PATHIRANNAHELAGE MEVAN NILUMINDA WIJEWARDENA

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RESEARCH OVERVIEW

My research focuses on stochastic control with partial information, exploring fairness, adaptiveness, and information asymmetry in multi-agent systems. I combine tools from stochastic optimization, learning, and game theory.

EDUCATION

University of Southern California, Los Angeles, USA   Aug. 2022 - Present
Ph.D. in Electrical Engineering
CGPA 4.0 out of 4.0
Advisor - Prof. Michael James Neely

University of Moratuwa, Moratuwa, Sri Lanka   Oct. 2016 - July 2021
B.Sc. Engineering Honours Degree specializing in Electronic and Telecommunication Engineering
First Class Honors with a CGPA 4.06 out of 4.2 (Ranked **5** out of **101**)
Dean's List Placements - Semesters **1, 2, 3, 4, 7, 8**

University of Auckland, New Zealand   June 2019 - Dec. 2019
Visiting Student
Augmented Human Lab
Worked on two research projects (MAGHair and AiSee) in Human Computer Interaction

PUBLICATIONS

- **M. Wijewardena**, and M. J. Neely, *"Online Multi-Player Resource-Sharing Games with Bandit Feedback,"* Dynamic Games and Applications. 2025. [https://tinyurl.com/2yzaykxw]

- **M. Wijewardena**, and M. J. Neely, *"Adaptive Algorithms for Automatic Link Selection in Multiple Access with Link Failures,"* in 23rd International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt '25), May 2025. [https://rb.gy/k0ous4]

- **M. Wijewardena**, M. J. Neely, *"A Two-Player Resource-Sharing Game with Asymmetric Information,"* Games. 2023; 14(5):61. [https://doi.org/10.3390/g14050061]

- **M. Wijewardena**, T. Samarasinghe, K. T. Hemachandra, S. Atapattu and J. S. Evans, *"Physical Layer Security for Intelligent Reflecting Surface Assisted Two–Way Communications,"* in IEEE Communications Letters, vol. 25, no. 7, pp. 2156-2160, July 2021. [https://rb.gy/yqoa0m]

- R. Boldu, **M. Wijewardena**, H. Zhang, and S. Nanayakkara, *"MAGHair: A Wearable System to Create Unique Tactile Feedback by Stimulating Only the Body Hair,"* in 22nd International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI '20), Oct. 2020. [https://rb.gy/rjjcd0]

- **M. Wijewardena**, K. Asgari, and M. J. Neely, *"Bandit-Based Rate Adaptation for a Single-Server Queue,"* under review for publication in the ACM SIGMETRICS 2026 Conference Proceedings.

- **M. Wijewardena**, and M. J. Neely, *"Automatic Link Selection in Multi-Channel Multiple Access with Link Failures,"* in preparation.

RESEARCH TALKS

- WiOpt '25 - Linköping, Sweden. May 2025
  - The 23rd International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks
  - Topic: Adaptive Algorithms for Automatic Link Selection in Multiple Access with Link Failures.
- University of Moratuwa - ENTC Research Seminar Aug. 2021
  - The monthly research seminar organized by the Department of Electronic and Telecommunication Engineering, University of Moratuwa.
  - Topic: Physical Layer Security for Intelligent Reflecting Surface Assisted Two-Way Communications.

CONFERENCE/JOURNAL REVIEWER

- IEEE/ACM Transactions on Networking
- 2025 Moratuwa Engineering Research Conference (MERCon)
- 2021 IEEE EMBS International Student Conference (Reviewer ID - R015)

WORK EXPERIENCE

University of Southern California, Los Angeles, USA Aug. 2023 - Present
Teaching Assistant
Department of Electrical and Computer Engineering

- EE 512- Stochastic Processes for Financial Engineering - (TA for Fall '23, '24, '25, Spring '24, '25)
- EE 518 - Mathematics and Tools for Financial Engineering - (TA for Fall ' 25)
- EE 450 - Introduction to Computer Networks - (TA for Summer '25)
- EE 538 - Computing Principles for Electrical Engineers - (TA for Summer '25)
- EE EES- Applied Linear Algebra for Engineering - (Course Producer for Summer '24)

University of Moratuwa, Moratuwa, Sri Lanka June 2021 - July 2022
Lecturer (On Contract)
Department of Electronic and Telecommunication Engineering

- EN2073 - Analog and Digital Communications - Teaching Assistant.
- EN2040 - Random Signals and Processes - Teaching Assistant.
- EN2053 - Communication Systems and Networks - Teaching Assistant.
- EN2090 - Laboratory Practice - II - Conducting laboratory sessions for Computer Organization.
- EN2022 - Digital Electronics - Conducting laboratory sessions.
- EN1094 - Laboratory Practice - I - Design of Laboratory Practicals for Telecommunications Section.

GRADUATE COURSES

- EE503 - Probability for Electrical and Computer Engineers (USC, Fall '22, Grade: A)
- EE510 - Linear Algebra for Engineering (USC, Fall '22, Grade: A)
- EE562 - Random Processes in Engineering (USC, Spring '23, Grade: A)
- MATH 425B - Fundamental Concepts of Analysis (USC, Spring '23, Grade: A)
- EE649 - Stochastic Network Optimization and Adaptive Learning (USC, Fall '23, Grade: A)
- EE550 - Data Networks (USC, Spring '24, Grade: A)
- ISE633 - Large Scale Optimization and Machine Learning (USC, Spring '24, Grade: A)
- CSCI678 - Theoretical Machine Learning (USC, Fall '24, Grade: A)
- DSO 699: Special Topics in Data Sciences and Operations "Bandit Algorithms and Reinforcement Learning" (USC, Spring '25, Grade: A)

ACADEMIC ACHIEVEMENTS

International

- International Mathematical Olympiad (IMO) - **Bronze Medals**   2012, 2013, 2014, 2016
  [https://rb.gy/j50bjq]
- International Mathematics Competition for University Students - **Bronze Medal**   2018
- International Mathematics Competition (IMC) -**Bronze Medals**   2012, 2013
- IEEExtreme Programming Competition - World Rank - **52**, Country Rank - **1**   2020
- Google Code Jam - World Rank - **1011**, Country Rank - **2** [https://rb.gy/uldq8a]   2019
- Google Hash Code -World Rank - **549**, Country Rank - **3** [https://rb.gy/pbjmp8]   2020

Asia/Asia Pacific

- Asia Pacific Mathematical Olympiad (APMO) - **Silver Medal** [https://rb.gy/y5houp]   2016
- Asian Physics Olympiad (APhO) - **Participation**   2016

Sri Lanka

- Sri Lanka Mathematical Olympiad (SLMO) - **Gold Medals**   2012, 2013, 2014, 2016
- Sri Lanka Physics Olympiad - **Gold Medal**   2015
- W.D.Gunarathne Memorial **Gold Medallist**   2012, 2014, 2016
  - Awarded to the best performer at the Sri Lanka Mathematical Olympiad.
- ACES Coders - **Runners Up**   2020
  - An Algorithmic Programming Competition organized by the Faculty of Engineering, University of Peradeniya.
- MoraXtreme - **Champions**   2017
  - An Algorithmic Programming Competition organized by the Computer Society - IEEE University of Moratuwa Student Branch.
- HackStat - **Second Runners Up**   2018
  - A Data Science Hackathon organized by the Stat Circle of the University of Colombo.

Scholarships

- Mahapola Scholarship for Undergraduates awarded by the Government of Sri Lanka.   2016 - 2021

PROJECTS

Bandit-Based Rate Adaptation for a Single-Server Queue   Jan. 2025 - Present

- Here, we are considering a time slotted system with a single queue, where the environment has an unknown time-varying capacity. The controller has to choose a rate and gets to transmit the rate given that the rate is less than or equal to the capacity. The controller gets as feedback whether or not the transmission was successful. The goal is to achieve a bounded time-average queue size.
- We have developed an algorithm for the problem. We have also derived a lower bound for the worst-case time-average queue size. We are currently working on closing the gap between the upper and lower bounds.

Automatic Link Selection in Multiple Access with Link Failures   Apr. 2024 - May. 2025

- Here, I am considering a multiple-access scenario where multiple users are accessing are accessing multiple channels. The link assigning a user to a channel may fail with a given probability, and we do not know the link failure probabilities. Additionally, the user-channel pairs have to be assigned such that at most one user is assigned to each channel and at most one channel is assigned to each user. The goal is to maximize a concave function of time-average success vector, in the presence of bandit feedback on success/failures.
- I have developed two algorithms where the first algorithm is adaptive and the second algorithm has faster convergence.

Fast Drift-Plus-Penalty Algorithm with Kullback-Leibler Divergence   Oct. 2023 - Apr. 2024
- I worked on improving the conventional fast-drift plus penalty algorithm to achieve a better convergence rate.
- The conventional algorithm is used for deterministic convex optimization. I particularly focused on using the underlying structure of the optimization domain to achieve faster convergence.
- I improved the convergence using the ideas of Kullback-Leibler Divergence when the underlying set is a probability simplex.

Multi-Player Resource-Sharing Games with Fair Reward Allocation   July 2023 - Feb. 2024
- I am developing algorithmic approaches for the worst-case expected utility maximization of the first player of the multi-player resource-sharing game with fair reward allocation. I am also extending the work to scenarios with bandit feedback.
- I have explored certain special cases in which the problem can be solved explicitly and developed a novel algorithm for the scenario with bandit feedback.

A Two-Player Resource-Sharing Game with Asymmetric Information Aug. 2022 - Sept. 2023
- Through this project, I developed an algorithm for a player to maximize their private worst-case expected reward in the two-player resource-sharing game with asymmetric information.
- The worst-case analysis is useful when the incentives of the opponent are not known.
- I developed a novel algorithm based on the drift-plus penalty method for the problem and explored special cases in which an explicit solution can be obtained.

Non-Intrusive Real-Time Power Monitor   Feb. 2020 - July 2021
- Through this project, our group aimed at developing a low-cost system to reduce household energy wastage by providing real-time feedback on appliance-level power consumption by only measuring the aggregate power consumption.
- I contributed by developing the algorithm for the task, which included experimenting with machine learning models such as additive factorial hidden Markov models and attention-based neural networks.
- The algorithm achieved superior real-time performance compared to the state-of-the-art algorithms.

Secrecy of an IRS Assisted Two-Way Communication System   Nov. 2019 - Nov. 2021
GitHub - [https://github.com/Mevan1996/Secrecy-of-two-way-IRS]
- This is a project investigating the exploitation of an intelligent reflecting surface (IRS) to communicate securely in a two-way communication system consisting of an untrusted user.
- I developed a semi-definite programming-based alternating optimization algorithm to maximize the sum-secrecy of the system, which yielded gains reaching 120% compared to partially optimized schemes.

SERVICES AND LEADERSHIP

Mathematics Society of the University of Moratuwa (UoM), Sri Lanka   2018 - 2019
- President (2018/19).
- Organized **M-Talks** (monthly research talks on mathematics).

Electronic Club (E-Club), UoM, Sri Lanka   2016 - 2021
- The official student body of the Department of Electronic and Telecommunication Engineering, UoM.
- Sri Lanka Robotics Challenge (SLRC) - The annual robotics challenge organized by the E-Club
  - The competition is held under two categories, school and undergraduate, and is open to all the students from Sri Lanka.
  - Conducted **robotics workshops** for the school category of SLRC 2018.
- uMora - The annual online mathematics competition organized by the E-Club
  - The competition is held under three categories, middle school, high school, and undergraduate, and is open to all the students from Sri Lanka.

– I was a **problem setter** and an **organizer** for all three categories of uMora 2020.
- Expose - An exhibition organized by the E-Club
  – Conducted the **digital signal processing stall** of Expose 2019.

Computer Society - IEEE University of Moratuwa Student Branch   2017 - 2021
- MoraXtreme - An annual algorithmic programming competition
  – The competition is open to all undergraduate students in Sri Lanka.
  – Conducted an **algorithmic programming workshop** for the participants of MoraXtreme 2021 and was a **problem setter** for MoraXtreme 2019.

IEEE Student Branch University of Jaffna   2024
- YarlXtreme 1.0 : Pre-Xtreme campaign (An algorithmic programming competition)
  – I conducted a session on **problem solving techniques**

OUTREACH

Rotaract Club of University of Moratuwa (Rotaract Mora)   2016-2020
- Grama Prabodhaya - A community service project to develop a selected rural village in Sri Lanka
  – Conducted **English workshops** for selected rural schools for Grama Prabodhaya 2017.

Engineering Faculty Students Union, University of Moratuwa   2016-2021
- Soyuru Sathkaraya - A community service project
  – Conducted **Mathematics workshops** for selected rural schools for Soyuru Sathkaraya 2018.