

# Debojjal Bagchi

Graduate Student  
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## ACADEMIC QUALIFICATIONS

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**Master of Science in Engineering (Thesis)** 2023-Present

The University of Texas at Austin

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

*CGPA* : 4.00 / 4.00

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

**Bachelor of Science (Research)** 2019-2023

Indian Institute of Science, Bengaluru

*Major:* Earth & Environmental Science, *Minor:* Mathematics

*CGPA* : 8.7/10 (*Major CGPA:* 9.4/10)

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

**All India Senior School Certificate Examination (AISSCE)** April, 2019

Central Board of Secondary Education (CBSE)

*Aggregate Score* : 96%

**All India Secondary School Examination (AISSE)** April, 2017

Central Board of Secondary Education (CBSE)

*CGPA* : 10/10

## CONFERENCE PRESENTATIONS

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- [C4] Kyle Bathgate, **Debojjal Bagchi**, and Stephen D Boyles (2024). Identifying capacities in a multimodal maritime freight network. In **INFORMS Annual Meeting 2024**, Seattle, USA (INFORMS 2024).
- [C3] **Debojjal Bagchi** and Stephen D Boyles. (2024). Error Bounds for Stochastic User Equilibrium Traffic Assignment. In **INFORMS Annual Meeting 2024**, Seattle, USA (INFORMS 2024).
- [C2] **Debojjal Bagchi**, Prateek Agarwal, Tarun Rambha, Venktesh Pandey. (2022, October). *A Local Search Heuristic for Bi-criterion Steiner Travelling Salesman Problem*, **INFORMS Annual Meeting 2022**, Indianapolis, USA. [\[Abstract\]](#) [\[Presentation\]](#)
- [C1] **Debojjal Bagchi**, Prateek Agarwal, Tarun Rambha, Venktesh Pandey. (2023, January). *A Local Search Heuristic for Bi-criterion Steiner Travelling Salesman Problem*, **TRB Annual Meeting 2023**, Washington, D.C., USA. [\[Poster\]](#)

## TECHNICAL SKILLS

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- **Programming Languages:** C, Python, Java, GAUSS
- **Software and Libraries:** SimPy, CPLEX, GAMS, OR-Tools, OSMnx (OpenStreetMap), NetworkX, TensorFlow, Pandas, NumPy, Scikit-learn, Matplotlib, Plotly, Streamlit, SciDavis, MS Office, L<sup>A</sup>T<sub>E</sub>X, GitHub

## RESEARCH EXPERIENCE

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**An Adaptive Large Neighbourhood Search Heuristics for Reverse Logistic Network Design** (May'22- Aug'22)  
Guide: [Prof. Amina Lamghari](#) *Université du Québec à Trois-Rivières, Québec, Canada*

- 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.
- Currently performing several **bench-marking tests** to compare the time constrained solutions of MILP formulation to the ALNS heuristic.

**A Local Search Heuristics for the Multi-objective Steiner Travelling Salesman Problem** (July'21- Ongoing)  
Guide: [Prof. Tarun Rambha](#) *Indian Institute of Science, Bengaluru, India*

- Performed extensive **literature review** of existing heuristic algorithms for the Travelling Salesman Problem, including Pareto Local Searches, Lin-Kernighan Heuristic, & r-opt.
- Formulated a **scalerisation based Integer Program (IP)** for the MOSTSP & implemented it using **CPLEX**.

- **Developed & implemented two brute-force exact methods** for the Multi-Objective Steiner Travelling Salesman Problem (MOSTSP).
- **Successfully developed & implemented a new local search heuristic** for the MOSTSP based on a **proposed Multi Objective 3-opt neighbourhood** that **performs better than CPLEX solutions to the IP formulation for fixed computational budget.**
- More details about the work can be found at [this google drive link](#). The work was presented at **INFORMS Annual Meeting** & is accepted for presentation at **TRB Annual Meeting**. Aim to publish the findings by January 2023.

#### Implemented an Algorithm for the Reliable Facility Location Problem (RFLP)

(Sep'20- Dec'20)

Guide: **Prof. Megha Sharma**

*Indian Institute of Management, Calcutta, India*

- Got an in-depth understanding of the Facility Location Problem.
- **Successfully implemented** an approximation algorithm with uniform failure probabilities for the Reliable Facility Location Problem (RFLP) based on [Shen et al., 2010](#)
- Understood the fundamentals of heuristics.

#### SHORT TERM PROJECTS

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##### Portfolio Optimization [\[GitHub Rep\]](#) [\[Project Report Presentation\]](#)

Guide: **Prof. Sashi Jain**, (IISc, Bengaluru)

- Implemented **Markowitz Portfolio Optimization using Quadratic Programming & Monte Carlo Method.**
- Computed the **Minimum Variance Portfolio (MVP)**, **Maximum Sharpe Portfolio**, plotted the **Efficiency Frontier**, calculated **Portfolio Beta** (for MVP) & compared with **Security Market Line.**
- Compared results between the two methods.

##### Traffic Equilibria [\[GitHub Rep\]](#) [\[Abridged Results PDF\]](#)

Guide: **Prof. Tarun Rambha** (IISc, Bengaluru)

- Implemented the **Method of Successive Averages (MSA)** algorithm for computing traffic equilibria in real transportation network in a **time & space efficient** way on python.
- Computed **User Equilibrium (UE)** & **System Optimum (SO)** along with the **Total System Travel Time** for both UE & SO problems.
- Compared the run times for the MSA algorithm based on **Label Correcting & Label Setting** shortest path algorithms.

#### SCHOLASTIC ACHIEVEMENTS

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- **Mitacs Globalink Research Internship** award for carrying out 12 weeks of research in Canada
- Kishore Vaigyanik Protsahan Yojana (**KVPY**) **Fellow**
- National Talent Scholarship (**NTSE**) **Scholar (State Rank 13)**
- Jagadis Bose National Talent Search (**JBNSTS**) **Fellow**
- **Awarded Certificate of Merit from IIT Guwahati** for completing a course & project on Data Analytics
- **Among top 0.1% in Joint Entrance Examination (Main) out of 1.5 million candidates**
- **Among top 1% in Joint Entrance Examination (Advanced) out of 1.2 lakh candidates**
- Awarded “**Special Honor**” in category “Academic excellence by a student” in **The Telegraph School Awards**
- **All India Rank 40** in National Creativity Aptitude Test (NCAT), 2020
- **Letter from Central Board of Secondary Education (CBSE)** for outstanding performance in Class 10th

#### SELECTED COURSE PRESENTATIONS

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- Integer Programming Formulation for Steiner Travelling Salesman Problem [\[Presentation\]](#)
- Environment Impact Assessment [\[Presentation\]](#) [\[Video\]](#)
- Traffic Demand Modelling [\[Presentation\]](#) [\[Video\]](#)

#### RELEVANT COURSES (UNDERGRADUATE LEVEL COURSES ARE \* MARKED)

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##### Computer Science:

- Algorithms & Programming \*
- Optimisation Methods
- Introduction to Computing for AI & ML
- Game Theory

##### Mathematics:

- Linear Algebra
- Real Analysis
- Algebra
- Algebraic Structures
- Probability & Statistics \*

##### Civil & Environmental Engineering:

- Public Transportation System Planning
- Traffic Network Equilibrium
- Linear Regression and Discrete Choice Modelling
- Environmental Design \*
- Introduction to Satellite Geodesy

##### Management:

- Behavioural Science
- Finance & Accounts

##### Industrial Engineering & Operations Research:

- Linear Programming

## LEADERSHIP ROLES & CO-CURRICULAR ACTIVITIES

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- 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.
- Co-ordinated [Quadspark](#), a national level quiz competition as a part of Pravega, the annual science fest of 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.
- Can play guitar and keyboard. Diploma in Spanish guitar from Nikhil Bharat Sangeet Kala Samiti.
- Passionate about chess.