

# Debojjal Bagchi

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## EDUCATION

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<b>Doctor of Philosophy</b> The University of Texas at Austin <i>Major:</i> Civil Engineering (Transportation Systems) <i>GPA:</i> 4.00 / 4.00 <i>Advisor:</i> Dr. Stephen D. Boyles	<b>2023–2027</b>
<b>Master of Science in Engineering (Thesis)</b> The University of Texas at Austin <i>Major:</i> Civil Engineering (Transportation Systems) <i>GPA:</i> 4.00 / 4.00 <b>Thesis:</b> Error bounds for stochastic user equilibrium traffic assignment. [ <a href="#">Link</a> ] <b>Winner:</b> CUTC Milton Pikarsky Memorial Award for outstanding MS thesis in science and technology <i>Advisor:</i> Dr. Stephen D. Boyles; <i>Reader:</i> Dr. Zhaomiao Guo	<b>2023-2025</b>
<b>Bachelor of Science (Research)</b> Indian Institute of Science, Bengaluru <i>Major:</i> Earth & Environmental Science, <i>Minor:</i> Mathematics <i>GPA:</i> 8.7 / 10 ( <i>Major GPA:</i> 9.4 / 10.0) <b>Thesis:</b> Energy efficient and safe routing for last mile logistics. [ <a href="#">Link</a> ] <b>Winner:</b> Institute Gold Medal for highest major GPA <i>Advisor:</i> Dr. Tarun Rambha	<b>2019-2023</b>

## PROFESSIONAL SERVICE

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- **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

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<b>Graduate Research Assistantship</b> “Data-Driven Multimodal Freight Modeling for Waterways and Port” sponsored by Coastal and Hydraulics Laboratory, US Army Corps of Engineers Research and Development Center, <i>PI: Dr. Stephen Boyles</i>	<b>Sept 2023 – Dec 2024</b>
<ul style="list-style-type: none"><li>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.</li><li>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.</li><li>Developed a queueing model for the Port of Houston to define operating capacity, and an ordinary differential equation-based model to identify system bottlenecks.</li></ul>	

- 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 (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 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.

## PUBLICATIONS

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- [M3] Bathgate, K., **Bagchi, D.**, Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2026). Anchorage Queue Dynamics due to Fog Channel Closures at the Port of Houston. *Journal of Waterway, Port, Coastal, and Ocean Engineering*. Minor (editor only) revisions.
- [M2] Bathgate, K., **Bagchi, D.**, Boyles, S.D., Mitchell, K.N., Asborno, M.I., and Kress, M.M. (2026). Characterizing Longitudinal Vessel Arrival and Queue Behavior from AIS at the Port of Houston. *Journal of Waterway, Port, Coastal, and Ocean Engineering*. Minor (editor only) revisions.
- [M1] Agarwal, P.<sup>†</sup>, **Bagchi, D.**<sup>†</sup>, 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*. doi:10.1016/j.cor.2025.107286 [Code] [Preprint] (<sup>†</sup>Equal contribution)

## CONFERENCE PRESENTATIONS

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- [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. (Lectern session)
- [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. (Poster session)
- [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. (Poster session)

- [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

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- [W6] **Bagchi, D.**<sup>†</sup>, Bathgate, K.<sup>†</sup>, Boyles, S.D., Mitchell, K.N., Asborne, M.I., and Kress, M.M. (2025). Measuring capacities in multiclass port system with open anchorage and narrow waterways
- [W5] **Bagchi, D.**<sup>†</sup>, Bathgate, K.<sup>†</sup>, Boyles, S.D., Mitchell, K.N., Asborne, M.I., and Kress, M.M. (2025). A generalizable simulation Framework for evaluating the resilience and capacity of multimodal port operations. **[Code]** (<sup>†</sup>**Equal contribution**)
- [W4] Bathgate, K., **Bagchi, D.**, Boyles, S.D., Mitchell, K.N., Asborne, M.I., and Kress, M.M. (2025). Hurricane characteristics influencing multimodal freight resilience at the Port of Houston.
- [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

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- [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

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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. [\[Code\]](#)

## AWARDS AND CERTIFICATIONS

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- **Milton Pikarsky Memorial Award** for Outstanding MS Thesis in Science and Technology from the Council of University Transportation Centers (2025).
- **Professional Development Award** from the Graduate School, UT Austin (2025).
- **Certified Engineering Teaching Assistant** certification from the Cockrell School of Engineering, UT Austin (2025).
- **Graduate School Fellowship** awarded by the UT Austin Graduate School (2023–2027).
- **Institute Gold Medal** awarded by the Indian Institute of Science for best performance in the 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 the Department of Science and Technology, Government of India (2019–2023).
- Awarded “Special Honor” in the category “Academic Excellence by a Student” in the **Telegraph School Awards** (2019).
- Awarded the **Dhirubhai Ambani Scholarship** by the Reliance Foundation (2019).
- **Jagadish Bose National Talent Search (JBNSTS) Fellowship** (2018).
- **National Talent Search (NTSE) Scholarship** awarded by the National Council of Educational 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*

- 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

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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.
- **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

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### Journal Referee

- Transportation Research Part B (2 reviews).

### Conference Referee

- Transportation Research Board Annual Meeting (8 reviews).

## SOCIETY SERVICE

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- **Community Service Chair**, UT Student Transportation Council, UT Austin chapter of Institute of Transportation Engineers (2023–2025)
- **Member**, Notebook Drive, Indian Institute of Science (2019–2023)

## 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 (Puzzles).

## 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.