

Debojjal Bagchi

Ph.D. student and Graduate Research Assistant, University of Texas at Austin

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ACADEMIC QUALIFICATIONS

Master of Science in Engineering (Thesis)

2023-2025 (Spring)

The University of Texas at Austin, GPA : 4.00 / 4.00

Major: Transportation Engineering, Minor: Operations Research & Industrial Engineering

Thesis: Error Bounds for Stochastic User Equilibrium Traffic Assignment (Ongoing)

Awards: Graduate school fellowship (2023-2027)

Bachelor of Science (Research)

2019-2023

Indian Institute of Science, Bangalore GPA : 8.7/10 (Major GPA: 9.4/10)

Major: Earth & Environmental Science, Minor: Mathematics

Thesis: Efficient and Safe Routing for Electric Vehicles Last Mile Logistics

Awards: Awarded gold medal for highest GPA in major

TECHNICAL SKILLS

- **Core Competencies:** Optimization, Discrete event simulation, Machine learning, Data analysis, Operations research, Mathematical programming
- **Programming Languages:** Python, C, Julia, GAUSS
- **Software and Libraries:** SimPy, CPLEX, OR-Tools, OSMnx (OpenStreetMap), NetworkX, TensorFlow, Pandas, NumPy, Scikit-learn, Matplotlib, Plotly, Streamlit, SciDavis, MS Office, SymPy, L^AT_EX, Git, GAMS, Microstation
- **Graduate level coursework:** Linear programming, Non linear programming, Optimization, Public transportation, Discrete choice modelling, Game theory, Static traffic assignment, Dynamic traffic assignment, Introduction to computing for AI & ML, Linear algebra, Real analysis, Behavioral science, Finance and accounts

RESEARCH EXPERIENCE

Data-Driven Multimodal Freight Modeling for Waterways and Port

Graduate Research Assistantship sponsored by Coastal and Hydraulics Laboratory, US Army Corps of Engineers ERDC

PI: Dr. Stephen Boyles

Sept 2023 – Dec 2024

- Part of the research team that processed and integrated data from multiple transport modes including Archival AIS data, port OCR data, terminal reports, and highway trucking data.
- Conducted interviews with subject matter experts in different modes.
- Identified bottlenecks in multimodal freight networks through a discrete event simulation.
- Simulated disruption scenarios to examine resilience and recovery bottlenecks.
- Proposed a queuing theory based model for defining operating capacity in multimodal port networks.

Skills: Discrete event simulation, queueing theory, data analysis, python, data collection, interviewing techniques

Integrating Waste and Resource Management: Data-Driven Optimization of Urban Mining Logistics

Globalink Research Internship sponsored by MITACS at Université du Québec à Trois-Rivières, Québec, Canada

PI: Dr. Amina Lamghari

May 2022 – Aug 2022

- 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 in Python.

Skills: Mixed integer linear program, scanario based optimization, heuristics, network design, CPLEX, python

A Bi-criterion Steiner Traveling Salesperson Problem with Time Windows for Last-Mile Electric Vehicle Logistics

Undergraduate Summer Research sponsored by KVPY at the Indian Institute of Science, Bangalore, India

PI: Dr. Tarun Rambha

July 2021 – July 2023

- Formulated an exact Mixed Integer Linear Program (MILP) for the BSTSPTW problem, incorporating multiple objectives, node/edge revisits, and time-window constraints to generate efficiency frontier using scalarization.
- Proposed a novel local search heuristic with six new operators, designed to handle large-scale, real-world instances and escape local minima effectively.
- Demonstrated the practical applicability of the proposed methods through a real-world case study, focusing on Amazon delivery routes in Austin, US, achieving efficient solutions within a two-hour computational budget.
- Benchmarked local search performance on Solomon-Potvin-Bengio datasets, matching exact MIP results.
- The proposed local search performed better than solutions obtained from state-of-the-art heuristics like the Lin-Kernighan-Helsgaun heuristic, validating the quality of the proposed methods for large-scale networks.

Skills: Mixed integer linear program, heuristics, network modelling, case study, CPLEX, Google OR-tools, Python

RESEARCH CONTRIBUTIONS

- [R8] 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. *Under review in Computers and Operations Research*. [\[Code\]](#) [\[Preprint\]](#) (Manuscript under review)
- [R7] **Bagchi, D.**, Bathgate, K., and Boyles, S. D. (2025, January). *A queuing-theory-based operating capacity model for multimodal port operations*. Transportation Research Board (TRB) 104th Annual Meeting 2023, Washington, D.C., USA. (Lectern session)
- [R6] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. (2025, January). *Use of AIS data to characterize vessel mix in Houston port operations for simulation*. Transportation Research Board (TRB) 104th Annual Meeting 2023, Washington, D.C., USA. (Lectern session)
- [R5] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. (2024, October). *Identifying capacities in a multimodal maritime freight network*. Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2024, Seattle, USA. (Invited session)
- [R4] **Bagchi, D.**, and Boyles, S. D. (2024). *Error Bounds for Stochastic User Equilibrium Traffic Assignment*. Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2024, Seattle, USA. (Invited session)
- [R3] Bathgate, K., **Bagchi, D.**, and Boyles, S. D. (2024). Data-Driven Modelling for Multimodal Port Resilience Assessment. UT Austin Center for Transportation Research Annual Symposium, 2024, Austin, USA. (Poster session)
- [R2] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2023). *A Local Search Heuristic for Bi-criterion Steiner Travelling Salesman Problem*. Transportation Research Board (TRB) 102nd Annual Meeting 2023, Washington, D.C., USA. (Contributed session)
- [R1] **Bagchi, D.**, Agarwal, P., Rambha, T., and Pandey, V. (2022). *A Local Search Heuristic for Bi-criterion Steiner Travelling Salesman Problem*. Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting 2022, Indianapolis, USA. (Poster session)

[†] Equal contribution

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 undergraduate major (2023)
- Globalink Research Internship (GRI) awarded by MITACS, Canada (2022)
- Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship awarded by Government of India (2019-2023)
- Awarded Dhirubhai Ambani scholarship by Reliance Foundation (2019)
- Awarded Jagadis Bose National Talent Search (JBNSTS) fellowship awarded by Government of West Bengal, India (2018)
- National Talent Scholarship (NTS) awarded by Government of India (2017-2019)