

Manav Mishra

EECS MAJOR · PH.D. STUDENT

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Summary

I am a PhD Student in the Department of EECS at Indian Institute of Science, Education, and Research (Bhopal, India). I am particularly interested in the domain of the multi-agent autonomous systems. Ever since the advent of deep learning techniques, it has gained a lot of traction in the robotics community, especially the area of multi-agent reinforcement learning. I have extensive exposure to the core areas of physics and mathematics - through a MS degree in Physics, and hands-on knowledge and experience in the field of Reinforcement learning and AI - developed over the years through research exposure. I like problems that are clean and well-defined, with the right mix of analytical and numerical methods; my place lies somewhere between the abstract and the empirical. I would love to advance my understanding in this domain further through interaction and participation in several workshops, seminars and summer schools.

Education

Indian Institute of Science Education and Research, Bhopal

CPI: 8.82/10.0

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 validate 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

IROS RA-L - Under Review

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

February 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 Experience

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 directly.
- 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 systems: 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, Tensorflow
Programming skills	Python, C, C++, LaTeX
Machine Learning Skills	Generative Modelling, Reinforcement Learning, SVM, Classification, Regression
Data Science Tools	Pandas, Numpy, Matplotlib, ScikitLearn, Seaborn, Keras
Interpersonal skills	Communication, Leadership, Teamwork, Decision making, Conflict Resolution
Languages	English, Hindi, Oriya, French, German

I have nearly five years of working experience with Python programming. I have extensively used Mathematica and Matlab for numerical computations in physics. I am also adept with machine learning skills like Generative modelling-used in my MS dissertation project, Reinforcement learning-implemented in walking robot project, SVM-used in coursework projects, etc. I have implemented and have familiarity with several machine learning libraries in python like Tensorflow, Scikitlearn, Pandas, Numpy, etc. over the last 2-3 years in various project work. I have a firm grasp on the working and implementation on Monte Carlo simulations.

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

AWARDS

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	India
2020	Best Poster Award - "Generative neural networks approach to path integrals" , 4th Inhouse 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 4 years	