

Neha

Final Year Ph.D. Candidate | Operations Management | Carnegie Mellon University
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PROFESSIONAL SUMMARY

Final-year Ph.D. candidate in Operations Management at Carnegie Mellon University, working at the intersection of optimization, machine learning, and sequential decision-making. Research focuses on data-driven decision-making in transportation, logistics, resource allocation, and consumer-facing systems, with an emphasis on developing predictive and prescriptive models to support operational and business decisions.

TECHNICAL SKILLS

Languages: Python, C++, Java, C, R, MATLAB

Optimization & OR Tools: Gurobi, Gurobi-machinelearning, CPLEX, Google OR-Tools

Machine Learning & Data Science: PyTorch, Scikit-learn, Pandas, SQL, Tableau, Simulation, Statistical Modeling

Transportation & Geospatial Tools: OpenStreetMap (OSM), Google Maps APIs

Software Development & APIs: Android development, backend API integration, Postman, Git, Jira

EDUCATION

Carnegie Mellon University, Tepper School of Business

Ph.D. in Operations Management | Minor in Operations Research | GPA: 3.77/4.0

Pittsburgh, Pennsylvania

August 2021 – May 2026

Carnegie Mellon University, Tepper School of Business

M.S. in Operations Management | GPA: 3.77/4.0

Pittsburgh, Pennsylvania

August 2019 – August 2021

Indian Institute of Technology, Kharagpur (IIT-KGP)

Integrated B.S. & M.S. in Mathematics & Computing | GPA: 8.7/10

Kharagpur, India

July 2011 – July 2016

ACADEMIC DISTINCTIONS & AWARDS

- Awarded the William W. Cooper Doctoral Dissertation Award, 2026.
- Awarded William Larimer Mellon Fellowship support, 2019–2024.
- Awarded the Mitacs Globalink Fellowship Grant, 2015.
- Received the INSPIRE Scholarship and mentorship grants from the Department of Science & Technology, Government of India, for outstanding academic performance, 2012–2016.
- Consistently ranked among the top three students in the Mathematics department across ten semesters at IIT-KGP.
- Earned a branch change to Mathematics, a competitive option granted to top-ranked first-year students at IIT-KGP.

Ph.D. RESEARCH

Optimizing School Bus Pickups with Third-Party Coordination and Delay Prediction

Advisors: Prof. Peter Zhang, Prof. Holly Wiberg

Summer 2023 – Fall 2025

- Developed a data-driven predict-then-optimize framework for tactical school bus delay management under traffic- and weather-related delays.
- Developed class-imbalance-aware machine learning models integrating school bus delay, traffic, and weather data to produce reliable delay predictions despite heavy zero-delay skew and missing contextual data.
- Embedded route-level delay forecasts into a cost-aware optimization model for third-party driver deployment within the existing school bus route structure.
- Evaluated the robustness of the framework using NYC school bus delay data, showing how forecast quality, cost assumptions, budget limits, and student-service priorities affect downstream deployment decisions.

Conditional Promotion Offers to Encourage Loyalty

Advisor: Prof. Alan Montgomery

Summer 2021 – Summer 2023

- Built a dynamic programming model comparing threshold-based promotions (“spend \$X to earn \$R”) against traditional discounts, with profitability driven by consumer demand, outside options, and margins.
- Designed repeated-campaign simulations with Thompson sampling to show that threshold-based offers can generate sharper preference signals and improve learning when they shift spending behavior.
- Derived closed-form conditions under which qualification-based rewards outperform per-transaction discounts – applicable to credit card sign-up bonuses, loyalty programs, and subscription growth incentives.

School Bus Sharing Across School Districts

Advisors: Prof. Peter Zhang, Prof. Hai Wang, Prof. John Hooker

Summer 2020 – Summer 2021

- Developed an analytical framework using continuous TSP/VRP approximations to characterize when transportation pooling across school districts reduces operating cost.
- Derived a closed-form critical-distance condition that serves as a lightweight screening rule for collaboration candidates, applicable without solving the underlying routing problem.
- Validated theoretical predictions through Tabu Search simulations across multiple demand patterns, quantifying a three-way trade-off among fleet size, route length, and student ride burden.

PAST EMPLOYMENT

Indian Institute of Science (IISc)

May 2018 – June 2019

Project Associate | Centre for Infrastructure, Sustainable Transportation and Urban Planning

Bangalore, India

Mentor: Prof. Tarun Rambha

Xerox Research Centre India (XRCI)

July 2016 – April 2018

Research Engineer | Algorithms and Optimization Group

Bangalore, India

Mentor: Dr. Koyel Mukherjee

PATENTS & PAPERS

- Optimizing School Bus Pickups with Third-Party Coordination and Delay Prediction. *In preparation for submission to Transportation Research Part C.*
- School Bus Sharing Across School Districts. *Working paper.*
- Conditional Promotion Offers to Encourage Loyalty. *Working paper.*
- **N. Singh**, T. Rambha: “Offline Optimization of Cab Supply for Ride-Sharing Applications using Hypergraph Matching.” Accepted for publication in *World Conference on Transport Research*, 2019.
- U.S. Patent, 20180003US01: “Method and system for dynamic trust model for personalized recommendation system in shared and non-shared economy,” filed November 2018.

RELEVANT COURSEWORK

Optimization & OR: Linear Programming, Integer Programming, Non-Linear Programming, Convex Optimization, Dynamic Programming, Operations Research, Markov Decision Processes

Probability, Statistics & Choice Modeling: Stochastic Processes, Intermediate Statistics, Bayesian Statistics, Causal Inference, Discrete Choice Theory

Machine Learning & Algorithms: Machine Learning, Probabilistic Graphical Models, Convex Optimization for Machine Learning, Design & Analysis of Algorithms, Graph Theory and Algorithms

SELECTED RESEARCH PROJECTS BEFORE Ph.D.

Improved Matching and Routing Algorithms for Ride Sharing

May 2018 – June 2019

Indian Institute of Science | Mentor: Prof. Tarun Rambha

Bangalore, India

- Developed a scalable lower-bound framework for minimum fleet sizing in pooled ride-hailing for known short-term ride demand, using a tractable relaxation of the NP-hard Dial-a-Ride Problem (DARP).
- Modeled feasible pooled trips as a non-uniform hypergraph using a divide-and-conquer framework, and formulated the relaxed fleet-sizing problem as a set-partitioning ILP.
- Designed a custom branch-and-price algorithm with a CPLEX backend to manage the combinatorial explosion of feasible pooled-trip columns.
- Benchmarked against DARP heuristics on the NYC yellow-taxi dataset, scaling to trip volumes beyond the reach of direct ILP formulations.

Dynamic Trust Model for Ride Recommendation in Shared Environment

January 2018 – April 2018

Xerox Research Centre India | Mentor: Saurabh Srivastava

Bangalore, India

- Built a TrustCircle model using ground-truth data collected on user preferences for taking different rides.
- Designed ride recommendation as a contextual multi-arm bandit problem and modified LinUCB algorithm to solve it.
- Trained the model to learn preferences through user feedback on previous recommended rides in an online fashion.
- Validated the model using cumulative regret and the Frobenius norm of estimated parameters versus actual parameters.

XhareCost: Online Strongly Individual Rational Cost-Sharing Scheme

October 2016 – March 2017

Xerox Research Centre India | Mentors: Prof. Ragavendranan Gopalakrishnan

Bangalore, India

Dr. Koyel Mukherjee | Raja Subramaniam Thangaraj

- Implemented a fair pricing model that included disutility costs to account for inconveniences in ride sharing.
- Estimated optimal values for model parameters through simulations on different datasets.
- Added the validated pricing module within the GoCity trip-planning applications.

CommuteShare: Offline Scheduling & Routing of Cabs for Employee Commute July 2016 – October 2016*Xerox Research Centre India* | Mentors: Dr. Koyel Mukherjee, Raja Subramaniam Thangaraj

Bangalore, India

- Used employee travel information to design an integer linear program with constraints on detours, time windows, and individual rationality.
- Optimized cab supply required to serve employee commute demand under operational and service-quality constraints.
- Observed superior results on Denver city data compared with the routing algorithm of Lyft rideshare.

Triad Prediction in Social Network

August 2015 – March 2016

Master's Thesis, Indian Institute of Technology, Kharagpur | Mentor: Prof. Bibhas Adhikari

Kharagpur, India

- Proposed new similarity measure leveraging network-structure information to predict triad formation in social networks.
- Validated the measure on a 1-week Twitter dataset and characterized triadic closure patterns in the network structure.