Arindam Roy Chowdhury

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Education

Columbia University *Sep 2022 – Jun 2027*
Ph.D. in Operations Research (GPA: 4.04/4.00)

Indian Statistical Institute *Jul 2019 – Jun 2021*
Master's in Statistics

Indian Statistical Institute *Jul 2016 – May 2019*
Bachelor's in Statistics

Work Experience

NASA Langley Research Centre *Jul 2024 – Sep 2024*
Research Intern

- Formulated tractable optimization framework for modeling multivariate flight data using polynomial features
- Developed an internal-use Python package; working on MATLAB implementation
- Developed estimation method leveraging non-normalized statistical models

Capital One Financial Services *Jul 2021 – Jul 2022*
Associate

- Predicting default probabilities in real estate and low-default commercial loan portfolios

Capital One Financial Services *May 2020 – Jul 2020*
Research Intern, Data Science Team

- Developed procedure to handle missing data in decision tree models
- Integrated the solution into a Python-based decision tree tool

Centre for Science of Student Learning *May 2019 – Jul 2019*
Research Intern

- Identifying causal impact of different teaching techniques on students

Selected Projects

Nonparametric Confidence Intervals using Cheap Bootstrap
Ongoing work with Prof. Henry Lam

- Developed a lightweight bootstrap framework that yields asymptotically exact confidence intervals for bagged predictors using a small, fixed number of bootstrap resamples with increasing bag size
- Applicable to Random Forests and bagged estimators in Stochastic Optimization

Superiority of Naive Optimization via Stochastic Dominance
Ongoing work with Prof. Henry Lam

- In the context of stochastic optimization, theoretically established that naive methods like Empirical Risk Minimization (ERM) can outperform advanced approaches such as Distributionally Robust Optimization (DRO) and regularization in minimizing worst-case regret under joint data and distributional uncertainty, leveraging a generalized symmetry argument
- Demonstrated effectiveness under standard distribution shift regimes widely studied in the literature

Fantasy Sports User Behavior Modeling
Ongoing Collaboration with Dream Sports

- Identifying platform actions (promotions/incentives) that causally impact user engagement in fantasy sports

Estimation of Rare Event Probabilities Using Extreme Value Theory
Ongoing work with Prof. Henry Lam

- Estimating rare-event probabilities by modeling the tail behavior using the Generalized Pareto Distribution (GPD)
- Investigating GPD-based methods as a model-agnostic alternative to importance sampling for rare-event simulation

Bayesian Nonparametric Generalization of Tree Based ML Approaches
Master's Dissertation Thesis

- Proposed a Bayesian nonparametric mixture model of decision trees with a random number of components, using a Dirichlet Process prior

Accelerography: Feasibility of Gesture Typing using Accelerometer
Bachelor's Project

- Designed intuitive motion gestures for the English alphabet, enabling text input by physically moving a phone
- Developed and implemented an R-based pipeline to identify and classify these gestures using accelerometer data.

Invited Talks

NASA Langley Research Centre *Nov 2024*
Session: Uncertainty Quantification Seminar

- **Talk 1:** Modelling Multivariate Data using Exponential Polynomials
- **Talk 2:** Stochastic Optimization: Superiority of Naive Approaches

INFORMS Annual Meeting *Oct 2024*
Session: Recent Advances in Data-driven Optimization

- **Title:** Robustness Vs Statistical Efficiency: Superiority of Naive Optimization

The 37th New England Statistics Symposium *May 2024*
Session: Recent Advances in Data-Driven Decision-Making

- **Title:** Regret Optimality of Empirical Risk Minimization

Patents and Publications

- **Roy Chowdhury, A.**, Lam, H. *Efficient Uncertainty Quantification of Bagging via the Cheap Bootstrap.* Accepted at Proceedings of the 2025 Winter Simulation Conference.
- Saha, P., Dasgupta, J., Tewari, A., Ramesh, A. K. N., **Roy Chowdhury, A.**, S, Anupam., Kedia, G. *Methods and systems for developing decision tree machine learning models.* US 2024/0386287 A1.

Awards and Honours

2022 Tang Family Fellowship, Columbia University
2018 Simon Marais Mathematics Competition (top 100 at the undergraduate Asia-Pacific Math competition)
2018 Madhava Mathematics Competition (Ranked within top 25 students at the National level)
2014 Attended the Indian National Math Olympiad Training Camp (INMOTC)
2013 Regional Math Olympiad Awardee (Ranked within top 20 students at the state level)

Relevant Graduate Coursework

Probability: Probability Theory (Measure Theoretic), Stochastic Modeling
Optimization: Linear Optimization, Discrete Optimization, Convex Optimization
Statistics: Theoretical Statistics, Computational Statistics (Bayesian)

Academic Services

- Reviewed for Operations Research Letters
- Contributed to editing papers for the Winter Simulation Conference (WSC) 2023

Skills & Interests

Programming Languages/Tools: Python, R, MATLAB, CVXPY, Pymanopt, Java, C
Interests: Chess, Table Tennis