Abhishek Naik

abhisheknaik22296@gmail.com | abhisheknaik96.github.io

EDUCATION

- **Ph.D., Computing Science** CGPA: 4.0/4.0, *Sep 2018-March 2024*
  University of Alberta, Edmonton, Canada Supervisor: Richard S. Sutton
- **Integrated B.Tech.+M.Tech., Computer Science and Engineering** CGPA: 9.49/10, *2013-18*
  Indian Institute of Technology Madras, Chennai, India Supervisor: B. Ravindran

SELECTED RESEARCH

(* equal contribution)

- **Reward Centering** [Paper, Poster]
  ***Abhishek Naik**, Yi Wan, Manan Tomar, Richard S. Sutton*
  In Reinforcement Learning Conference (RLC), 2024
- **Investigating Action-space Generalization in RL for Recommender Systems** [Paper, Poster]
  ***Abhishek Naik**, Bo Chang, Alexandros Karatzoglou, Martin Mladenov, Ed H. Chi, Minmin Chen*
  Oral presentation at the *Decision Making for RecSys workshop at WWW*, 2023
- **Multi-Step Average-Reward Prediction via Differential TD(λ)** [Paper, Poster]
  ***Abhishek Naik**, Richard S. Sutton*
  Presented at the *Conference on Reinforcement Learning and Decision Making (RLDM), 2022*
- **Average-Reward Learning and Planning with Options** [Paper, Poster]
  *Yi Wan, **Abhishek Naik**, Richard S. Sutton*
  In *Advances in Neural Information Processing Systems (NeurIPS)*, 2021
- **Towards Reinforcement Learning in the Continuing Setting.** [Paper, Poster]
  ***Abhishek Naik**, Zaheer Abbas, Adam White, Richard S. Sutton*
  Presented at the *Never-Ending Reinforcement Learning (NERL) workshop at ICLR*, 2021
- **Learning and Planning in Average-Reward Markov Decision Processes** [Paper, Poster]
  Yi Wan, **Abhishek Naik***, Richard S. Sutton*
  In *International Conference on Machine Learning (ICML)*, 2021
- **Discounted Reinforcement Learning Is Not an Optimization Problem** [Paper, Poster]
  ***Abhishek Naik**, Roshan Shariff, Niko Yasui, Hengshuai Yao, Richard S. Sutton*
  Presented at *The Optimization Foundations of RL workshop at NeurIPS*, 2019
- **MADRaS: Multi Agent DRiving Simulator** [Paper]
  *A. Santara, S. Rudra, S.A. Buridi, M. Kaushik, **Abhishek Naik**, B. Kaul, B. Ravindran*
  In *Journal of Artificial Intelligence Research (JAIR)*, 2021
- **RAIL: Risk-Averse Imitation Learning** [Paper]
  A. Santara, **Abhishek Naik***, B. Ravindran, D. Das, D. Mudigere, S. Avancha, B. Kaul*
  In *International Conference on Autonomous Agents and MultiAgent Systems (AAMAS)*, 2018

WORK EXPERIENCE

- Postdoctoral Fellow, **National Research Council (NRC) Canada** *Sep 2024–ongoing*
  Ottawa, Canada
  Developing fast and efficient reinforcement-learning algorithms for space-related applications, including for enabling reliable terabit satellite-to-ground optical communication.
- Software, Automation, and Testing Team Member, **AlbertaSat** *April 2023–Aug 2024*
  Edmonton, Canada
  AlbertaSat is University of Alberta's student group that designs, builds, and operates nano satellites. I wrote software and simulated various operational and safety scenarios of AlbertaSat's upcoming satellite to ensure it could robustly achieve all the mission objectives.
- Research Intern, **Google Research, Brain Team** *June–Sep 2022*
  Toronto, Canada Advisors: Bo Chang, Alexandros Karatzoglou
  Investigated methods for action-space generalization in reinforcement learning for large-scale recommender systems like YouTube.
- Research Intern, **Huawei Research** *May–Aug 2019*
  Edmonton, Canada Advisor: Hengshuai Yao
  Began investigating the discounted-reward and average-reward formulations for continuing (non-episodic) problems in reinforcement learning.
- Research Intern, **Intel Labs** *May–Jul 2017*
  Bengaluru, India Advisor: Bharat Kaul
  Started work on a risk-averse imitation learning approach that achieved up to 89% improvement over the then state-of-the-art on standard robotic control tasks.
- Research Intern, **Purdue University**, Dept. of Computer Science *May–Jul 2016*
  Indiana, USA Advisor: Bruno Ribeiro
  Analyzed the expected activity-lifespan of social-media users based on their early profile activity. Curated and released a rich social-media dataset for public use via a technical paper.
- Software Engg. Intern, **Amazon Development Center** *May–Jul 2015*
  Chennai, India Advisor: Sravan Bodapati
  Helped build a classifier to determine the start-reading-location of books.
  Now in production, this feature helps Kindle users start reading a book quicker after downloading it without having to flip through pages like acknowledgements or copyright notices.

PH.D. DISSERTATION

Reinforcement Learning for Continuing Problems Using Average Reward [Dissertation, Slides]

During my Ph.D., I developed simple and practical algorithms from first principles for long-lived artificial decision-making systems. In particular, I developed algorithms within the reinforcement-learning framework for continuing (non-episodic) problems–in which the agent-environment interaction goes on ad infinitum–with the goal of maximizing the average reward obtained per step. Empirically, the algorithms are easy to implement and use.

MASTER'S THESIS

Deep Reinforcement Learning: Reliability and Multi-Agent Environments [Thesis, Slides]

My goal was to make self-driving cars a reality in my country, India. I modeled this as a safety-critical multi-agent learning problem and:

- proposed a risk-averse imitation learning algorithm that achieved lower tail-end risk compared to the then state-of-the-art,
- trialled a curriculum-based learning approach for multi-agent learning in RoboSoccer, and
- extended the TORCS racing game to release the first open-source driving simulator that supports multi-agent training – MADRaS (has 100+ stars on Github).

SELECTED TALKS

- **Demystifying the Discount Factor** [Slides]
  Guest lecture at a graduate course at the University of Alberta *Nov 2024*
- **An Experimentalist's Venture into RL Theory: Two Success and a Failure** [Video, Slides]
  Amii AI Seminar, University of Alberta *Feb 2024*
- **Unifying Perspectives on Intelligence** [Slides]
  Summer School at the Science of Intelligence Institute, Berlin, Germany *Aug 2023*
- **Essentials of Reinforcement Learning** [Slides]
  3rd Nepal Winter School in AI, Virtual *Dec 2021*
- **Towards Reinforcement Learning in the Continuing Setting** [Slides]
  Never-Ending Reinforcement Learning (NERL) workshop at ICLR 2021, Virtual *May 2021*
- **Personalized Brain State Targeting via Reinforcement Learning** [Video, Slides]
  The 3rd Neuromatch Conference, Virtual *Oct 2020*
- **Learning and Planning in Average-Reward MDPs** [Video, Slides]
  Tea Time Talk, Virtual *Aug 2020*
- **On Intelligence: A Glimpse of the Diversity in Natural Intelligence** [Video, Slides]
  Amii AI Meetup, Edmonton, Canada *June 2020*
- **Figuring Out How the Mind Works** [Video, Slides]
  Cognitive Psychology Seminar, Dept. of Psychology, University of Alberta *March 2020*
- **Discounting – Does It Make Sense?** [Video, Slides]
  Tea Time Talk, RLAI lab and Amii, Edmonton, Canada *Aug 2019*

COMMUNITY SERVICE

- **Reviewer**, *Artificial Intelligence, RLC '25, ICLR '20, AAAI '21, RL4RL* at *ICML '21* and *NeurIPS '22*
- **Co-organizer**, *ICML 2021 Social* on Continuing (Non-episodic) RL Problems *July 2021*
- **Co-organizer**, *NeurIPS 2020 Tutorial* on Policy Optimization in RL *Dec 2020*
- **Organizer**, *Amii Tea Time Talks* *June - Aug 2020*
- **Executive Member**, *Computing Science Graduate Students' Association, UofA* *Apr 2019 - Apr 2020*
- **Volunteer**, *Centre for Autism Services Alberta,* Edmonton *Jan 2019 - Mar 2020*
- **Mentor**, *Student Wellness Center*, IIT Madras *Aug 2015 - May 2017*

RECENT AWARDS

- **Winner**, natHACKS 2023 *hackathon with Khurram Javed. Using new advances in RL, we showed we can learn to control on-screen objects via our brains' EEG signals* within seconds. [Video]

TEACHING EXPERIENCE

- Teaching Assistant, **Reinforcement Learning II** (CMPUT609) *Jan–Apr 2020, 2021, 2023, 2024*
  University of Alberta, Edmonton, Canada Instructor: Richard S. Sutton
- Teaching Assistant, **Reinforcement Learning I** (CMPUT397) *Sep–Dec 2020*
  University of Alberta, Edmonton, Canada Instructor: Martha White
- Content Developer, **Coursera Reinforcement Learning Specialization** *Jan–Oct 2019*
  University of Alberta, Edmonton, Canada Instructors: Adam White, Martha White
- (Head) Teaching Assistant, **Reinforcement Learning** (CS6700) *Jan–May 2018*
  Indian Institute of Technology Madras, Chennai, India Instructor: B. Ravindran
- Teaching Assistant, **Machine Learning** (CS4011) *Aug–Nov 2017*
  Indian Institute of Technology Madras, Chennai, India Instructors: B. Ravindran, M. Khapra