Apoorva Narula

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Google Scholar: https://scholar.google.com/citations?user=cupIUlIAAAAJ

EDUCATION

Georgia Institute of Technology, Atlanta, GA — Aug 2024 – May 2028 (Expected)
Ph.D., Industrial Engineering (GPA: 4.0/4.0)
Research interests: Mixed-Integer Programming, Change-point detection.

Indian Institute of Technology (IIT) Delhi, India — Jul 2019 – May 2024
B.Tech., Production & Industrial Engineering (GPA: 9.29/10)
Institute Silver Medalist – Highest CGPA in B.Tech. cohort
M.Tech., Industrial Engineering (GPA: 9.81/10)
Highest CGPA in M.Tech. cohort - IIIE Cash Award

SKILLS

Optimization/Operations Research: Mixed-integer programming, Change-point detection, Discrete event simulation, Simulation optimization.
Programming: Python (Gurobi, Pandas, NumPy, scikit-learn, Keras), MATLAB, C++
Data Science: Hands-on experience in training Deep Learning Models (LSTMs, RNNs, Transformers) and time series analysis.

WORK EXPERIENCE

Georgia Institute of Technology, Atlanta, GA — Spring 2026
Graduate Teaching Assistant

- Conducting office hours, developing grading rubrics, and evaluating assignments for a graduate-level course on Foundations of Modern Data Science for 30 students.

Georgia Institute of Technology, Atlanta, GA — Fall 2025
Graduate Teaching Assistant

- Conducting office hours, developing grading rubrics, and evaluating assignments for a graduate-level course on Regression Methods for 35 students.

Argonne National Laboratory, Lemont, IL — Summer 2025
Research Aide (PhD)

- Built predictive interpretable models linking historical power outages with meteorological and environmental covariates to inform grid resilience planning.

Georgia Institute of Technology, Atlanta, GA — 2024 – 2025
Graduate Student Tutor

- Held weekly tutoring sessions in undergraduate statistics and optimization methods. Created sample problems and solution walkthroughs.

Indian Institute of Technology (IIT) Delhi, New Delhi, India — 2022 – 2024
Teaching Assistant

- Assisted with undergraduate optimization courses; held weekly recitations, graded assignments for about 150 students.

Tata Institute of Fundamental Research (TIFR), Mumbai, India — Summer 2023; Summer 2021
Research Assistant

- Trained deep learning sequence models to predict rainfall by leveraging both spatial context (neighboring weather patterns) and temporal context (historical trends at the target location); achieved 22–27% lower error for 1–3 day forecasts across India compared to the highly cited High-Resolution Forecast System (HRES) of the European Centre for Medium-Range Weather Forecasts (ECMWF).
- Modeled oxygen demand–supply gaps across districts during the COVID-19 waves.

RESEARCH EXPERIENCE

Mixed-Integer Programming for Change-Point Detection — Ongoing

- Created mixed integer programming formulations with tighter LP relaxations for change-point detection in multi-dimensional data; faster convergence to global optimal solution than existing benchmarks.
- Applications: interpretable segmentation for transportation analytics, energy demand forecasting, reliability analysis.

Minimal-Contact Routing of Randomly Arriving Agents — 2022 – 2024

- Designed robust optimization mixed integer formulations to minimize congestion and maximizing throughput in dynamic logistics networks under uncertainty.
- Applications: Warehousing applications; routing automated guided vehicles (AGVs).

Approximation Algorithms for Optimized Scheduling 2022 – 2023

- Studied Open Shop Scheduling; proved NP-hardness for the Data Migration problem on trees with arbitrary edge lengths.
- Applications: Resource sharing and transportation; scheduling trucks under driver feasibility constraints and other similar allocation problems.

Sentiment-driven Stock Prediction 2021 – 2022

- Used Deep Learning sequence models and word embeddings to model stock movement based on Twitter microblogs.
- Applications: Time series trend prediction, based on analysis of textual context.

TALKS & POSTERS

INFORMS Optimization Society Conference 2026, Atlanta, GA March 2026

Invited Talk: *Mixed-Integer Programming (MIP) for Changepoint Detection*

Session: *Applications of Stochastic Programming in Machine Learning*

- Presented a strengthened MIP framework for offline multiple change-point detection via globally optimal piecewise linear fitting. Established LP relaxations with integral projections onto segment-assignment variables for provably tighter bounds. Extended methodology to multidimensional and sparse change-point detection settings, demonstrating significant computational gains under both ℓ_1 and ℓ_2 losses relative to state-of-the-art MIP formulations.

INFORMS Annual Meeting 2025, Atlanta, GA October 2025

Invited Talk: *Spatio-Temporal Statistical Analysis of Power Grid Resilience to Extreme Weather Conditions*

- Presented research integrating spatial and meteorological predictors to explain and forecast power grid outage resilience across the Southeastern U.S.

NeurIPS ML×OR Workshop: Mathematical Foundations and Operational Integration of Machine Learning for Uncertainty-Aware Decision-Making, San Diego, CA December 2025

Poster: *Mixed Integer Programming for Change-point Detection*

- Showcased tighter mixed integer programming formulations for change-point detection, with faster runtimes than benchmark formulations.

NeurIPS Workshop: Tackling Climate Change with Machine Learning, San Diego, CA December 2025

Poster: *Deep learning for short-range monsoon rainfall forecast using ground truth rainfall data*

- Achieved 22–27% lower error for 1–3 day forecasts across India compared to the highly cited High-Resolution Forecast System (HRES) of the European Centre for Medium-Range Weather Forecasts (ECMWF).

AWARDS & SCHOLARSHIPS

Stewart Fellowship (Georgia Istitute of Technology - Fall 2024 and Spring 2025); DAAD WISE Scholar (Kiel University); NTSE scholar (National Talent Search Examination, among selected 1000 scholarship winners out of approximately 3 million aspirants); KVPY rank 278 (National Science Fellowship, selected out of approx 1M applicants); JEE Main (Joint Entrance Examination Main, 1.2M applicants): 99.87 percentile; qualified JEE Advanced (next stage of JEE Main), securing admission to IIT Delhi; CBSE National Certificate of Merit (100% Score in Computer Science Exam; 96% aggregate across all subjects including Chemistry, Phsyics, Mathematics and English).

PAPERS & PRE-PRINTS

[1] Apoorva Narula, Santanu S. Dey, and Yao Xie. *Mixed-Integer Programming for Change-point Detection*. 2026. arXiv: `2602.11947 [math.OC]`. URL: `https://arxiv.org/abs/2602.11947`.

[2] Apoorva Narula, Aastha Jain, Jatin Batra, MN Rajeevan, and Sandeep Juneja. *Comparing skill of historical rainfall data based monsoon rainfall prediction in India with NWP forecasts*. 2025. arXiv: `2402.07851 [cs.LG]`. URL: `https://arxiv.org/abs/2402.07851`.

EXTRA CURRICULAR ACTIVITIES

Georgia Institute of Technology, Atlanta, GA 2025 – Present

Bee Well Student Ambassador

- Supporting graduate student well-being by organizing student community events.

Rohini Ghadhiok Foundation, New Delhi, India 2017 – 2018

Volunteer Teacher

- Taught English and Mathematics to underprivileged children; designed engaging practice modules.