Apoorva Narula

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Google Scholar: https://scholar.google.com/citations?user=cupIUlIAAAAJ
Personal Webpage: https://apoorvagor.github.io

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, Scalable Optimization.

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

PhD RESEARCH SUMMARY

My PhD research focuses on developing scalable optimization methods for change-point detection in time-series data. In many datasets and applications (such as manufacturing quality control, sensor-based monitoring, and climatology), changes do not always appear as abrupt jumps; instead, signals may begin to increase or decrease at a different rate, resulting in more subtle slope changes that can be difficult to detect. We develop optimization-based methods for detecting such changes through continuous piecewise-linear fitting. For the offline multiple slope-change problem, where a univariate time series undergoes multiple changes in trend, we develop strengthened mixed-integer programming formulations for optimally partitioning the time domain into contiguous linear segments while maintaining continuity at the breakpoints. We also study slope-change detection in high-dimensional time series, where multiple signals may share a single common change point. For this setting, we establish polynomial-time solvability under several error norms and develop scalable domain-reduction techniques for solving sparse and non-sparse variants in very high dimensions. Overall, my research combines discrete optimization, statistical learning, algorithmic techniques, and parallel computation to develop change-point detection methods with theoretical guarantees and strong computational performance.

PAPERS & PRE-PRINTS

[1] Apoorva Narula, Santanu S. Dey, and Yao Xie. *Change-Point Detection via Piecewise Linear Fitting Using MIP*. Submitted to INFORMS Journal on Computing. Aug. 2026. arXiv: `2602.11947 [math.OC]`. URL: `https://arxiv.org/abs/2602.11947`.

SKILLS

Operations Research: Mixed-integer programming, change-point detection, discrete event simulation.
Data Science: Hands-on experience in training deep learning models and time series analysis.
Programming: Python, Gurobi, C++, MPI

WORK EXPERIENCE

Georgia Institute of Technology, Atlanta, GA — Fall 2024 – Fall 2026
Graduate Teaching Assistant

- Teaching Assistant for Deterministic Optimization, Foundations of Modern Data Science, and Regression, with class sizes varying from 20 to 150 students.

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

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

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

- Assisted with undergraduate optimization courses through weekly recitations and assignment grading for approximately 150 students.

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

- Summer 2023: Developed deep learning models using spatial and temporal weather patterns for rainfall prediction, achieving 20% lower error than ECMWF-HRES for 1–3 day forecasts across India.
- Summer 2021: Modeled district-level oxygen demand–supply gaps during the COVID-19 pandemic.

PAST RESEARCH EXPERIENCE

Minimal-Contact Routing of Randomly Arriving Agents B.Tech. Thesis, Prof. Varun Ramamohan, IIT Delhi

- Developed robust mixed-integer optimization models for congestion-aware routing and throughput maximization in dynamic logistics networks, with applications to AGV routing.

Approximation Algorithms for Optimized Scheduling Independent Research, Prof. Naveen Garg, IIT Delhi

- Studied approximation algorithms for Open Shop Scheduling and proved NP-hardness of the Data Migration problem on trees with arbitrary edge lengths, with applications to resource allocation and scheduling.

Sentiment-Driven Stock Prediction Independent Research, Prof. Kiran Seth, IIT Delhi

- Developed deep learning sequence models using word embeddings and Twitter sentiment to predict stock-market trends from textual information.

TALKS & POSTERS

2026 NeurIPS ML×OR Workshop, Atlanta, GA December 2026
Poster: *Very High-Dimensional Slope Change Detection with Guarantees*

2026 INFORMS Annual Meeting, San Francisco, CA November 2026
Invited Talk: *Mixed-Integer Programming for Slope Change Detection*

2026 ML@GT Student Conference, Atlanta, GA October 2026
Poster: *Change-Point Detection via Piecewise Linear Fitting Using MIP*

2026 Georgia Statistics Day, Atlanta, GA October 2026
Poster: *Mixed-Integer Programming for Change-Point Detection*

2026 MIP Society Workshop, Stamford, CT May 2026
Poster: *Mixed-Integer Programming for Change-Point Detection*
Best Poster Competition Finalist; Travel Grant Award

2026 INFORMS Optimization Society Conference, Atlanta, GA March 2026
Invited Talk: *Mixed-Integer Programming for Change-point Detection*

2025 NeurIPS ML×OR Workshop, San Diego, CA December 2025
Poster: *Mixed-Integer Programming for Change-Point Detection*

2025 NeurIPS Workshop on 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*

2025 INFORMS Annual Meeting, Atlanta, GA October 2025
Invited Talk: *Spatio-Temporal Statistical Analysis of Power Grid Resilience to Extreme Weather Conditions*

AWARDS & SCHOLARSHIPS

Stewart Fellowship (Georgia Institute 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 3M 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, Physics, Mathematics and English).

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.