Debojjal Bagchi

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EDUCATION

Master of Science in Engineering (Thesis)   2023-2025
The University of Texas at Austin
Major: Civil Engineering (Transportation)
CGPA: 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
CGPA: 8.7/10 (*Major GPA*: 9.4/10)
Awards: **Institute Gold Medal** for Best Performance in Major
Advisor: Dr. Tarun Rambha

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 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.

Graduate Research Assistantship   Sept 2023 – May 2024
Sponsored by Centre for Transportation Research, UT Austin, *PI: Dr. Stephen Boyles*

- Implemented a Gradient Projection algorithm for Vista Software in Java.
- Developed Python and Bash scripts for database management on network modelling centre servers.
- Conducted an extensive literature review of data frameworks for vehicle-to-everything technologies.

MITACS Globalink Research Internship   May 2022 – Aug 2022
"Integrating Waste and Resource Management: Data-Driven Optimization of Urban Mining Logistics" spon-
sored 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 Optimisation.
- 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 neighbourhoods.
- Solved the MILP using CPLEX and implemented the ALNS heuristic on Python.

Undergraduate Research Assistantship   July 2021 − July 2023

"A Local Search Heuristics for the Bi-criteria Steiner Travelling 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 Travelling Salesman Problem, including Pareto Local Searches, Lin-Kernighan Heuristic, and r-opt.
- Developed and implemented two brute-force exact methods for the Multi-Objective Steiner Travelling Salesman Problem (BSTSP).
- Formulated a new scalerisation-based Mixed Integer Program (MIP) formulation for BSTSPTW which improves the single commodity flow formulation for STSP 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.
- Bench-marked results on real world instances focusing on Amazon delivery routes in Austin, US

Manuscripts under Review

[M1] Agarwal, P.[†], **Bagchi, D.**[†], Rambha, T., and Pandey, V. (2024). A Bi-criterion Steiner Traveling Salesperson Problem with Time Windows for Last-Mile Electric Vehicle Logistics. [Code][Preprint]

[†] Equal contribution

Refereed Conference Presentations

[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 (TRB) 104th Annual Meeting 2023, Washington, D.C., USA. (Lecturn 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 (TRB) 104th Annual Meeting 2023, Washington, D.C., USA. (Lecturn session)

[C4] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. (2024, October). *Identifying capacities in a multimodal maritime freight network.* in Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2024, Seattle, USA.

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

[C2] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2023, January). *A Local Search Heuristic for Bi-criterion Steiner Travelling Salesman Problem.* in Transportation Research Board (TRB) 102nd Annual Meeting 2023, Washington, D.C., USA.

[C1] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2022, October). *A Local Search Heuristic for Bi-criterion Steiner Travelling Salesman Problem.* in Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2022, Indianapolis, USA.

Manuscripts under Preparation

[M4] **Bagchi, D.** and Boyles, S. D. (2025). *Error bounds for stochastic user equilibrium traffic assignment.*

[M3] Robbennolt, J, **Bagchi, D.** and Boyles, S. D. (2025). *Localized Queue Spillback with Uncertain Demand.*

[M2] **Bagchi, D.**, Bathgate, K., and Boyles S. D. (2025). *A queuing-theory-based operating capacity model for multimodal port operations.*

[M1] Bathgate, K., **Bagchi, D.,** and Boyles S. D. (2025). *Use of AIS data to characterize vessel mix in Houston port operations for simulation.*

Technical Presentations and Posters

[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 Modelling for Multimodal Port Resilience Assessment. *Presented in* UT Austin Center for Transportation Research Annual Symposium, 2024, Austin, USA.

Thesis

[D2] **MS thesis:** Error bounds for stochastic user equilibrium traffic assignment.
Advisor: Dr. Stephen D. Boyles
University of Texas at Austin

[D1] **Undergraduate thesis:** Energy efficient and safe routing for last mile logistics.
Advisor: Dr. Tarun Rambha
Indian Institute of Science, Bengaluru

Honors and Awards

- 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 Mathematics of Information Technology and Complex Systems (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)
- Jagadis Bose National Talent Search (JBNSTS) fellowship (2018)
- National Talent Scholarship (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 and 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 1.2 lakh 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
- Assisted with major course redesign
- Led two weekly discussion and recitation sections of 20 students each

Mentoring Experience

Undergraduate students mentored
- Dylan Croteau (2024-2025)

Society Service

Transportation Research Board (TRB)
- AW010 Standing Committee on Ports and Channels, **Member** (2025-2028)
- AEP40 Standing Committee on Transportation Network Modeling, **Friend** (2025-Present)
- AT015 Standing Committee on Freight Transportation Planning and Logistics, **Friend** (2025-Present)

Institute of Transportation Engineers (ITE)
University of Texas at Austin Student Chapter
- Member (2023-Present)
- Social Service Officer (2023-2025)

NoteBook Drive (NBD)
Indian Institute of Science
- Member (2019-2021)

Referee Service

Journal Referee
- Transportation Research Part B

Coursework

- **University of Texas at Austin:** Linear programming, Non linear programming, Optimization, Public transportation, Traffic engineering, Discrete choice modelling, Transportation network analysis, Dynamic traffic assignment,
- **Indian Institute of Science:** Optimization, Public transportation, Game theory, Traffic network equilibrium, Dynamic traffic assignment, Introduction to computing for AI & ML, Linear algebra, Real analysis, Behavioral science, Finance and accounts

Co-Curricular Activities

- **Spanish Guitar**: Diploma with first-division distinction from Nikhil Bharat Sangeet Samiti
- **Chess**: Member of All India Chess Federation, Peak rating (on Lichess) of 1378 (Rapid) and 1346 (Bullet)

Leadership Roles

- Co-founded CoachIO, an ed-tech startup to provide affordable bootcamp courses to KVPY and olympiad aspirants across India. Managed a team of 9 members with gross revenue over 5 lakh INR.
- Co-ordinated 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.

Skills

- **Core Competencies:** Optimization, Discrete event simulation, Machine learning, Data analysis, Operations research, Mathematical programming
- **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 LaTeX, Git, GAMS, Microstation, CORSIM