Shaan Ul Haque

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Research Interests: Reinforcement Learning, Stochastic Approximation, Machine Learning

Education

PhD in Machine Learning, Industrial and Systems Engineering, Georgia Tech, GPA: 4/4 **2022 — present**

– *Advisor: Prof. Siva Theja Maguluri*

Bachelor of Technology, Electrical Engineering, IIT Bombay, GPA: 9.52/10 **2018 — 2022**

– *Minor, Computer Science and Engineering,* IIT Bombay
– *Honours, Electrical Engineering,* IIT Bombay

Intermediate/+2, Science, Delhi Public School, Ranchi, Percentage: 92.7% **2017 — 2018**

Matriculation, Delhi Public School, Ranchi, CGPA: 10/10 **2015 — 2016**

Honour and Awards

- Honorable mention in the 2024 **Alice and John Jarvis Best Paper Award** in ISyE, Georgia Tech
- Recipient of **Stewart Topper Fellowship Award** from ISyE, Georgia Tech
- Recipient of **ISYE Stewart M. Fell Stipend** from ISyE, Georgia Tech
- Awarded **Undergraduate Research Award-01** (URA-01) by IIT Bombay for research on **RADAR Imaging**
- Secured **All India Rank 111** in **JEE Advanced, 2018** among selected 172,000 aspirants
- Bagged a rank of **481** in **JEE Mains, 2018** among 1.2 million students across the whole country
- Stood among the **state wise top 1%** in **National Standard Examination in Chemistry (NSEC)**
- Recipient of fellowship by the **Indian Institute Of Science (IISc), Bangalore** for clearing **Kishore Vagyanik Protsahan Yojana (KVPY)**
- Awarded scholarship by Government of India for clearing **NTSE (National Talent Search Examination)**

Publications

- S. Chandak, **SU Haque**, N. Bambos, "Finite-time Bounds for Two-Time-Scale Stochastic Approximation with Arbitrary Norm Contractions and Markovian Noise", 64th IEEE Conference on Decision and Control, Link
- **SU Haque**, ST Maguluri, "Stochastic Approximation with Unbounded Markovian Noise: A General-Purpose Theorem", Proceedings of The 28th International Conference on Artificial Intelligence and Statistics, PMLR 258:3718-3726, 2025, Link
- **SU Haque**, A. Rajwade, K. Gurumoorthy, "Joint Probability Estimation Using Tensor Decomposition and Dictionaries," 2022 30th European Signal Processing Conference (EUSIPCO), Belgrade, Serbia, 2022, pp. 2226-2230, Link

- **SU Haque**, S. Chandak, F. Chiariotti, D. Gunduz, P. Popovski, "Learning to Speak on Behalf of a Group: Medium Access Control for Sending a Shared Message," in IEEE Communications Letters, vol. 26, no. 8, pp. 1843-1847, Aug. 2022, Link
- S. Sharma, A. Girish, N. Rakhashia, V. M. Gadre, **SU Haque**, A. Ansari, R.B. Pachori, P. Radhakrishna, P. Sahay, "Theoretical Analysis of an Inverse Radon Transform Based Multicomponent Micro-Doppler Parameter Estimation Algorithm," 2022 National Conference on Communications (NCC), Mumbai, India, 2022, pp. 70-75, Link

Pre-prints and Submissions

- G. G. Anil, **SU Haque**, N. Kannen, D. Nagaraj, K. Shanmugan, S. Shakottai, "Fine-Tuning Diffusion Models via Intermediate Distribution Shaping", arXiv:2510.02692 , Submitted
- **SU Haque**, S. Khodadadian, ST Maguluri, "Tight Finite Time Bounds of Two-Time-Scale Linear Stochastic Approximation with Markovian Noise", arXiv:2401.00364 , Submitted to a Journal (Honourable Mention in the 2024 Alice and John Jarvis Best Paper Award)
- S Zhang, Z Zhang, Z Chen, **SU Haque**, ST Maguluri, "A non-asymptotic theory of seminorm Lyapunov stability: From deterministic to stochastic iterative algorithms", arXiv:2502.14208, Submitted to a Journal

Research Experience

- **DeepMind, Google, India**: Student Research Intern — Feb 2025 — Aug 2025
  - Proposed a provably efficient method for fine-tuning flow-based models for image generation.
- **Georgia Institute of Technology**: Graduate Research Assistant (GRA) — Aug 2022 — Present
  - Developing methods to provide non-asymptotic performance guarantees for various machine learning algorithms through the lens of stochastic approximation.
- **Aalborg University, Denmark**: Summer Intern — May 2021 — Aug 2021
  - Designed a learning scheme for multi-agent communication over a shared collision channel.

Invited Talks

- "Inverse Noise Correction for Flow Models", INFORMS Annual Meeting, October 2025 (Slides)
- "Stochastic Approximation with Unbounded Markovian Noise: A General-Purpose Theorem", INFORMS Annual Meeting, October 2024 (Slides)
- "Tight Finite Time Bounds of Two-Time-Scale Linear Stochastic Approximation with Markovian Noise", ACO Student Seminar, April 2024 (Slides)
- "Tight Finite Time Bounds of Two-Time-Scale Linear Stochastic Approximation with Markovian Noise", DCL Student Symposium 2024, February 2024 (Slides)

Teaching Experience

- **ISyE 2027 (TA) -** Probability with Applications
  - Instructor: Prof. Sigrun Andradottir, Spring 2023
  - Instructor: Prof. Robert Foley, Fall 2022

Professional Service

- Reviewed papers for the following journals:
  - INFORMS Mathematics of Operations Research (Math of OR)
  - Journal of Machine Learning Research (JMLR)
  - Neurocomputing (NEUCOM)
- Reviewed papers for the following conferences:
  - International Conference on Artificial Intelligence and Statistics (AISTATS)
  - Learning for Dynamics & Control Conference (L4DC)
  - Conference on Decision and Control (CDC)

Student Mentoring

- **Puneet Bagga, Sushanth Malipati** - Fall 2024
  - Sample complexity analysis for stochastic approximation of non-expansive operators.
- **Pranay Begwani, Akhter Abdullah Tahmid** - Fall 2024
  - Single-time scale vs two-time-scale: Finite-time performance comparison.

Key Courses

- **Machine Learning-** Machine Learning: Theory and Methods, Mathematical Foundations of Machine Learning, Advanced Machine Learning, Foundations of Intelligent and Learning Agents, Advanced Algorithms for Image Processing
- **Optimization and Algorithms-** Optimization for Reinforcement Learning, Linear Programming, First order methods in optimization for Machine Learning, Design and Analysis of Algorithms
- **Mathematics and Statistics-** Stochastic Processes 1, Theoretical Statistics, Real Analysis, Introduction to Stochastic Optimization, Advanced Probability and Random Processes

Technical Skills

- **Programming Languages and Libraries -** C++, Python, TensorFlow, SciPy, NumPy, PuLP, MATLAB
- **Deep Learning -** CNNs, RNNs, GANs, Deep Q-Networks, Auto Encoder Models

Position of responsibilities

- **Organizing Assistant | AI4OPT, Georgia Tech** [Aug ’23 - Dec ’23]
  Assited in organizing 15+ weekly seminar series for AI4OPT
- **Activity Associate | Green Campus, National Service Scheme(NSS), IITB** [Apr ’19 - Apr ’20]
  Mentored 100+ volunteers with a team of 7 members for the rejuvenation of ecosystem of the institute