Eshika Pathak

Graduate Student, Electrical and Computer Engineering, Carnegie Mellon University
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Education

Carnegie Mellon University **Pittsburgh, PA**
Master of Science in Electrical and Computer Engineering, AI/ML Specialization, CGPA: 4.00/4.00 *December 2024*
Courses: Optimization, Applied Stochastic Processes, Machine Learning for Signal Processing, Machine Learning for Engineers, Introduction to Deep Learning, Statistical Models of the Brain

Indian Institute of Technology (IIT) **Gandhinagar, India**
Bachelor of Technology in Electrical Engineering, CGPA: 9.51/10.00 (Rank 1 of 40) *July 2023*

Internships

Control and Learning Group, Carnegie Mellon University **Pittsburgh, PA**
Research Assistant, Autonomous Vehicle Safe Control in the Presence of Self-Seeking Humans *August 2023 - Present*
- Designed and experimentally validated optimal and safe autonomous vehicle policies by accounting for humans' self-seeking behaviors in a game-theoretic setting. *Submitting to PNAS 2024.*

Bosch Center for Artificial Intelligence **Bangalore, India**
Research Intern, Bidirectional Charger Models, V2X Framework & Optimal Decision Making *May 2022 - July 2022*
- Developed two bidirectional charger models for a consumer electric vehicle. Built an end-to-end simulation framework for vehicle-to-grid and vehicle-to-house (V2X) power transfer capabilities and optimal multi-variable decision-making for profit.

Nano Devices and Circuits Lab, IIT Gandhinagar **Gandhinagar, India**
Research Intern, OPC Algorithms in Computational Lithography *August 2021 - May 2022*
- Built a robust resist and optical model lithography simulation system with control on critical optical proximity correction (OPC) parameters. Formulated an intelligent mask fragmentation algorithm to reduce computation time-accuracy trade-off.

Learning and Emerging Networked Systems Lab, Texas A&M University **College Station, TX**
Research Intern, Reinforcement Learning Algorithms for Autonomous Navigation *May 2021 - July 2021*
- Modelled deep reinforcement learning algorithms for autonomous navigation of mobile robots in indoor environments. Engineered and tested 11 reward functions. Trained and deployed an optimal model demonstrating perfect waypoint tracking.

Projects

Adaptive Risk-Aware Reinforcement Learning Based Multi-Stock Portfolio Optimization
Integrated deep reinforcement learning agents with a control barrier function-based controller for optimal risk control. *2024*

Personalized Federated Learning using Hypernetworks
Reproduced and performed ablation study with insights on client learning configurations and hypernetwork architectures. *2024*

Information Coding and Learning in Spiking Neural Networks and Predictive Coding Networks
Applied SuperSpike and differential equation-based learning for image classification in SNNs and PCNs. *2024*

Blind Source Separation in High-Density EMG Data
Designed algorithms for noise filtering, wavelet feature extraction, PCA, NMF, and clustering to analyze motor unit signals. *2023*

Automating Microbial Growth Detection and Monitoring Using TDLAS
Detected E.coli growth with quantum cascade laser and TDLAS; designed an intelligent algorithm to automate baseline selection. *2023*

Wearable Foot Plantar Pressure Monitoring and Analysis System
Engineered a system to analyze gait data from shoe insole sensors, reducing latency from over a minute to seconds. *2022*

Skills

- **Languages:** Python, MATLAB
- **Libraries and Frameworks:** NumPy, Pandas, Matplotlib, SciPy, CVXPY, TensorFlow (Keras), PyTorch, OpenCV, OpenAI Gym, Stablebaselines3, Quantipi, FinRL
- **Tools:** Simulink, MATLAB App Designer, QtDesigner, STM32, Xilinx Vivado, DipTrace, LTSpice, Arduino, Autodesk Inventor, OpenChoice Desktop, LabView

Awards

- **Institute Gold Medal, IIT Gandhinagar:** For the highest academic performance among batchmates over four years
- **O.P. Jindal Engineering and Management Award:** Amongst the top eighty engineering students in India
- **Award for Academic Excellence, IIT Gandhinagar:** For securing the highest CGPA (three consecutive years)
- **Dean's List Semester I, III, IV, V, VI, IIT Gandhinagar:** For outstanding academic performance