Manav **Mishra**

EECS Department · Ph.D. Student

(+91) 9320655965 | manavmishra96@gmail.com | http://manavmishra96.github.io/ | manavmishra96

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

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

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*

GALOPP: Multi-Agent Deep Reinforcement Learning For Persistent Monitoring With Localization Constraints

Arxiv Pre-print

Manav Mishra, Prithvi Poddar, Jingxi Chen, Pratap Tokekar, P.B. Sujit — *September 2021*

Research Internships

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 the 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.

Path Integral Formulation of Quantum Mechanics *NISER Bhubaneswar, India*

Research Intern *May 2017 - July 2017*

- Worked under Dr. Chethan Gowdigere in understanding about 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 sytems: the free particle and the harmonic oscillator.

Electromagnetic radiation from moving charges: Dipole radiation *IIT Gandhinagar, India*

Research Intern *May 2016 - July 2016*

- Worked under Dr. Vinod Chandra with a motivation to learn how moving charges affect the Electromagnetic dipole radiations.
- It also involved understanding the concept of radiation reaction force and its physical basis. Later, we briefly touched upon Lorentz self force and mass renormalization.

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 (Lectureship)

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

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

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*
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*