# Debojjal Bagchi

Doctoral Student and Graduate Research Assistant
Maseeh Department of Civil, Architectural, and Environmental Engineering
The University of Texas at Austin
Ernest Cockrell Jr. Hall (ECJ) 6.202
301 E. Dean Keeton St.
Austin, TX, 78712-1172

**Cell:** 737-304-9684
**Email:** debojjalb@utexas.edu
**Web:** debojjalb.github.io/

## Education

### Doctor of Philosophy — 2023–2027
The University of Texas at Austin
*Major:* Civil Engineering (Transportation Systems and Operations Research)
*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 Systems and Operations Research)
*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 / 10.0); **Institute gold medal for highest major GPA**
*Advisor:* Dr. Tarun Rambha

## Professional Service

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

## Research Experience

### 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 Research and Development Center, *PI: Dr. Stephen Boyles*

- Processed and integrated multimodal transportation data from AIS vessel tracking, terminal operations, and landside logistics and conducted stakeholder interviews as part of a research team.
- Built an extensive discrete event simulation using open-source software SimPy in Python for the entire Port of Houston system, including anchorage, channel, terminals, landside trucks, rail, and pipelines.
- Developed a queueing model for the Port of Houston to define operating capacity, and an ordinary differential equation-based model to identify system bottlenecks.
- Simulated disruption scenarios such as hurricanes and intermittent fog to assess port performance under capacity constraints and infrastructure expansion.
- **The work resulted in five conference presentations and six publications in preparation (four methodological, two empirical).**

**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 (BST-SPTW)" 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 out-performed an adapted version of Lin-Kernighan-Helsgaun (LKH) heuristic on real world Amazon delivery routes in Austin, US.
- **The work resulted in two conference presentations and a journal article.**

## Thesis

[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*

## Publications

[M1] Agarwal, P.[†], **Bagchi, D.**[†], Rambha, T., and Pandey, V. (2025). A Bi-criterion Steiner Traveling Salesperson Problem with Time Windows for Last-Mile Electric Vehicle Logistics. *Computers & Operations Research. In press.* [**Code**] [**Preprint**] (**[†]Equal contribution)**

## Conference Presentations

[C12] **Bagchi, D.**, Bathgate, K., Boyles, S. D., and Asborno, M. I. (2026). A dynamic ultimate capacity framework for seaport systems. *Transportation Research Board 104th Annual Meeting* (**TRB**), Washington, D.C., USA. *(Accepted)*

[C11] Bathgate, K., **Bagchi, D.**, Boyles, S. D., Mitchell, K. N., Asborno, M. I., and Kress, M. M. (2026). Characterizing anchorage queue dynamics due to channel fog closures at the Port of Houston. *Transportation Research Board 104th Annual Meeting* (**TRB**), Washington, D.C., USA. *(Accepted)*

[C10] Robbennolt, J., **Bagchi, D.**, and Boyles, S. D. (2026). Dynamic traffic assignment with uncertain demand: A localized queue spillback approach. *Transportation Research Board 104th Annual Meeting* (**TRB**), Washington, D.C., USA. *(Accepted)*

[C9] Robbennolt, J, **Bagchi, D.** and Boyles, S. D. (2025). Localized Queue Spillback with Uncertain Demand. *10th International Symposium on Dynamic Traffic Assignment* (**DTA2025**), Salerno, Italy.

[C8] **Bagchi, D.** and Boyles, S. D. (2025). Error bounds for stochastic user equilibrium traffic assignment. *12th Triennial Symposium on Transportation Analysis conference* (**TRISTAN XII**), Okinawa, Japan.

[C7] **Bagchi, D.**, Bathgate, K., and Boyles, S. D. (2025). A framework for measuring maritime port system capacities with limited input data. *Institute for Operations Research and the Management Sciences Annual Meeting 2024* (**INFORMS**), Seattle, USA. **(Invited session)**

[C6] **Bagchi, D.**, Bathgate, K., and Boyles, S. D. (2025). A queuing-theory-based operating capacity model for multimodal port operations. *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. *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. *Institute for Operations Research and the Management Sciences Annual Meeting 2024* (**INFORMS**), Seattle, USA. **(Invited session)**

[C3] **Bagchi, D.**, and Boyles, S. D. (2024). Error Bounds for Stochastic User Equilibrium Traffic Assignment. *Institute for Operations Research and the Management Sciences Annual Meeting 2024* (**INFORMS**), Seattle, USA. **(Invited session)**

[C2] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2023). A Local Search Heuristic for Bi-criterion Steiner Traveling Salesman Problem. *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. *Institute for Operations Research and the Management Sciences Annual Meeting 2022* (**INFORMS**), Indianapolis, USA.

## Working Papers

[W8] **Bagchi, D.**, Bathgate, K., Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2025). A queuing theory-based operating capacity model for multi-modal port operations. **[Preprint]**

[W7] **Bagchi, D.**, Bathgate, K., Boyles, S.D., Mitchell, K.N., and Asborno, M.I. (2025). A Dynamic Ultimate Capacity Framework for Seaport Systems.

[W6] **Bagchi, D.**[†], Bathgate, K.[†], Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2025). A Generalizable Simulation Framework for Evaluating the Resilience and Capacity of Multimodal Port Operations. **[Code]** **([†]Equal contribution)**

[W5] Bathgate, K., **Bagchi, D.**, Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2025). Hurricane Characteristics Influencing Multimodal Freight Resilience at the Port of Houston.

[W4] Bathgate, K., **Bagchi, D.**, Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2025). Characterizing anchorage queue dynamics due to channel fog closures at the Port of Houston.

[W3] Bathgate, K., **Bagchi, D.**, Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2025). Use of AIS Data to Characterize Vessel Mix in Houston Port Operations for Simulation.

[W2] Robbennolt, J., **Bagchi, D.**, and Boyles, S. D. (2025). Dynamic traffic assignment with uncertain demand: A localized queue spillback approach.

[W1] **Bagchi, D.** and Boyles, S. D. (2025). Error bounds for stochastic user equilibrium traffic assignment.

## Technical Presentations and Posters

[T2] Bathgate, K., **Bagchi, D.,** and Boyles S. D (2024). 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). Data-Driven Modeling for Multimodal Port Resilience Assessment. *Presented in UT Austin Center for Transportation Research Annual Symposium, 2024*, Austin, USA.

## Open source projects

[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]**

## Awards and Certifications

- **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

- 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

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

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

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

## Skills and Interests

- **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.
- **Coursework:**
  - **Transportation:** Transportation network analysis, dynamic traffic assignment, railway project design & construction, public transportation, traffic engineering, discrete choice modeling, infrastructure systems.
  - **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.

## Referee Service

### Journal Referee

- Transportation Research Part B (2 reviews).

### Conference Referee

- Transportation Research Board Annual Meeting (8 reviews).

## Co-Curricular Activities

- **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

- 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.