

SHOBHIT SINGHAL

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- Research interests: power markets, game theory, control theory

EDUCATION

PhD in Electrical Engineering

2024 - Present

Technical University of Denmark (DTU)

Supervisors: Profs. Spyros Chatzivasileiadis and Lesia Mitridati

Thesis: AI-powered local electricity markets

Master of Science in Robotics Systems and Control

2021 - 2024

ETH Zürich

GPA: 5.88/6

Relevant coursework: Power Markets I, Computational Control, Game Theory and Control, Model Predictive Control, Dynamic Programming and Optimal Control, Advanced Topics in Control (Distributed Systems), Foundations of Reinforcement Learning, Probabilistic AI

Projects

Jun 23 - Apr 24

Optimization for wind producer participating in forward electricity markets

Supervisors: Liviu Aolaritei, Marta Fochesato, and Prof. Florian Dörfler, Automatic Control Lab, ETH Zürich

- Distributionally robust bids for price-taker wind power producer in day-ahead and balance market using forecasts
- Modeled the price-maker setup as a stochastic program with decision-dependent uncertainty
- Developed a Lipschitz contextual multi-armed bandit algorithm and validated on German market data

May 22 - Jul 22

Distributed Gradient Flow Feedback Optimization in DC Power Grids

Course project for Advanced Topics in Control. Instructor: Prof. Florian Dörfler

- A paper on voltage regulation using distributed feedback optimization in DC micro grids

Mar 22 - Jun 22

Imitation Learning from MPC for Legged Mobile Manipulation

Robotics Systems Lab, ETH Zürich

- Extended MPC-NET, an Imitation learning based policy for controlling ALMA using MPC as teacher.
- Achieved two orders of magnitude faster inference of whole body joint control policy in 10 minutes of training.

Bachelor of Technology in Mechanical Engineering

2017 - 2021

Indian Institute of Technology Delhi

GPA: 9.672/10 (Rank 1)

Relevant coursework: Introduction to Machine Learning, Stochastic Control and Reinforcement Learning, Deep Learning, Data Structures and Algorithms, Operations Research, Control Theory

Projects

Oct 20 - May 21

Simulation Optimisation for Hyperparameter Tuning in ML (B.Tech. Thesis)

Supervisor: Prof. V. Ramamohan and Prof. Nomesh Bolia, IIT Delhi, DOI

- Discreet stochastic optimisation algorithms are used to optimize hyperparameters in ML algorithms

- Showed application of KN procedure and Stochastic Ruler method in Neural Networks and SVMs
- Developed a Mixed-Integer algorithm for handling continuous hyperparameters without discretization

PROFESSIONAL EXPERIENCE

- Jul 22 - Feb 23 **Computer Vision for Autonomous Maritime Shipping (Internship)**
 ABB Corporate Research Center, Baden-Dättwil, DOI
- Developed a method for vessel attitude estimation from monocular camera in feature-less marine environments.
 - Used a semantic segmentation network for scene understanding and known feature detection (eg. coastline).

PUBLICATIONS

- 2023 Singhal, S., Ao, Y., Maas, D., Arsenali, B., & Maranò, S. (2023). Marine Vessel Attitude Estimation from Coastline and Horizon. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (pp. 6149-6154). DOI
- 2023 Ramamohan, V., Singhal, S., Raj Gupta, A., & Bolia, N. B. (2023). Discrete simulation optimization for tuning machine learning method hyperparameters. Journal of Simulation, 1-21. DOI
- 2021 Singhal, S., & Khatait, J. P. (2021). Modeling of Looping Behavior in a Flexible Instrument Using a Bézier Curve. Journal of Engineering and Science in Medical Diagnostics and Therapy, 4(3), 031003. DOI

TECHNICAL SKILLS

Programming languages and libraries: Python, PyTorch, C++, ROS, LaTeX, MATLAB, Git, Docker, Linux

AWARDS AND RECOGNITIONS

- 2021 • **Excellence Scholarship and Opportunity Programme, ETH Zürich, 2021**
- 2020 • **Institute Silver Medal:** Awarded for highest CGPA amongst **69** students in the MechE Department
- 2019, 2020 • **Semester Merit Awards (4):** Awarded for being in **Top 7%** performers in a semester in the department
- 2019 • **OPJEMS:** Awarded scholarship by Jindal Group for leadership, entrepreneurial excellence and innovation
- **Summer Undergraduate Research Award:** Awarded for a research project by Industrial R&D, IIT Delhi

TEACHING AND VOLUNTEERING

- Feb 24 - May 24 • Teaching Assistant for General Laboratory D-ITET (FS24), ETHZ
- Oct 23 - Feb 24 • Teaching Assistant for Game Theory and Control (HS23), ETHZ
- Mar 23 - Jul 23 • Teaching Assistant for Robotics Summer School (FS23), ETHZ
- Feb 21 - May 21 • Teaching Assistant for undergraduate course in Probability and Statistics, IITD
- Jul 18 - Nov 18 • Student Academic Mentor, Board for Student Welfare, IIT Delhi
- Ensured and fueled progress of 3 students in MTL100 (Calculus) through personal tutoring sessions
- Jul 17 - May 19 • National Service Scheme, IIT Delhi
- Arohan: Volunteered to teach mathematics and mentor 4 underprivileged students for JEE 2018
- Vidya: Taught Mathematics and Physics to Class XII students at KVPY, IIT Delhi campus