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Ashwin De Silva

Ph.D. candidate in Biomedical Engineering with expertise in statistical machine learning, deep learning and signal processing, focused on developing theory and robust methods for prospective learning, continual learning and out-of-distribution generalization. Passionate about bridging artificial and natural intelligence. My work spans applications in large language models, biomedical data, and computer vision.

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 : 3.97/4.00

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

CGPA : 3.97/4.00

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

Summer 2025 **Amazon (AWS AI), Santa Clara, CA**, *Applied Scientist Intern*.
Developed self-adaptive context recomposition methods for multi-turn tool-using agents that reduced the input token utilization by 50% while maintaining the task success rate across mathematical reasoning and software engineering benchmarks

Summer 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.

Publications

2025 Jayanta Dey, Haoyin Xu, **Ashwin De Silva**, and Joshua T Vogelstein. Simple calibration via geodesic kernels. *Transactions on Machine Learning Research*, 2025. [pdf].

2025 Yuxin Bai, Cecelia Shuai, **Ashwin De Silva**, Siyu Yu, Pratik Chaudhari, and Joshua Vogelstein. Prospective learning in retrospect. *Artificial General Intelligence (AGI)*, 2025.

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].

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

2025 Yuxin Bai, Aranyak Acharyya, **Ashwin De Silva**, Zeyu Shen, James Hasset, and Joshua T. Vogelstein. Optimal control of the future via prospective foraging. 2025.

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

2026 **Best Student Paper Award** at the 18th Annual Conference on Artificial General Intelligence (AGI-25), Reykjavík, Iceland

2025 **Member, Alpha Eta Mu Beta (AEMB) – National Biomedical Engineering Honor Society** Invited for membership in recognition of academic excellence, ranking in the top third of the Biomedical Engineering PhD class.

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** at the 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

2025 Fall: **EN.580.697 Biomedical Data Design**, JHU, USA..

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.

Reviewing Activities

Reviewer NeurIPS 2025, Conference on Language Models (COLM) 2025, Moratuwa Engineering Research Conference (MERCon) 2024

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

Jul. 2025 *Prospective Learning: Learning for a Dynamic Future*, NeuroAI 2025, Allen Institute, Seattle, WA, USA

Apr. 2025 *Prospective Learning: Learning for a Dynamic Future*, Johns Hopkins Data Science and AI Institute Spring 2025 Symposium, Baltimore, MD, USA

Dec. 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*.