

# Debojjal Bagchi

Doctoral Student and Graduate Research Assistant  
Maseeh Department of Civil, Architectural, and Environmental Engineering  
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## EDUCATION

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### Doctor of Philosophy 2025–2027

The University of Texas at Austin  
*Major:* Civil Engineering (Transportation)  
*GPA:* 4.00 / 4.00  
*Advisor:* Dr. Stephen D. Boyles

### Master of Science in Engineering (Thesis) 2023–2025

The University of Texas at Austin  
*Major:* Civil Engineering (Transportation)  
*GPA:* 4.00 / 4.00  
*Advisor:* Dr. Stephen D. Boyles

### Bachelor of Science (Research) 2019–2023

Indian Institute of Science, Bengaluru  
*Major:* Earth & Environmental Science, *Minor:* Mathematics  
*GPA:* 8.7 / 10 (*Major GPA:* 9.4 / 10 )  
*Advisor:* Dr. Tarun Rambha

## PROFESSIONAL SERVICE

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- **Committee Member**, Transportation Research Board (TRB) Standing Committee AT014 on Inter-modal Freight and Truck Transportation (2025–2028).
- **Committee Member**, Transportation Research Board (TRB) Standing Committee AW010 on Ports and Channels (2025, prior to restructuring).

## THESIS

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[D2] **MS thesis:** Error bounds for stochastic user equilibrium traffic assignment. [[Link](#)]

*Advisor:* Dr. Stephen D. Boyles  
*The University of Texas at Austin*

[D1] **Undergraduate thesis:** Energy efficient and safe routing for last mile logistics. [[Link](#)]

*Advisor:* Dr. Tarun Rambha  
*Indian Institute of Science, Bengaluru*

## RESEARCH EXPERIENCE

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### Graduate Research Assistantship

Sept 2023 – Dec 2024

“Data-Driven Multimodal Freight Modeling for Waterways and Port” sponsored by Coastal and Hydraulics Laboratory, US Army Corps of Engineers ERDC, *PI: Dr. Stephen Boyles*

- Part of the research team that processed and integrated data from multiple transport modes.
- Identified bottlenecks in multimodal freight networks through discrete event simulation.
- Simulated disruption scenarios to examine resilience and recovery bottlenecks.
- Proposed a queueing theory based model for defining operating capacity in multimodal port networks.

### MITACS Globalink Research Internship

May 2022 – Aug 2022

“Integrating Waste and Resource Management: Data-Driven Optimization of Urban Mining Logistics” sponsored by MITACS at Université du Québec à Trois-Rivières, *PI: Dr. Amina Lamghari*

- Performed an extensive literature review of heuristics for Reverse Logistics (RL) network design problems including Tabu Search, Simulated Annealing, and Bee Colony Optimization.
- Developed a scenario-based Mixed Integer Linear Program (MILP) formulation for the RL network design problem under uncertainties for wood industries of Quebec.
- Developed an Adaptive Large Neighbourhood Search (ALNS) heuristic for the RL network design problem and introduced the concept of adaptive neighborhoods.
- Solved the MILP using CPLEX and implemented the ALNS heuristic in Python.

### Undergraduate Research

July 2021 – July 2023

“A Local Search Heuristic for the Bi-criteria Steiner Traveling Salesman Problem with Time Windows (BSTSPTW)” at the Indian Institute of Science, Bengaluru, India, *PI: Dr. Tarun Rambha*

- Performed extensive literature review of existing heuristic algorithms for the Traveling Salesman Problem, including Pareto Local Searches, Lin-Kernighan Heuristic, and r-opt.
- Developed and implemented two brute-force exact methods for the Bi-Objective Steiner Traveling Salesman Problem with Time Windows (BSTSPTW).
- Formulated a new scalarization-based Mixed Integer Program (MIP) formulation for BSTSPTW using a single commodity flow based formulation and implemented it using CPLEX.
- Proposed a novel local search-based heuristic with six operators that performs better than an adapted version of Lin-Kernighan-Helsgaun (LKH) Heuristic.
- Benchmarked results on real world instances focusing on Amazon delivery routes in Austin, US.

## PUBLICATIONS

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- [M1] Agarwal, P.<sup>†</sup>, **Bagchi, D.**<sup>†</sup>, Rambha, T., and Pandey, V. (2024). A Bi-criterion Steiner Traveling Salesperson Problem with Time Windows for Last-Mile Electric Vehicle Logistics. *Computers & Operations Research*. Under review (minor revisions). [\[Code\]](#)[\[Preprint\]](#)

<sup>†</sup> Equal contribution

## CONFERENCE PRESENTATIONS

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- [C8] Robbennolt, J., **Bagchi, D.** and Boyles, S. D. (2025). Localized Queue Spillback with Uncertain Demand. *Accepted in 10th International Symposium on Dynamic Traffic Assignment (DTA2025)*, Salerno, Italy
- [C7] **Bagchi, D.** and Boyles, S. D. (2025). Error bounds for stochastic user equilibrium traffic assignment. *Accepted in 12th Triennial Symposium on Transportation Analysis conference (TRISTAN XII)*, Okinawa, Japan

- [C6] **Bagchi, D.**, Bathgate, K., and Boyles, S. D. (2025). A queuing-theory-based operating capacity model for multimodal port operations. *in Transportation Research Board 104th Annual Meeting 2023 (TRB)*, Washington, D.C., USA. (Lectern session)
- [C5] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. (2025). Use of AIS data to characterize vessel mix in Houston port operations for simulation. *in Transportation Research Board 104th Annual Meeting 2023 (TRB)*, Washington, D.C., USA. (Lectern session)
- [C4] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. (2024). Identifying capacities in a multimodal maritime freight network. *in Institute for Operations Research and the Management Sciences Annual Meeting 2024 (INFORMS)*, Seattle, USA. (TSL Invited session)
- [C3] **Bagchi, D.**, and Boyles, S. D. (2024). Error Bounds for Stochastic User Equilibrium Traffic Assignment. *in Institute for Operations Research and the Management Sciences Annual Meeting 2024 (INFORMS)*, Seattle, USA. (TSL Invited session)
- [C2] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2023). A Local Search Heuristic for Bi-criterion Steiner Traveling Salesman Problem. *in Transportation Research Board 102nd Annual Meeting 2023 (TRB)*, Washington, D.C., USA.
- [C1] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2022). A Local Search Heuristic for Bi-criterion Steiner Traveling Salesman Problem. *in Institute for Operations Research and the Management Sciences Annual Meeting 2022 (INFORMS)*, Indianapolis, USA.

## WORKING PAPERS

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- [W8] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. Resilience metrics for characterizing hurricanes in ports.
- [W7] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. Characterizing anchorage queue dynamics due to channel fog closures at the Port of Houston.
- [W6] **Bagchi, D.** and Boyles, S. D. A dynamic ultimate capacity framework for seaport systems.
- [W5] **Bagchi, D.** and Boyles, S. D. A simulation framework for modelling multimodal port operations with a case study on the Port of Houston — A throughput curve approach.
- [W4] **Bagchi, D.** and Boyles, S. D. Error bounds for stochastic user equilibrium traffic assignment.
- [W3] Robbennolt, J., **Bagchi, D.**, and Boyles, S. D. Localized queue spillback with uncertain demand.
- [W2] **Bagchi, D.**, Bathgate, K., and Boyles, S. D. A queueing-theory-based operating capacity model for multimodal port operations.
- [W1] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. Use of AIS data to characterize vessel mix in Houston port operations for simulation.

## TECHNICAL PRESENTATIONS AND POSTERS

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- [T2] Bathgate, K., **Bagchi, D.**, and Boyles S. D (2024, October). Simulation methods for measuring multimodal maritime freight system capacity, and resilience: A case study at the Port of Houston. *Presented in UT Austin Center for Transportation Research Annual Symposium, 2025*, Austin, USA.
- [T1] Bathgate, K., **Bagchi, D.**, and Boyles S. D (2024, October). Data-Driven Modeling for Multimodal Port Resilience Assessment. *Presented in UT Austin Center for Transportation Research Annual Symposium, 2024*, Austin, USA.

## OPEN SOURCE PROJECTS

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- [P2] **Major contributor** (one of two primary developers), Data-driven multimodal freight simulation framework for waterways and ports. [\[Code\]](#) [\[Documentation\]](#) [\[Technical manual\]](#)
- [P1] **Major contributor** (one of two primary developers), Safe and energy-efficient routing of last-mile electric freight vehicles. [\[Code\]](#)

## SKILLS AND INTERESTS

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- **Research interests:** Freight and maritime logistics, traffic assignment, congestion pricing.
- **Technical skills:** Optimization, discrete event simulation, machine learning, data analysis, operations research, mathematical programming, Markov Decision Processes, reinforcement learning.
- **Programming Languages:** Python, C, Julia, GAUSS, SQL.
- **Software and Libraries:** SimPy, CPLEX, OR-Tools, OSMnx (OpenStreetMap), NetworkX, TensorFlow, Pandas, NumPy, Scikit-learn, Matplotlib, Plotly, Streamlit, SciDavis, MS Office, SymPy, L<sup>A</sup>T<sub>E</sub>X, Git, GAMS, MicroStation, CORSIM.

## AWARDS AND CERTIFICATIONS

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- **Professional development award** from Graduate School, UT Austin (2025).
- **Certified engineering teaching assistant** from Cockrell School of Engineering, UT Austin (2025).
- **Graduate school fellowship** awarded by UT Austin Graduate School (2023-2027).
- **Institute gold medal** awarded by Indian Institute of Science for best performance in 4-year Bachelor of Science (Research) in Earth and Environmental Science (2023).
- **MITACS Globalink Research Internship (GRI)** awarded by MITACS, Canada (2022).
- **Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship** awarded by Department of Science and Technology, Government of India (2019-2023).
- Awarded “Special Honor” in category “Academic excellence by a student” in The **Telegraph School Awards** (2019).
- Awarded **Dhirubhai Ambani scholarship** by Reliance Foundation (2019).
- **Jagadish Bose National Talent Search (JBNSTS) fellowship** (2018).
- **National Talent Search (NTSE) Scholarship** awarded by National Council of Education Research and Training, India (2017).

## TEST SCORES

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- Graduate Record Examination (GRE) – 155/170 (Verbal Reasoning), 167/170 (Quantitative Reasoning), 4.0/6.0 (Analytical Writing), 2023.
- Test of English as a Foreign Language (TOEFL) iBT Test – 29/30 (Reading), 29/30 (Listening), 26/30 (Writing), 25/30 (Speaking), 109/120 (Overall), 2023.
- All India Rank 40 in National Creativity Aptitude Test (NCAT), 2020.
- 99.3 percentile score in Joint Entrance Examination (Main) out of 1.5 million candidates, 2019.
- Among top 1% in Joint Entrance Examination (Advanced) out of 120 thousand candidates, 2019.
- 96% in All India Senior School Certificate Examination (12th Board examination), 2019.
- CGPA 10/10 in All India Secondary School Examination (10th board examination), 2017.

## TEACHING EXPERIENCE

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### CE 311S Probability and Statistics for Civil Engineers

*Teaching Assistant, University of Texas at Austin, Spring 2025, Fall 2025*

- Consolidated feedback rating 4.02 / 5.00 (Spring 2025) across seven parameters.
- Assisted with major course redesign.
- Led two weekly discussion and recitation sections of 20 students each.

## MENTORING EXPERIENCE

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### Undergraduate students mentored

- Dylan Croteau (2024-2025)

## REFeree SERVICE

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### Journal Referee

- Transportation Research Part B (2 reviews).

### Conference Referee

- Transportation Research Board Annual Meeting (8 reviews).

## COURSEWORK

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- **Transportation:** Public transportation, traffic engineering, discrete choice modeling, transportation network analysis, dynamic traffic assignment, railway project design & construction.
- **Operations research and mathematics:** Linear programming, non-linear programming, optimization, Markov decision processes, game theory, introduction to computing for AI & ML, linear algebra, real analysis.

## Co-CURRICULAR ACTIVITIES

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- **Spanish Guitar:** Diploma with first-division distinction from Nikhil Bharat Sangeet Samiti.
- **Chess:** Member of All India Chess Federation, peak stable Lichess ratings ([@debojjalb](#)): 1423 (Rapid), 1453 (Blitz), 1175 (Bullet), 1502 (Puzzels).

## LEADERSHIP ROLES

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- Co-founded [CoachIO](#), an ed-tech startup to provide affordable boot-camp courses to KVPY and Olympiad aspirants across India. Managed a team of 9 members with gross revenue over 5 lakh INR.
- Coordinated and sourced funding for [Quadspark](#), a national level quiz competition as a part of Pravega, IISc, Bengaluru. The event witnessed 1200+ participants and was held in 3 stages.
- Content creator on personal YouTube channel [Debojjal Bagchi](#). The channel currently has over 10k subscribers and 1M+ views.