Sushmita Bhattacharya

Ph.D. (CS) Candidate at Harvard University
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RESEARCH INTERESTS

Reinforcement Learning, Autonomous Multiagent Systems, Robotics, Machine Learning, and Deep Learning.

EDUCATION

- **Ph.D. in Computer Science**
  Harvard University, MA, USA *Present*
  Advisor: Dr. Stephanie Gil
- **M.Tech. in Computer Science**
  Indian Institute of Technology Bombay *2015*
  Advisor: Dr. N. L. Sarda
- **B.E. in Computer Science**
  Indian Institute of Engineering Science and Technology Shibpur *2011*
  Advisor: Dr. Prasun Ghosal.

AWARDS AND ACHIEVEMENT

- **2022 Apple Scholars in AI/ML PhD Fellowship** in Fundamentals of Machine Learning.
- **Engineering Graduate Fellowship** from Ira A. Fulton Schools of Engineering (Spring 2020) for extraordinary academic achievements.
- Secured All India Rank 57 among 2,24,160 candidates appeared in Graduate Aptitude Test in Engineering, 2013 in Computer Science.

RESEARCH PROJECTS

- **Multiagent RL for autonomous taxicab pickup problems in urban environments**
  - Derived an online optimization framework using GNN-based offline policy approximation for coordinated taxi routing/pickup schedules with stochastic requests in downtown San Francisco.
  - Proposed a Wasserstein distance-based switching framework that adapts to fluctuating demand distributions.
  - Extended to a large urban map using map partition and a two-phased rollout-based online optimization framework that closely approximates a near-optimal policy. Presented associated theoretical bounds on the number of taxis.
  - Published a conference paper [4] at ICRA 2023 and submitted a conference paper [3] at ICRA 2024.
- **RL for large POMDP with realistic computation and communication constraints**
  - Developed scalable multiagent rollout and approximate policy iteration algorithms for finding cooperative policies in large Partially Observable Markov Decision Processes with large control space and robust approaches to deal with imperfect agent communication.

- Proposed feature-based partitioning of the state-space and partitioned approximate policy iteration for problems with large state space to deal with exploration-exploitation issues with parallel computation.
- Published a journal paper [2] at IEEE T-RO, a journal paper [6] at IEEE RA-L, and a conference paper [5] at CoRL.

RESEARCH EXPERIENCE

- Research Assistant at Harvard University *July 2020 - Present*
- Interactive AI Personalization Research Intern at Apple Inc. *June 2022 - August 2022*
- Graduate Research Assistant at Arizona State University *August 2018 - June 2020*

TEACHING EXPERIENCE

- Teaching Assistant at Arizona State University
  - Topics in Reinforcement Learning, Instructor: Dr. D. P. Bertsekas *Spring 2020, Spring 2019*
  - Coordination of Multi-Robot Systems, Instructor: Dr. S Gil *Fall 2019*
  - Introduction to Artificial Intelligence, Instructor: Dr. S Gil *Spring 2019*
  - Planning and Learning Methods in AI, Instructor: Dr. S Gil *Fall 2018*
- Teaching Assistant at Indian Institute of Technology Bombay
  - Embedded Systems Lab, Instructor: Dr. Kavi Arya *Spring 2014*
  - Database and Information Systems Lab, Instructor: Dr. N. L. Sarda *Fall 2014*

TALKS AND PRESENTATIONS

- *Sequential Decision-making with Reinforcement Learning*
  Invited talk at Apple Inc, February, 2023.
- *Multiagent Rollout and Policy Iteration for POMDP with Application to Multi-Robot Repair Problems*
  Sushmita Bhattacharya, Siva Kailas, Sahil Badyal, Stephanie Gil, and Dimitri Bertsekas
  Presentation at Conference on Robot Learning (CoRL), 2020
- *Reinforcement Learning for POMDP: Rollout and Policy Iteration with Application to Sequential Repair*
  Sushmita Bhattacharya, Thomas Wheeler, Stephanie Gil, Dimitri Bertsekas
  Poster presentation at Learning for Dynamics and Control (L4DC), 2019

REVIEWER

- Conference on Robotics and Automation (ICRA)
- International Conference on Intelligent Robots and Systems (IROS)

OTHER WORK EXPERIENCE

- Software Developer in Microsoft India Development Center. *December 2016 - July 2018*
- Data Scientist in Honeywell Technology Solution Labs. *July 2015 - December 2016*

PUBLICATIONS

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[1] *Multiagent Reinforcement Learning: Rollout and Policy Iteration for POMDP with Application to Multi-Robot Problems*,
Sushmita Bhattacharya, Siva Kailas, Sahil Badyal, Stephanie Gil, Dimitri Bertsekas,
IEEE Transactions on Robotics, 2024.

[2] *Approximate Multiagent Reinforcement Learning for On-Demand Urban Mobility Problem on a Large Map (extended version)*,
Daniel Garces, **Sushmita Bhattacharya**, Dimitri Bertsekas, Stephanie Gil,
Submitted to International Conference on Robotics and Automation (ICRA), 2024.

[3] *Multiagent Reinforcement Learning for Autonomous Routing and Pickup Problem with Adaptation to Variable Demand*,
Daniel Garces, **Sushmita Bhattacharya**, Stephanie Gil, Dimitri Bertsekas,
International Conference on Robotics and Automation (ICRA), 2023.

[4] *Multiagent Rollout and Policy Iteration for POMDP with Application to Multi-Robot Repair Problems*,
Sushmita Bhattacharya, Siva Kailas, Sahil Badyal, Stephanie Gil, and Dimitri Bertsekas,
Conference on Robot Learning (CoRL), 2020.

[5] *Reinforcement Learning for POMDP: Rollout and Policy Iteration with Application to Autonomous Sequential Repair Problems*,
Sushmita Bhattacharya, Sahil Badyal, Thomas Wheeler, Stephanie Gil, and Dimitri Bertsekas,
IEEE Robotics and Automation Letters (RA-L), 2020.