Vindula Jayawardana

Personal Information

vindulamj [at] gmail [dot] com
https://vindulamj.github.io
in/vindulajayawardana

Education

Massachusetts Institute of Technology, Cambridge, USA — *Sep 2019-June 2025*
Ph.D. Electrical Engineering and Computer Science (GPA: 4.9/5.0)
Thesis: *Learning to tackle task variations in control: A transportation context*
Advisor: *Cathy Wu*

Massachusetts Institute of Technology, Cambridge, USA — *Sep 2019-Sep 2022*
M.S. Electrical Engineering and Computer Science (GPA: 4.9/5.0)
Thesis: *An Invisible Issue of Task Underspecification in Deep Reinforcement Learning Evaluations*
Advisor: *Cathy Wu*

University of Moratuwa, Colombo, Sri Lanka — *Jan 2018-July 2019*
M.S. Data Science (GPA: 4.2/4.2)
Thesis: *On Demand High Capacity Ride Sharing for Mobility on Demand (MoD) Systems*
Advisor: *Shehan Silva*

University of Moratuwa, Colombo, Sri Lanka — *Mar 2014 -Dec 2017*
B.S. Computer Science and Engineering (GPA: 4.08/4.2)
Thesis: *Ontology-based Legal Information Extraction*
Advisor: *Shehan Perera, Nisansa de Silva*

Chartered Institute of Management Accountants (CIMA), United Kingdom — *2013 - 2014*
Advanced Diploma in Management Accounting (Dip. MA)

Work Experience

Toyota Research Institute, Los Altos, USA — Research Scientist
Human-Centered AI Division — *July 2025 – Present*

Research on human behavior modeling with generative AI to enable carbon-neutral behaviors.

Massachusetts Institute of Technology, Cambridge, USA — Ph.D. Candidate
Laboratory for Information and Decision Systems (LIDS) — *Sep 2019 – June 2025*

Advised by Prof. Cathy Wu, conducted research on robustness and generalization in reinforcement learning for contextual MDPs, developed large-scale traffic simulations across major U.S. cities, and applied deep reinforcement learning to real-world problems including eco-driving, socially compatible driving, and traffic smoothing.

NVIDIA, Santa Clara, USA — Research Scientist Intern
Simulation Technology Group — *June 2024 – August 2024*

Advised by Prof. Sanja Fidler, Prof. Xue Bin Peng, and Dr. Jonah Philion, developed tokenized driving datasets and GPT-style models to frame multi-agent autonomous driving (Sim-Agent) as a language modeling task, and designed a residual reinforcement learning approach to fine-tune large transformer vehicle control models in closed-loop using Waymo motion data.

Toyota Motor North America, Mountain View, USA — Research Intern
Toyota InfoTech Labs — *June 2023 – August 2023*

Worked with Dr. Yashar Farid and Mr. Kentaro Oguchi to improve generalization in multi-agent reinforcement learning by combining model-based and learning-based policies and validate on large-scale eco-driving experiments.

University of Moratuwa, Colombo, Sri Lanka — Research Assistant
Data Science, Engineering & Analytics Research Hub — *Jan 2018 – July 2019*

Worked with Dr. Shehan Perera and Dr. Uthayasankar Thayasivam on ride-sharing simulations, using integer programming for driver-passenger matching, and analyzed optimality gaps.

Digital Mobility Solutions Lanka, Colombo, Sri Lanka — Consultant Research Engineer
Data Science Team — *Jan 2018 – July 2019*

Built large-scale simulations of ride-sharing in major Sri Lankan cities using real-world data to evaluate the effectiveness of ride-sharing in Sri Lanka.

Cornell University, Ithaca, USA — Visiting Student Researcher
Mobility, Algorithms, and Society Lab — *June 2018 – Aug 2018*

Advised by Prof. Samitha Samaranayake, built an open-source C++ ride-pooling simulator for large-scale simulations, and developed integer programming-based driver-passenger matching algorithms.

WSO2, Colombo, Sri Lanka — Software Engineering Intern
Identity Server Team — *July 2016 – Dec 2016*

Developed Charon, an open-source library implementing SCIM 2.0 in compliance with IETF specifications, and integrated SCIM 2.0 support into the WSO2 Identity Server.

Patents

[1] V. Jayawardana, Y. Farid, K. Oguchi. *Systems and methods for vehicles navigating roads using a control model trained with residual policies*, U.S patent application 18507458.

Work in Peer-review / Pre-prints

[1] V. Jayawardana, C. Tang, J. Ji, J. Philion, X. Peng, C. Wu. *Noise-Aware Generative Microscopic Traffic Simulation*, In review at IEEE International Conference on Robotics and Automation (ICRA) 2026.

[2] V. Jayawardana, S. Li, Y. Farid, C. Wu. *Multi-residual Mixture of Experts Learning for Cooperative Control in Multi-vehicle Systems*, In review at IEEE Robotics and Automation Letters (RA-L).

[3] S. Nath, V. Jayawardana, M. Van, M, Klenk, S. Hakimi. *Designing Rewards for Rewarding Designs*, In review at International Conference on Design Computing and Cognition (DCC) 2026.

[4] Y. Kim, V. Jayawardana, S. Samaranayake. *Learning augmented vehicle dispatching with slack times for high-capacity ride-pooling, In review at Transportation Research Part C: Emerging Technologies (TR-C) - Major Revision.*

[5] Papalia et al. *A Roadmap for Climate-Relevant Robotics Research, In review at Foundations and Trends in Robotics.*

Publications

[1] V. Jayawardana, B. Freydt, A. Qu, C. Hickert, Z. Yan, C. Wu. *IntersectionZoo: Eco-driving for Benchmarking Multi-Agent Contextual Reinforcement Learning*, International Conference on Learning Representations (ICLR) 2025. **Featured in MIT News**

[2] V. Jayawardana, B. Freydt, A. Qu, C. Hickert, E. Sanchez, C. Tang, M. Taylor, B.Leonard, C. Wu. *Mitigating metropolitan vehicular carbon emissions with semi-autonomous vehicles using deep reinforcement learning*, Transportation Research Part C: Emerging Technologies (TR-C) 2025. **Featured in MIT News Spotlight, New Scientist, Anthropocene Magazine, The World Bee Project, The Cool Down, The Brighter Side of News**

[3] E. Sanchez, C. Tang, Y. Xu, N. Renganathan, V. Jayawardana, Z. He, C. Wu. *NeuralMOVES: A lightweight and microscopic vehicle emission estimation model based on reverse engineering and surrogate learning*, Transportation Research Part C: Emerging Technologies (TR-C) 2025.

[4] V. Jayawardana, S. Li, C. Wu, Y. Farid, K. Oguchi. *Generalizing cooperative eco-driving via multi-residual task learning*, IEEE International Conference on Robotics and Automation (ICRA) 2024.

[5] J. Cho, V. Jayawardana, S. Li, C. Wu. *Model-Based Transfer Learning for Contextual Reinforcement Learning*, Advances in Neural Information Processing Systems (NeurIPS) 2024. **MIT News Feature**.

[6] V. Jayawardana, B. Freydt, A. Qu, C. Hickert, E. Sanchez, C. Tang, M. Taylor, B.Leonard, C. Wu. *Learning Eco-driving Strategies that Generalize*, Conference in Emerging Technologies in Transportation Systems (TRC-30) 2024.

[7] D. Suo*, V. Jayawardana*, C. Wu. *Model-free learning corridor clearance: A near term deployment perspective*, IEEE Transactions on Intelligent Transportation Systems (T-ITS) 2023. *** equal contribution**.

[8] S. Jayawardana, V. Jayawardana*, K.Vidanage, C. Wu*. *Multi-behavior learning for socially compatible autonomous driving, IEEE International Conference on Intelligent Transportation Systems (ITSC) 2023.* **** equal supervision***

[9] V. Jayawardana, C. Tang, S. Li, D. Suo, C. Wu. *The impact of task underspecification in evaluating deep reinforcement learning*, Advances in Neural Information Processing Systems (NeurIPS) 2022.

[10] V. Jayawardana, C. Wu. *Learning eco-driving strategies at signalized intersections*, European control Conference (ECC) 2022. **Featured in MIT Home Page, National Public Radio(NPR), and TechCrunch, Autonomous Vehicle International Magazine**

[11] D. Zhuang, Y. Huang, V. Jayawardana, J. Zhao, D. Suo, and C. Wu, *The braess paradox in dynamic traffic*, IEEE International Conference on Intelligent Transportation Systems (ITSC) 2022.

[12] Qu, A. Valiveru, C. Tang, V. Jayawardana, B. Freydt, and C. Wu, *What is a typical signalized intersection in a city? A pipeline for intersection data imputation from OpenStreetMap Transportation Research Board (TRB) 2022.*

[13] V. Jayawardana, A. Landler, C. Wu. *Mixed autonomous supervision in traffic signal control*, IEEE International Conference on Intelligent Transportation Systems (ITSC) 2021.

[14] M. Mounesan, V. Jayawardana, Y. Wu, S. Samaranayake, H. T. Vo, *Fleet management for ride-pooling with meeting points at scale: A case study in the five boroughs of New York City*, 2021.

[15] C. Vidanapathirana, S. Bandara, V. Jayawardana. *A Statistical Approach to Quantify the Reliability of Travel Time for Trip Planning Purposes, Moratuwa Engineering Research Conference (MERCon) 2020.*

[16] V. Jayawardana, D. Lakmal, N. de Silva, S. Perera, K. Sugathadasa, B. Ayesha, M. Perera. *Word vector embeddings and domain specific semantic based semi-supervised ontology instance population, International Journal on Advances in ICT for Emerging Regions (ICTer) 2018.*

[17] K. Sugathadasa, B. Ayesha, N. de Silva, S. Perera, V. Jayawardana, D. Lakmal, M. Perera. *Legal document retrieval using document vector embeddings and deep learning, Science and information conference 2018.*

[18] K. Sugathadasa, B. Ayesha, N. de Silva, S. Perera, V. Jayawardana, D. Lakmal, M. Perera. *Synergistic union of word2vec and lexicon for domain specific semantic similarity, IEEE international conference on industrial and information systems (ICIIS) 2017.*

[19] V. Jayawardana, D. Lakmal, N. de Silva, S. Perera, K. Sugathadasa, B. Ayesha, M. Perera. *Semi-supervised instance population of an ontology using word vector embedding, International conference on advances in ICT for emerging regions (ICTer) 2017.*

[20] V. Jayawardana, D. Lakmal, N. de Silva, S. Perera, K. Sugathadasa, B. Ayesha. *Deriving a representative vector for ontology classes with instance word vector embeddings, Seventh International Conference on Innovative Computing Technology (INTECH) 2017.*

Workshop papers

[1] J. Cho, V. Jayawardana, S. Li, C. Wu. *Efficient Source Tasks Selection for Zero-shot Transfer in Contextual Reinforcement Learning*, European Workshop on Reinforcement Learning (EWRL) 2024.

[2] V. Jayawardana, S. Li, C. Wu, Y. Farid, K. Oguchi. *Robust Driving Across Scenarios via Multi-residual Task Learning*, In Generalization in Planning workshop at Advances in Neural Information Processing Systems (NeurIPS) 2023.

[3] V. Jayawardana, S. Li, C. Wu, Y. Farid, K. Oguchi. *Robust Driving Across Scenarios via Multi-residual Task Learning*, Machine Learning for Autonomous Driving Symposium 2023.

[4] V. Jayawardana, C. Wu. *Reinforcement Learning for Eco-Lagrangian Control at Intersections*, In Robotics for Climate Change workshop at IEEE International Conference on Robotics and Automation (ICRA) 2022.

[5] E. Sanchez, C. Tang, V. Jayawardana, C. Wu. *Learning surrogates for diverse emission models, In Tackling Climate Change with Machine Learning at Advances in Neural Information Processing Systems (NeurIPS) 2022.*

Awards and Achievements

Rising Star in Cyber-Physical Systems Research (University of Virginia) 2024
IEEE ITSS WiE/YP Fellowship (IEEE Intelligent Transportation Systems Society) 2024
Harold L. Hazen Teaching Excellence Award (MIT) 2022
NeurIPS Scholar Award (NeurIPS) 2022, 2023
Annenberg Fellowship - Declined (University of Southern California) 2019
Digital Mobility Solutions Lanka Fellowship (Digital Mobility Solutions Lanka) 2018
Gold Award at National Best Quality ICT Awards (Sri Lanka Sector of British Computer Society) 2017
Global Finalist at NASA International Space Apps (NASA) 2017
Academic Excellence Award (University of Moratuwa) 2017
Google Summer of Code (Google) 2017
Academic Excellence Award (University of Moratuwa) 2016
Outstanding non-academic Award (University of Moratuwa) 2016
Winner in Google I/O Extended Sri Lanka (Google Sri Lanka) 2016
Merit Award, Sri Lanka Physics Olympiad (Institution of Physics, Sri Lanka) 2012
High Distinction, Australian National Chemistry Quiz (Royal Australian Chemical Institution) 2009

Invited Research Talks

UCLA Seminar Series, Los Angeles, USA *2026*
Transportation Research Board, I-24 MOTION Workshop, Washington DC, USA *2026*
Toyota Research Institute, Los Altos, USA *2025*
MIT Graduate Student Seminar Series, Cambridge, USA *2024*
MIT CEE Annual Research Day, Cambridge, USA *2024*
LIDS Climate Tea Talks, Cambridge, USA *2023*
Toyota R&D, Mountain View, USA *2023*
MIT CEE Annual Research Day, Cambridge, USA *2023*
Neural Information Processing Systems Conference, New Orleans, USA *2022*
European Control Conference, London (online), UK *2022*
Robotics for Climate Change (**Spotlight talk**), Philadelphia, USA *2022*
MIT CEE Annual Research Day, Cambridge, USA *2022*
University of Moratuwa, Moratuwa, Sri Lanka *2021*
MIT-IBM Watson AI Lab Open House, Cambridge, USA *2021*
Data Drives - Data science applications in technology-based industries, Colombo, Sri Lanka *2019*
Innovative Computing Technology Conference, London (online), UK *2017*

Reviewing Services

Neural Information Processing Systems Conference (NeurIPS)- Reviewer (**Top 10% Reviewer**) *2023, 2025*
Transportation Research Part C (TR-C) - Reviewer *2025*
International Conference on Machine Learning (ICML) - Reviewer *2024*
IEEE Transactions on Robotics (T-RO) - Reviewer *2023*
AAAI Conference on Artificial Intelligence (AAAI) - Reviewer *2024, 2025, 2026*
Journal of Cleaner Production - Reviewer *2026*
Physica A: Statistical Mechanics and its Applications (Physica A) - Reviewer *2023*
IEEE International Conference on Robotics and Automation (ICRA) - Reviewer *2021, 2023, 2025*
IEEE Transactions on Intelligent Systems and Technology (T-IST) - Reviewer *2022*
IEEE Intelligent Transportation Systems Conference (ITSC) - Reviewer *2024*
Conference in Emerging Technologies in Transportation Systems (TRC-30) - Reviewer *2024*
Northern Lights Deep Learning Conference (NLDL) - Reviewer *2024, 2025*
Transportation Research Board (TRB) - Reviewer *2023, 2026*
Moratuwa Engineering Research Conference (MERCon) - Reviewer *2021, 2025*
NeurIPS Tackling Climate Change with Machine Learning - Reviewer *2023*
AAAI When Machine Learning meets Dynamical Systems: Theory and Applications - Reviewer *2022*
Representation Learning for Responsible Human-Centric AI - Area Chair (**Top Area Chair**) *2022*

Other Services

Autonomous Vehicles Across Scales workshop at RSS - Co-organizer 2024
Reproducibility in Transportation Research Tutorial at ITSC - Instructor 2024
MIT Civil and Environmental Engineering faculty hiring - Student committee member 2023
Sri Lankan Students' Association at MIT - President 2019-2023
Rotaract Club of Alumni of the University of Moratuwa - Director 2017-2019
Old Royalists Engineering Professionals' Association Student Chapter - Director 2015-2018
Rotaract Club of University of Moratuwa - Volunteer 2014-2016

Major Open Source Contributions

IntersectionZoo for Eco-driving – Co-main contributor	★ 71 Stars	⑂ 5 Forks
SCIM 2.0 Compliance Test Suite - Main contributor	★ 29 Stars	⑂ 22 Forks
Charon 3.0: SCIM 2.0 Implementation - Main contributor	★ 132 Stars	⑂ 171 Forks
Open Ridepool Simulator - Co-main contributor	★ 2 Stars	⑂ 3 Forks

Teaching

Teaching Assistant

1.041/1.200 - Transportation: Foundations and Methods **(MIT EECS Teaching Excellence Award)** *MIT Fall 2020, 2021*

CS2022 - Data Structures and Algorithms	*UoM Spring 2019*
CS4622 - Machine Learning	*UoM Fall 2018*
CS3042 - Database Systems	*UoM Fall 2018*
CS2052 - Computer Architecture	*UoM Spring 2018*
CS2062 - Object Oriented Software Development	*UoM Spring 2018*
CS3962 - Research and Report Writing	*UoM Fall 2017*

Students Mentored

Graduate Students (Masters Thesis)

Jessica Ding: MIT (Now: Software Engineer at Bloomberg)
- Co-authored a research paper on safety vs. performance tradeoff in autonomous driving.

Baptiste Freydt: ETH Zurich (Now: Software Engineer at DeepJudge)
- Co-authored multiple research papers on large-scale eco-driving using deep reinforcement learning.

Undergraduates

Catherine Tang: MIT (Now: Software Engineer at Palantir)
- Co-authored multiple research papers on deep reinforcement learning and eco-driving.

Anna Landler: MIT (Now: Software Engineer at Crusoe)
- Co-authored research paper on autonomous traffic signal supervision.

Jiaxin He: Vanderbilt University (Now: Software Engineer at Amazon)
- Worked on large-scale traffic analysis.

Anirudh Valiveru: MIT (Now: Member of Technical Staff at Decagon)
- Co-authored paper on data processing pipeline for open street maps.

Sanjula Jayawardana: University of Westminster (Now: PhD Candidate at La Trobe University)
- Co-authored a research paper on socially compatible autonomous driving.

Ammar Fayad: MIT (Now: Senior at MIT)
- Built traffic signal control simulation framework.

Sunera Chandrasiri: University of Moratuwa (Now: Co-founder of iXD Labs)
- Worked on building a visualization framework for eco-driving.

Media Features

MIT **Home Page** Feature: On the road to cleaner, greener, and faster driving

TechCrunch: Perceptron: Risky teleoperation, Rocket League simulation, and zoologist multiplication

New Scientist **Worldwide Printed** Feature: A simple driving trick could make a big dent in cars' carbon emissions

National Public Radio (NPR): Green Driving at Low The Loh Down on Science Podcast

MIT News **Spotlight**: Eco-driving measures could significantly reduce vehicle emissions

MIT News: MIT researchers develop an efficient way to train more reliable AI agents

MIT News: New tool evaluates progress in reinforcement learning

ADAS & Autonomous Vehicle International Magazine: A greener way to negotiate traffic lights

Anthropocene Magazine: AI shows stoplights are a big climate problem-with a deceptively simple fix.

The Cool Down: New study shows surprisingly simple method to cut carbon pollution by millions of tons a year: 'We don't .. need to wait'

The Brighter Side of News: Eco-driving reduces urban carbon emissions by up to 22%, MIT study finds

The World Bee Project: AI finds traffic lights are a hidden climate culprit