

Manav Mishra

EECS DEPARTMENT · PH.D. STUDENT

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Summary

I am a current Ph.D. candidate at the Department of Electrical Engineering and Computer Science at the Indian Institute of Science, Education, and Research (Bhopal, India) with a keen interest in multi-agent autonomous systems. My research has focused on the integration of deep learning techniques into robotics, particularly in the area of multi-agent reinforcement learning. My academic background includes a Master of Science degree in Physics, providing me with a solid foundation in physics and mathematics. Through years of research exposure, I have gained hands-on knowledge and experience in reinforcement learning, deep learning, and artificial intelligence. My expertise lies in solving well-defined problems through a combination of analytical and numerical methods, and I enjoy the challenge of finding solutions that bridge the gap between the abstract and the empirical. I am eager to advance my understanding of this domain through participation in workshops, seminars, and summer schools.

Education

University of Maryland, College Park, MD

VISTING PHD STUDENT - COMPUTER SCIENCE

November 2023 - May 2024

- Joined as a member of the RAAS Lab, working under the guidance of Prof. Dr. Pratap Tokekar. My research focused on Reinforcement Learning with Human Feedback (RLHF) applied to the challenge of persistent monitoring..
- Developed methods for real-time reconfiguration of surveillance routes in response to emerging threats and new information, utilizing mixed preference reward optimization to handle both intrinsic and extrinsic reward factors. This work is currently under review at ICAPS.

Indian Institute of Science Education and Research, Bhopal

CPI: 9.0/10.0

PHD - ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

August 2020 -

- Thesis outline: "Generalized Multi-Agent Persistent Monitoring" under the supervision of Prof. Dr. P.B. Sujit.
My research interest is to develop intelligent decision-making algorithms for autonomous multi-robotic systems. In particular, I am interested in the problem of generalized persistent monitoring by a team of cooperative multi-agent systems that arises in several applications like border patrol and security. I will be using tools from reinforcement learning and approximation algorithms to design algorithms that have theoretical guarantees, adaptable under uncertainty, and are validated experimentally.

Indian Institute of Science Education and Research, Bhopal

CPI: 8.82/10.0

B.S. - M.S. - MAJOR IN PHYSICS, MINOR IN ENGINEERING SCIENCES

August 2015 - May 2020

- MS-thesis: "Generative neural network approach to path integrals" under the supervision of Prof. Dr. Ambar Jain.
–The work involves on developing a generative model of a neural network that efficiently mimics a distribution in a high dimensional space. The generated distribution function is used to perform multidimensional integrals to solve the path integral problem.
- Relevant coursework:
–Physics: Nuclear and Particle Physics, Quantum Field Theory-I and II, Quantum Information Theory, Numerical Methods and Programming.
–Engineering science: Control systems, Data science and machine learning, Intelligent robotics, Data structures and algorithms.

Mithibai College (Chauhan Institute of Science), Mumbai

Percentage: 87.23%

CLASS 12TH - HIGH SCHOOL

July 2013 - March 2015

- Subjects: Physics, Chemistry, Mathematics, Computer Science

Publications/ Pre-prints

TACTIC: Task-Agnostic Contrastive pre-Training for Inter-Agent Communication

MALTA, AAAI Workshop

PEIHONG YU, MANAV MISHRA, SYED ZAIDI, PRATAP TOKEKAR

December 2024

A Maximinimalist Approach to Multi-Objective Preference-Based Reinforcement Learning for Persistent Monitoring

ICAPS 2025, Under Review

MANAV MISHRA, PEIHONG YU, SUJIT PB, PRATAP TOKEKAR

October 2024

TACTIC: Task-Agnostic Contrastive pre-Training for Inter-Agent Communication

AAMAS 2025, Under review

PEIHONG YU, MANAV MISHRA, SYED ZAIDI, PRATAP TOKEKAR

October 2024

Deep Reinforcement Learning-Based Approach for a Single Vehicle Persistent Surveillance Problem with Fuel Constraints

ICRA 2024, Under review

MANAV MISHRA, HRITIK BANA, SASWATA SARKAR, SUJEEVRAJA SANJEEVI, PB SUJIT, KAARTHIK SUNDAR

September 2024

Beyond Joint Demonstrations: Personalized Expert Guidance for Efficient Multi-Agent Reinforcement Learning

T-MLR

PEIHONG YU, **MANAV MISHRA**, ALEC KOPPEL, CARL BUSART, PRIYA NARAYAN, DINESH MANOCHA, AMRIT BEDI, PRATAP TOKEKAR

December 2024

Reward Copilot for RL-driven Systems Optimization

MLforSys, Neurips Workshop

KARAN TANDON, **MANAV MISHRA**, GAGAN SOMASHEKAR, MAYUKH DAS, NAGARAJAN NATARAJAN

December 2024

Multi-Agent Deep Reinforcement Learning For Persistent Monitoring With Sensing, Communication, and Localization Constraints

T-ASE

MANAV MISHRA, PRITHVI PODDAR, RAJAT AGARWAL, JINGXI CHEN, PRATAP TOKEKAR, P.B. SUJIT

April 2024

Finite-Time Standoff Target Tracking in The Presence of Wind

ECMR 2023

PALLOV ANAND, PRANAV NITURKAR, A. PEDRO AGUIAR, RAJAT AGARWAL, **MANAV MISHRA**, P. B. SUJIT

September 2023

Visibility-Aware Navigation With Batch Projection Augmented Cross-Entropy Method over a Learned Occlusion Cost

RA-L + IROS 2022

HOUMAN MASNAVI, JATAN SHRESTHA, **MANAV MISHRA**, P.B SUJIT, KARL KRUUSAMÄE, ARUN K. SINGH

October 2022

Research Internships

Reward Co-pilot for Oppertune

Microsoft Research, India

PH.D. RESEARCH INTERN

May 2024 - Aug 2024

- I was involved in integrating an LLM-based evolutionary reward generation algorithm to the Oppertune software at Microsoft.
- The algorithm combined the use of LLM reward generation, hybrid solvers, and reflection-based feedback to fire the pipeline.
- The preliminary paper is accepted as a workshop paper in Neurips 2024.

Reinforcement learning-based method for parking an electric vehicle fleet in the depot

Siemens Technologies, India

PH.D. RESEARCH INTERN

Oct 2023 - Nov 2023

- Applied reinforcement learning techniques to develop a novel method for optimizing the parking of an electric vehicle fleet within a depot setting.
- The algorithm combined the use of PPO as a reinforcement learning algorithm, along with integer programming, to generalize the parking schedules for buses in different depot configurations.
- Collaborated effectively with the team to formulate the theoretical approach, design experiments, and fine-tune the algorithm.

Walking Robot Project

IISc Bangalore, India

RESEARCH INTERN

May 2019 - July 2019

- Worked with the research group led by Dr. Shishir Kolathaya involved in the design and implementation of a quadruped walking robot 'Stoch2'.
- Involved in deploying an on-board Jetson TX2 Neural network on the walking robot to get the training and inferences running on the onboard GPU neural network.
- Also involved in developing a software interface for the gym environments for getting the Reinforcement Learning algorithms to run in the simulations.

Solving Schrodinger's equation for 1-D potentials using Neural Networks.

IISER Bhopal, India

RESEARCH INTERN

May 2018 - July 2018

- Worked with Dr. Nirmal Ganguli in analyzing and developing a neural network that could solve Schrodinger's equation for an arbitrary 1-D potential using machine learning tool-kits like Tensorflow and Keras.
- The network was able to efficiently predict the ground-state wave-function of a particle, restricted by a one-dimensional potential, after being trained with a large known data-set of numerically solved Schrodinger's equations.

Approximation Algorithm for the Knapsack Problem.

IISER Bhopal, India

RESEARCH INTERN

May 2018 - July 2018

- Worked under Dr. Pawan Kumar Aurora in learning about the NP-complete optimization problem and the approximation algorithms to find the best polynomial bound approximate solution.
- Studied about a class of NP-complete problem called the 'Knapsack problem' and implemented a Polynomial Time Approximation Scheme (PTAS) and a Fully Polynomial Time Approximation Scheme (FPTAS) to solve the optimization problem.

- Worked under Dr. Chethan Gowdigere in understanding the path integral formulation in quantum mechanics, its role in generalizing the action principle of classical mechanics, and its significance in getting a better comprehension of the quantum mechanical framework.
- Implemented the Feynman path integral method for calculating the amplitude for two physical systems: the free particle and the harmonic oscillator.

Skills

Software skills	Mathematica, Matlab, Linux ROOT, ROS, Gazebo, AirSim, Rviz
Programming skills	Python, C, C++, Shell scripting
Machine Learning Skills	Deep Reinforcement Learning, Geometric Deep Learning, Neural Networks, GAN, SVM, Auto-encoders
Data Science Tools	Pytorch, Tensorflow, OpenCV, OpenAI Gym, Pandas, Numpy, Matplotlib, ScikitLearn, Seaborn, Keras
Interpersonal skills	Communication, Leadership, Teamwork, Decision making, Conflict Resolution
Languages	English, Hindi, Oriya, Marathi, German, French

Test Scores

TOEFL iBT	111/120	R: 28/30, L: 26/30, S: 29/30, W: 28/30
GRE General	318/340	Q: 164/170, V: 154/170, AWA: 4.5/6.0
CSIR-NET	83.75/200	All-India Rank 94 (Lecture ship)

Honors & Awards

SCHOLARSHIPS

2021	Prime Minister Research Fellowship (PMRF) , Fellowship awarded to top Doctoral scholars (May 2021) - awarded by MHRD, Govt. of India	India
2015	DST-Inspire scholarship , Scholarship for Higher Education (SHE) - awarded by DST, Govt. of India (August 2015 - June 2020)	India

AWARDS

2024	IEEE RAS Travel Grant for IROS 2024 , Awarded the IEEE RAS Travel Grant to attend and present my work at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024	Abu Dhabi, UAE
2022	MBZIRC Grand Maritime Challenge 2023 - Semi Finalist , Part of team LUNA (member of Logic Subsystem) from India, which reached the Semi-finals (top 14) at the Mohammed Bin Zayed International Robotics Challenge (MBZIRC) Grand Maritime Challenge 2023 to be held at Abu Dhabi, UAE	India
2022	MRIM Virtual Challenge - 1st Place , Part of team 'Talismann', which won 1st place in the Multi-Robot Inspection and Monitoring Challenge (Virtual Challenge) at the IEEE RAS Summer School on Multi-robot systems 2022	Czech Technical University, Prague
2022	MRIM Real-World Challenge - 2nd Place , Part of team 'Talismann', which won 2nd place in the Multi-Robot Inspection and Monitoring Challenge (Real-World Challenge) at the IEEE RAS Summer School on Multi-robot systems 2022	Czech Technical University, Prague
2022	IISM Mens' Basketball - Gold Medal , Captain of the IISERB Basketball team, which won the Gold medal at the Inter-IISER Sports Meet (IISM)	IISER Bhopal
2020	Best Poster Award - "Generative neural networks approach to path integrals" , Received the Best poster award for poster on my MS thesis at the Annual Physics Symposium	IISER Bhopal

POSITION HELD

2018	Department Representative - Physics , Representative Council	IISER Bhopal
2018	Hostel-6 Representative , Representative Council	IISER Bhopal
2018	Basketball coordinator , Sports council	IISER Bhopal
	IISM Basketball player , represented the IISER Bhopal contingent in Inter IISER Sports meet for 5 years	

Teaching and Outreach activities

Feb 2024	Workshop on hands-on reinforcement learning , Conducted a 3-day workshop on hands-on reinforcement learning for Somaiya Machine Learning Research Association (SMLRA), KJ Somaiya Mumbai	Bhopal, India
Apr 2023	Invited seminar talk on Multi-agent reinforcement learning , Invited to deliver talk on Challenges and future of Multi-Agent Reinforcement Learning for the Computer Science department, KJ Somaiya Mumbai	Bhopal, India
Aug 2023	Lecture series on Python Programming , Organized and conducted a 32-hour short course on Hands-on Python Programming for Semester-V students of Electrical and Communication Engineering, SIRT Bhopal	Bhopal, India
Apr 2023	Invited seminar talk on Reinforcement learning , Invited to deliver a 2-hour seminar on Reinforcement Learning at the School of Computing Science and Engineering, VIT Bhopal	Bhopal, India
Apr 2023	Invited talk on “Reinforcement learning for industrial applications.” , Invited to deliver a 2-hour talk on Reinforcement Learning at the Industrial Robotics and Manufacturing Automation Laboratory, NIT Puducherry	Puducherry, India
Jan 2023	Teaching Assistant for the NPTEL Course on Reinforcement Learning - January 2023 , Organized live discussion session for 12 weeks for the NPTEL course on Reinforcement Learning taught by Prof. Balaraman Ravindran, IIT Madras	India
Jan 2023	India International Science Festival 2022 , Participant in the IISF 2022 Mega-Event as part of team MOONLAB held at MANIT Bhopal	Bhopal, India
Oct 2022	Teaching Assistant for the NPTEL Course on Reinforcement Learning - October 2022 , Organized live discussion session for 12 weeks for the NPTEL course on Reinforcement Learning taught by Prof. Balaraman Ravindran, IIT Madras	India
Aug 2022	IEEE RAS Summer School on Multi-Robot Systems 2022 , Participated in the in-person MRS Summer School 2022 held at Czech Technical University, Prague	Prague, Czech Republic
Feb 2022	Lecture Series on Intelligent Robotics , Invited for a 6-week lecture series on Intelligent Robotics, organized under Center of Excellence by Department of Electrical and Communication Engineering, SIRT Bhopal	Bhopal, India
2021 -	IEEE Robotics and Automation Society (RAS) , Student Member	India