Udari Madhushani

Ph.D. Candidate
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Research Interest

Deep reinforcement learning, Multi-agent reinforcement learning, Sequential decision making, Multi-robot coverage problem, Collective dynamics, Geometric controls for path planning.

Education

Program	Institution	Years
Ph.D., Mechanical Engineering	Princeton University NJ, USA	2017 - Present
M.A., Mechanical Engineering	Princeton University NJ, USA	2017 - 2019
B.Sc. Eng (Hons), Electronic Engineering	University of Peradeniya Kandy, Sri Lanka	2011 - 2015

Honors

Graduate Honors (Princeton University)

- Harold W. Dodds Fellowship (prestigious honorific fellowship from Graduate School) — 2021-22
- Britt and Eli Harari Fellowship — 2020-21
- Larisse Rosentweig Klein Memorial Award — Fall 2019
- Martin Summerfield Graduate Fellowship — 2018-19
- Athena-Feron Prize for Mathematical Excellence — Fall 2018
- Elliotte Robinson Little '25 Student Aid Fund Fellowship — 2017-18

Awards

- Presidential Award for Scientific Research (Sri Lanka) — 2019
- Best Undergraduate Project Award (IEEE Sri Lanka Section) — December 2015

Travel Grants

- WiML travel grant (full registration fee), NeurIPS — 2020
- Student travel grant (full registration fee), ICLR — 2020
- Graduate student travel grant, MAE Princeton University — 2018, 2019
- Graduate student travel grant, SEAS Princeton University — 2019
- Research assistant travel grant, SLTC, Sri Lanka — 2016, 2017, 2018

Experience

Research Internships

- Facebook AI Research, Menlo Park, California. USA — May 2021 - August 2021
  Mentors: Kalesha Bullard and Roberto Calandra
- Siemens, Princeton, New Jersey, USA — May 2020 - August 2020
  Mentors: Biswadip Dey and Amit Chakraborty
- Atrenta Lanka (Pvt.) Ltd., Sri Lanka — October 2014 - January 2015
- Division of Biomedical Engineering Services, Sri Lanka — October 2013 - January 2014

Assistant in Research

- Princeton University — September 2017 - Present
- Sri Lanka Technological Campus (SLTC), Sri Lanka — January 2016 - August 2017

Assistant in Teaching

- MAE 542 Advanced Dynamics (Princeton University) — Fall 2020
- MAE 502/APC 506 Mathematical Methods of Engineering Analysis (Princeton University) — Spring 2020
- MAE 345/MAE 549 Introduction to Robotics (Princeton University) — Fall 2019
- EE 554 Microwave Techniques (University of Peradeniya), Sri Lanka — October 2015 - December 2015

Outreach

Mentoring

Princeton University

- Sarah Dillender (B.S.E. Mechanical Engineering) — 2020-21
  Thesis: Message passing structures for improved policy finding in decentralized multi-agent Q-learning.
- Gargi Sadalgekar, Samarie Wilson and Jacob Walrath (B.S.E. Mechanical Engineering) — 2020-21
  Thesis: Decision making and task allocation in a multi-robot system.

Peradeniya University, Sri Lanka

- Lasitha Weerakon (Post graduate, Mechanical Engineering) — 2016-17
  Published in American Control Conference (**ACC**), *2018.*
- Isuru Basnayake (Post graduate, Mechanical Engineering) — 2016-17
  Published in International Conference of Industrial and Information Systems, (**ICIIS**), *2017.*
- Kusal Tennakoon (Post graduate, Mechanical Engineering) — 2016-17
  Published in International Conference of Industrial and Information Systems, (**ICIIS**), *2017.*

Commitment to Diversity and Inclusion

- Co-organized "Re-education Monthly Book Club" aimed towards improving awareness of implicit biases (Princeton University) — 2020-Present
- Co-organized the workshop "Diversity and Mentorship" at American Control Conference — May 2021
- Co-organized the workshop "Inclusive Teaching" (Princeton University) — Jan 2021

Leadership Roles

- Committee member of Women in STEM Leadership Council (Princeton University) — 2020-Present
- Committee member of Graduate Women in Science & Engineering (Princeton University) — 2020-Present
- Future Digileaders Training (Stockholm, Sweden) — November 2019
- Founder of EE Instructors Scholarship (Peradeniya University, Sri Lanka) — 2016

Volunteer for

- World Maker Faire — September 2018
- American Control Conference — June 2018

Academic Services

Student Member of

IEEE (Institute of Electrical and Electronics Engineers), IEEE Young Professionals, IEEE Women in Engineering, APS (American Physical Society)

Reviewer for

Journal: Automatica, IEEE Transactions on Automatic Control, IEEE Control Systems Letters, Journal of Field Robotics, IEEE Transactions on Communications
Conference: IEEE Conference on Decision and Control, American Control Conference, International Conference on Intelligent Robots and Systems, European Control Conference, International Conference of Industrial and Information Systems

Publications

Journal Papers

[J5] Cooperative Bandits: A Class of Communication Protocols with Logarithmic Communication Cost
Udari Madhushani, Naomi Leonard
(In preparation)

[J4]   Decentralized Stochastic Bandits with Probabilistic Communications
Udari Madhushani, Anusha Lalitha, Andrea Goldsmith, Naomi Leonard
(In preparation)

[J3]   On Using Hamiltonian Monte Carlo Samplingfor Reinforcement Learning Problems in High-dimension
Udari Madhushani, Biswadip Dey, Naomi Leonard, Amit Chakraborty
(In preparation)

[J2]   Heterogeneous Explore-Exploit Strategies on Multi-Star Networks
Udari Madhushani, Naomi Leonard
IEEE Control Systems Letters, 2020.

[J1]   Semi-globally Exponential Trajectory Tracking for a Class of Spherical Robots
Udari Madhushani, Sanjeeva Maithripala, Janaka Wijayakulasooriya, Jordan Berg
Automatica, 2017.

Peer-reviewed Conference Papers

[C12]   What is Wrong with UCB? Adverse Effect of Cooperative Optimism in the Face of Uncertainty
Udari Madhushani, Naomi Leonard
(In preparation)

[C11]   Say What Matters Most: Effective Communication in Cooperative Bandits
Udari Madhushani, Naomi Leonard
Conference on Neural Information Processing Systems, **(NeurIPS)** 2021 (under review).

[C10]   One More Step Towards Reality: Cooperative Bandits with Imperfect Communication
Udari Madhushani, Abhimanyu Dubey, Naomi Leonard, Alex Pentland
Conference on Neural Information Processing Systems, **(NeurIPS)** 2021 (under review).

[C9]   Multi-robot Learning and Coverage of Unkown Fields
Maria Santos, **Udari Madhushani**, Alessia Benevento, Naomi Leonard
IEEE International Symposium on Multi-Robot and Multi-Agent Systems, **(MRS)** 2021 (under review).

[C8]   Distributed Bandits: Probabilistic Communication on d-regular Graphs
Udari Madhushani, Naomi Leonard
European Control Conference, **(ECC)** 2021.

[C7]   A Dynamic Observation Strategy for Multi-agent Multi-armed Bandit Problem
Udari Madhushani, Naomi Leonard
European Control Conference, **(ECC)** 2020.

[C6]   Heterogeneous Stochastic Interactions for Multiple Agents in a Multi-armed Bandit Problem
Udari Madhushani, Naomi Leonard
European Control Conference, **(ECC)** 2019. **(Invited Paper)**

[C5]   Feedback Regularization and Geometric PID Control for Robust Stabilization of a Planar Three-link Hybrid Bipedal Walking Model
Lasitha Weerakon, **Udari Madhushani**, Sanjeeva Mathripala, Jordan Berg
American Control Conference, **(ACC)** 2018.

[C4]   Multi-armed Bandit Based Approach for Performance Enhancement of Window Intensity Test (WIT) Detector
Kusal Tennakoon, **Udari Madhushani**, Sanjeeva Mathripala
International Conference of Industrial and Information Systems, **(ICIIS)** 2017.

[C3]   Intrinsic PID Controller for a Segway Type Mobile Robot
Isuru Basnayake, **Udari Madhushani**, Sanjeeva Mathripala
International Conference of Industrial and Information Systems, **(ICIIS)** 2017.

[C2] Feedback Regularization and Geometric PID Control for Trajectory Tracking of Mechanical Systems: Hoop Robots on an Inclined Plane
Udari Madhushani, Sanjeeva Mathripala, Jordan Berg
American Control Conference, **(ACC)** 2017.

[C1] WIT: Window Intensity Test Detector and Descriptor
Udari Madhushani, Sanjeeva Mathripala, Janaka Wijayakulasooriya
International Conference of Industrial and Information Systems, **(ICIIS)** 2016.

Peer-reviewed Workshop Papers and Extended Abstracts

[A1] Cost-effective Communication Strategies for Distributed Learning Systems
Udari Madhushani
European Control Conference, **(ECC)** 2021.

[W2] It Doesn't Get Better and Here's Why: A Fundamental Drawback in Natural Extensions of UCB to Multi-agent Bandits
Udari Madhushani, Naomi Leonard
I can't Believe It's Not Better! Workshop **(ICBINB)**, Conference on Neural Information Processing Systems, **(NeurIPS)** 2020. **(Spotlight)**

[W1] Distributed Learning: Sequential Decision Making in Resource-Constrained Environments
Udari Madhushani, Naomi Leonard
Practical ML for Developing Countries Workshop **(PML4DC)**, International Conference on Learning Representations, **(ICLR)** 2020. **(Oral)**

Skills

Computer Skills: Python, PyTorch, Matlab, LaTeX
Language Skills: Sinhala (Native), English (Fluent)