Education

2021–present **Ph.D., Biomedical Engineering**, *Johns Hopkins University*, MD, USA.
Highlighted Courses: Probability Theory, Statistical Theory, High-Dimensional Approximation, Machine Learning, Optimal Transport, Probabilistic Models of Visual Cortex, Neuroscience and Cognition, Computational Molecular Medicine, Compressed Sensing & Sparse Recovery

CGPA : 3.98/4.00

2021–2024 **M.S.E., Applied Mathematics and Statistics**, *Johns Hopkins University*, MD, USA.
Focus Area: Statistics and Statistical Learning

CGPA : 3.98/4.00

2016–2020 : **B.Sc., Biomedical Engineering**, *University of Moratuwa*, Sri Lanka.
Class Rank : 1 out of 117, Faculty Rank : 1 out of 948, Included in Dean's Honors List every semester.
Highlighted Courses: Real Analysis, Calculus, Differential Equations, Linear Algebra, Signals and Systems, Machine Vision, Digital Signal Processing, Data Structures & Algorithms

CGPA : 4.09/4.20 (First Class Honors)

Research Experience

2024 **Amazon (AWS AI), Santa Clara, CA**, *Applied Scientist Intern*.
Developed large language models (LLMs) based on state-space models (SSMs) to perform code generation and constrained generation

2021-Present **Johns Hopkins University, Baltimore, MD**, *Graduate Research Assistant*.
Building theory and methods for learning from non-stationary and out-of-distribution data, with applications in large language models, computer vision, and biomedical data science

2019-2021 **University of Moratuwa, Sri Lanka**, *Junior Lecturer*.
Developed deep learning models for various problems including retinal vascular segmentation, surface EMG based hand gesture recognition, human pose estimation, and phase unwrapping

2018 **Center for Advanced Imaging, University of Queensland, Australia**, *Research Intern*.
Developed convolutional neural networks (CNNs) to solve the inverse problem of phase unwrapping

2017,2018 **The Florey Institute of Neuroscience, University of Melbourne, Australia**, *Research Intern*.
Developed machine learning and signal processing algorithms for charaterizing epileptogenic mutations based on multi-electrode array (MEA) recordings acquired from in-vitro neuronal networks.

Selected Publications

2024 **Ashwin De Silva**, Rahul Ramesh, Rubing Yang, Pratik Chaudhari, and Joshua T. Vogelstein. Prospective learning: Learning for a dynamic future. *Neural Information Processing Systems (NeurIPS)*, 2024. [pdf].

2024 Hayden Helm, **Ashwin De Silva**, Joshua T. Vogelstein, Carey E. Priebe, and Weiwei Yang. Approximately optimal domain adaptation with fisher's linear discriminant. *Mathematics*, volume 12, 2024.

2023 **Ashwin De Silva**, Rahul Ramesh, Carey E. Priebe, Pratik Chaudhari, and Joshua T. Vogelstein. The value of out-of-distribution data. *International Conference on Machine Learning (ICML)*, 2023. [pdf].

2023 **Ashwin De Silva**, Rahul Ramesh, Pratik Chaudhari, and Joshua T. Vogelstein. Prospective learning: Principled exploration to the future. *Conference on Lifelong Learning Agents (CoLLAs)*, 2023. [pdf].

For exhaustive lists of courses and research works, please visit: list of courses, list of research works

2022 Mohamed Afham, Udith Haputhanthri, Jathurshan Pradeepkumar, Mithunjha Anandakumar, **Ashwin De Silva**, and Chamira US Edussooriya. Towards accurate cross-domain in-bed human pose estimation. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2022. [pdf].

2021 Malsha V Perera and **Ashwin De Silva**. A joint convolutional and spatial quad-directional lstm network for phase unwrapping. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2021. [pdf].

2020 **Ashwin De Silva**, Malsha V Perera, Kithmin Wickramasinghe, Asma M Naim, Thilina Dulantha Lalitharatne, and Simon L Kappel. Real-time hand gesture recognition using temporal muscle activation maps of multi-channel semg signals. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020. [pdf].

2020 Asma M Naim, Kithmin Wickramasinghe, **Ashwin De Silva**, Malsha V Perera, Thilina Dulantha Lalitharatne, and Simon L Kappel. Low-cost active dry-contact surface emg sensor for bionic arms. *IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, 2020. [pdf].

Preprints

2022 Jayanta Dey, Haoyin Xu, **Ashwin De Silva**, Will LeVine, Tyler M Tomita, Ali Geisa, Tiffany Chu, Jacob Desman, and Joshua T Vogelstein. Deep discriminative to kernel generative networks for calibrated inference. 2022. [pdf].

2021 **Ashwin De Silva**, Malsha V Perera, Navodini Wijethilake, Saroj Jayasinghe, Nuwan D Nanayakkara, and Anjula De Silva. A thickness sensitive vessel extraction framework for retinal and conjunctival vascular tortuosity analysis. 2021. [pdf].

Academic Achievements & Recognitions

2024 **MINDS Fellowship** selected as a fellow of the Mathematical Institute of Data Science, Johns Hopkins University

2023 **Johns Hopkins School of Medicine Student Spotlight** for research and academic accomplishments

2022 **Best Paper Award** ECCV 2022 Workshop on Out-of-distribution Generalization in Computer Vision, Tel Aviv, Israel

2021 **2nd Runners-up of the IEEE Video and Image Processing Cup** awarded at the International Conference on Image Processing (ICIP) 2021, Anchorage, Alaska, USA

2020 **Prof. Pathuwathawithana Memorial Prize** for attaining the *highest* GPA at the Faculty of Engineering, University of Moratuwa, Sri Lanka

2020 **Gold Medal sponsored by Technomedics International Pvt Ltd** for the *highest* overall academic performance in the Biomedical Engineering Stream (University of Moratuwa)

2020 **National Finalists at the Migara Ranatunga Awards** awarded by Institution of Engineers, Sri Lanka (IESL) for the *best* performance in the research internship

2019 **World Finalists at the IEEE ComSoc Student Competition** ranked among *the top 15 in the world*, received an Honorable Mention

2019 **Merit Award at SLAAS Awards** awarded by Sri Lanka Association for the Advancement of Science (SLAAS) for the *best undergraduate* project in the country

2019 **National Finalists at the Sri Lankan IoT Challenge** ranked among *the top 10 in the country*, received an Honorable Mention

2019 **Runners-Up at the the National Inter-University Statistics Quiz Competition** Organized by University of Sri Jayawardenapura, Sri Lanka

2016 **Dialog Merit Scholarship for Engineering Undergraduates** awarded by Dialog Axiata PLC for the students who excelled at the university entrance examinations at the national level (country rank: 10 out of $\sim$ 35,000 in the physical science stream)

2016 **Mahapola Merit Scholarship for Engineering Undergraduates** awarded by the Government of Sri Lanka for the students who excelled at the university entrance examinations

2015 **Darrel Medal** awarded by Richmond College, Sri Lanka for the most outstanding advanced level student.

Selected Teaching Experience

Junior Lecturer

2021 Fall: **EN 1060 Signals and Systems**, UoM, Sri Lanka.

2020 Fall: **EN 2030 Laboratory Practice II**, UoM, Sri Lanka.

2020 Spring: **EN 3030 Circuits and Systems Design**, UoM, Sri Lanka.

2020 Spring: **BM 4111 Medical Electronics and Instrumentation**, UoM, Sri Lanka.

2020 Fall: **BM 2101 Analysis of Physiological Systems**, UoM, Sri Lanka.

2020 Fall: **BM 2011 Human Anatomy and Physiology**, UoM, Sri Lanka.

2019 Fall: **EN 1093 Laboratory Practice I**, UoM, Sri Lanka.

Visiting Lecturer

2020 Spring: **Workshop on MATLAB for signal/image processing, communication systems, and electronics**, Institute of Engineering Technology, Sri Lanka.

Technical skills

Programming Languages: Python, MATLAB, C/C++, Verilog HDL, LaTeX

Frameworks: PyTorch, PyG (PyTorch Geometric), Tensoflow, Keras, scikit-learn, ITK/VTK

Software: Quartus, Multisim, AutoCAD, Altium, Solidworks

Hardware: STM32 Family, Atmel AVR, Altera DE2, Raspberry Pi, Arduino

Selected Talks

Dec. 2024 *Prospective Learning*, Center for Imaging Science (CIS) Retreat, Johns Hopkins University, MD, USA

Sep. 2022 Critique on *Invertible Neural Networks for Graph Predictions*, Theorinet Retreat, Simons Foundation, NY, USA

Oct. 2022 *The Value of Out-of-distribution Data*, ECCV 2022 workshop on Out-of-distribution Generalization in Computer Vision, Tel Aviv, Israel

Selected Poster Presentations

Sept. 2024 *Prospective Learning: Learning for a Dynamic Future*, NeurIPS 2024 workshop on NeurIPS Workshop on NeuroAI: Fusing Neuroscience and AI for Intelligent Solutions, Vancouver, Canada

Sept. 2024 *Prospective Learning*, Mathematical and Scientific Foundations of Deep Learning Annual Meeting (MoDL), Simons Foundation, NY, USA

Dec. 2022 *The Value of Out-of-distribution Data*, NeurIPS 2022 Workshop on distribution shifts (DistShift), New Orleans, LA, USA

Apr. 2022 *Kernel Density Networks*, From Neuroscience to Artificially Intelligent Systems (NAISys), Cold Spring Harbor Laboratory, NY, USA

Services and Leadership

2018-Present **Richmond to University (R2U) Foundation**, *Co-Founder*.

- An alumni-run organization aimed at organizing career guidance programs for the students of Richmond College, Sri Lanka

2016-2020 **IEEE Engineering in Medicine and Biology Student Branch Chapter, University of Moratuwa**, *Chairperson 2019/20, Vice Chairperson 2018/19, 2017/18*.

- Received the *Most Outstanding EMB Student Branch Chapter Regional Award* for the term 2019/20 (Asia-Pacific region)
- Received the *IEEE Darrel Chong Award (Silver Category)* for the term 2019/20

2016-2017 **Mathematics Society, University of Moratuwa**, *Assistant Secretary 2016/17*.