Laknath Ashwin De Silva

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I am a third-year PhD student in the Department of Biomedical Engineering at Johns Hopkins University where I am fortunate to be advised by Prof. Joshua Vogelstein, Prof. Pratik Chaudhari (UPenn), and Prof. Carey E. Priebe. I broadly work on {machine, deep} learning, with an aspiration to strive towards reducing the gap between machine and natural intelligence. My doctoral research is currently focused on learning under non-stationary distributions, out-of-distribution generalization, and robustness to distribution shifts. Outside of theoretical pursuits, I am passionate about tackling challenging problems in computer vision, language modeling, biomedical data science, and cognitive neuroscience. My research has been featured in venues such as ICML, NeurIPS, ECCV, ICASSP, CoLLAs, and SMC.

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
CGPA : 4.00/4.00

2021–present — **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 in all 8 consecutive semesters.
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)

Work Experience

2019-2021 — **Junior Lecturer**, *Department of Electronic and Telecommunication Engineering*, University of Moratuwa, Sri Lanka.

2018 — **Research Intern**, *Center for Advanced Imaging*, University of Queensland, Australia.

2017,2018 — **Research Intern**, *Florey Institute of Neuroscience & Mental Health*, University of Melbourne, Australia.

Publications

In Conference Proceedings

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].

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].

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

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

2023 Hayden S Helm, **Ashwin De Silva**, Joshua T Vogelstein, Carey E Priebe, and Weiwei Yang. Approximately optimal domain adaptation with fisher's linear discriminant analysis. 2023. [pdf].

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].

Workshop Papers

2022 **Ashwin De Silva**, Rahul Ramesh, Carey E. Priebe, Pratik Chaudhari, and Joshua T. Vogelstein. The value of out-of-distribution data. *ECCV Workshop on Out-of-distribution Generalization in Computer Vision*, 2022. [pdf].

2022 **Ashwin De Silva**, Rahul Ramesh, Carey E. Priebe, Pratik Chaudhari, and Joshua T. Vogelstein. The value of out-of-distribution data. *NeurIPS Workshop on Distribution Shifts (DistShift)*, 2022. [pdf].

Theses

2020 **Ashwin De Silva**, Malsha V Perera, Kithmin Wickramasinghe, Asma M Naim, Thilina Dulantha Lalitharatne, and Simon L Kappel. Designing a cost-effective dry contact semg sensor system for controlling a bionic hand. 2020.

Academic Achievements & Recognitions

2024 **MINDS Fellowship** selected as a fellow at 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

Teaching Assistant

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.

2018 Spring: **DE 2410: Astronomy and Cosmology**, 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

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

Selected Poster Presentations

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

Professional Activities

Organizing

2021 *IEEE EMBS International Student Conference*, Moratuwa, Sri Lanka

2018 *Workshop on Brain Computer Interfaces*, MerCon 2018, Moratuwa, Sri Lanka

2017 *TechMedImpact Forum*, Sri Lanka

Reviewing (Conferences)

2021 *IEEE EMBS International Student Conference*, Moratuwa, Sri Lanka

2021 *MerCon 2021*, Moratuwa, Sri Lanka

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*.