Milind Nakul

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Research Interests

My research interests lie at the intersection of **high-dimensional statistics**, **optimization**, and **reinforcement learning**. I am particularly passionate about developing theoretically motivated algorithms to address fundamental challenges in these fields. Recently, my work has focused on creating techniques that enable effective learning from **dependent data**. I have focused on:

1. **Distribution estimation** from dependent samples
2. **Stochastic optimization** for statistical and machine learning
3. **Policy evaluation** in reinforcement learning

Education

Georgia Institute of Technology **Atlanta, US**
PhD in Machine Learning, GPA: 3.85/4, *2023–Present*
Advisors: Prof. Ashwin Pananjday and Prof. Vidya Muthukumar

Indian Institute of Technology Kanpur **Kanpur, India**
M. Tech in Electrical Engineering, CPI: 9.83/10, *2022–2023*
Advisor: Prof. Ketan Rajawat

Indian Institute of Technology Kanpur **Kanpur, India**
B. Tech in Electrical Engineering, CPI: 9.5/10, *2018–2022*
Minor in Machine Learning & Applications
Advisor: Prof. Rohit Budhiraja

Preprints/Publications

Milind Nakul, Vidya Muthukumar, and Ashwin Pananjday. *Estimating stationary mass, frequency by frequency. (arXiv)(Extended abstract at **COLT, 2025**)* .

Milind Nakul, Tianjiao Li, and Ashwin Pananjday. *Multiscale Replay: A Robust Algorithm for Stochastic Variational Inequalities with a Markovian Buffer.* (Under preparation).

Milind Nakul, Anupama Rajoriya, and Rohit Budhiraja. *Variational Learning Algorithms For Channel Estimation in RIS-assisted mmWave Systems.* **IEEE Transactions on Communications**. (IEEE Link)

Experience

Signal Processing in Networks (SPiN) Lab **Kanpur, India**
Graduate Researcher, Supervisor: Prof. Ketan Rajawat *May' 22 - Apr' 23*
Stochastic Gradient based algortihms for imitation learning.

Intelligent Wireless Networks (IWiN) Lab **Kanpuri, India**
Undergraduate Researcher, Supervisor: Prof. Rohit Budhiraja *Jan' 22 - Oct' 22*
Variational Inference for CE in reconfigurable intelligent surface systems.

Cisco Systems **Banglore, India**
Software Engineering Intern, Manager: Rajavel Ganesamoorthy *May' 21 - Jul' 21*
IP Multicast Routers.

Academic Achievements

Awarded **John Morris Fellowship** by H. Milton Stewart School of Industrial & Systems Engineering.

Awarded **Dr. Prateek Mishra Memorial Gold Medal** for the best academic performance in 4-year/5-year programmes of the Electrical Engineering department at IIT Kanpur.

Ranked among the top **10%** among the 150 Dual-Degree students at IIT Kanpur.

Awarded **Pre-Placement** offer by Cisco for demonstrating outstanding analytical & programming skills.

Awarded **Academic Excellence Award** (equivalent to Dean's List) by IIT Kanpur for exceptional academic performance in academic years 18-19, 19-20 and 21-22.

All India Rank 773 in Joint Entrance Examination Advanced, 2018 among 0.2 million applicants.

All India Rank 634 in Joint Entrance Examination Mains, 2018 among 1.2 million applicants.

Secured **Rank 13** in State Level National Talent Search Examination 2015-16 organized by NCERT.

Relevant Courses

Computer Science: Machine Learning Theory, Probabilistic Machine Learning, Online Decision Making, Deep Reinforcement Learning, Data Structures & Algorithms, Fundamentals of Computing.

Mathematics: High-dimensional Statistics, Probability and Statistics, Real Analysis & Multivariate Calculus, Linear Algebra and Differential Equations, Complex Analysis & Partial Differential Equations, Advanced Statistical Methods for Business Analytics.

Engineering: Optimization for Reinforcement Learning, Stochastic Processes, Nonlinear Optimization, Convex Optimization, Machine Learning for Wireless Communications, Digital Signal Processing.

Technical Skills

Languages: Python, C, C++,Matlab, Octave, Java.

Frameworks: OpenAI-Gym, Pytorch, Tensorflow, Keras, SciKit-Learn, Numpy, Pandas, ChainerRL.

Tools: LaTeX, Git, Arduino, Colab, Autodesk Inventor, Fusion

Teaching and Mentorship Activities

Tutor
Course: ISYE 3133 (Engineering Optimization) *Aug' 23 - Apr' 24*

- Assisted professors and conducted weekly tutor sessions for the course.

Teaching Assistant
Course: EE675 (Introduction to Reinforcement Learning) *Jan' 23 - Apr'23*

- Planned the conduct of the course, including logistics, teaching assessment and evaluation for students.
- Guided students projects on various topics in Reinforcement Learning.

Teaching Assistant
Course: EE381 (Electrical Engineering Laboratory) *Aug' 22 - Nov'22*

- Assisted professors and conducted lab sessions and weekly tutorial sessions for the course.

Secretary
Electronics Club IIT Kanpur *May' 19 - Jul' 20*

- Helped with the organization of lectures and workshops for campus interested in the field of **ML** for electronics.
- Guided participants during various competitions and projects organized by **Electronics Club, IIT Kanpur**.
- Worked on project for emulation of quantum algorithms, **Grover's Search Algorithm** and **QFT**, on FPGA.