Zehaan Naik

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Education

BS — **Indian Institute of Technology Kanpur**, Statistics and Data Science — 2022 – 2026
GPA: 8.9/10

- **Awards:** Academic Excellence Award (2022 & 2023)
- **Honors Track Student**
- **Minors:** Machine Learning and Applications; English Literature

Grade XII — **Delhi Public School, Surat** — **Score:** 97.6% | 2022

Grade X — **Delhi Public School, Surat** — **Score:** 98.4% | 2020

Preprints

Z. Naik, D. Kundu; — Manuscript in preparation
Coordinate Descent Algorithm for Least Absolute Deviations Regression

Z. Naik, M. Chow, S. Mitra; — Manuscript in preparation
Automated Label Imputation and Robust Optimization for SWAP Regression

Work Experience

Boston Consulting Group, Associate Intern | Mumbai, India — May'25 – Jul'25
Received a full-time job offer to join as an associate at the Mumbai office for outstanding performance

- Partnered with **Gujarat Administrative Reforms Commission** as knowledge partners for policy modernisation
- **Benchmarked global best practices** (Estonia, Singapore, UK) to design strategic digital governance interventions
- Analyzed utilization across **1400+** PHCs to **optimize healthcare service** coverage and streamline delivery statewide
- Re-imagined **5+ best-in-class workflows** to enable **data-driven governance**, improve accountability and impact
- Implemented e-governance policy, impacting **60M+** citizens through enhanced digital access and service efficiency

IIM Bangalore, Research Intern | Prof. Sharkarsan Basu | **LOR** | Bengaluru, India — May'24 – Jul'24
*Got research featured in the **Research Symposium on Finance and Economics 2024** by IFMR*

- **Optimized lending strategies** & establish equity trends for public and private sector banks in economic crises
- Analyzed public and private lending data for over **100,000** firms and top **50** banks to train a **predictive model**
- Validated the state double-engine government hypothesis on economic growth through **discriminant analysis**
- Analyzed **dividend stickiness** by analyzing agency cost issues with large shareholders and corporate governance
- Analyzed executive structures of **17,000** firms to assess their impact on **company growth & dividend stickiness**

Teaching Experience

IIT Kanpur | **MTH208** - Data Science Lab-1 | Fall 2024 — **Teaching Assistant**

Research Experience

SWAP Regression | Prof. Sharmishtha Mitra | IIT Kanpur | — Aug'23 – Sep'25

- Developed an EM based **Label–imputation mechanism** to predict response – predictor roles for SWAP regression
- Implemented a **weighted LAD M–step** (L_1 loss) with **MAD–based scale updates** for a stable fit robust to outliers
- Validated the approach on **USD/INR – SENSEX** data outperforming standard model with **81.6%** reduction in RMSE
- Auto-imputed alternating **causality regimes** that align with established **empirical findings and economic theory**

Coordinate Descent for LAD Estimation | Prof. Debasis Kundu | IIT Kanpur | — Aug'25 - Nov'25

- Developed a novel **coordinate-wise descent strategy** to compute **LAD estimates** for linear regression parameters
- Demonstrated stability in **high-dimensional regimes** ($p > n$) and performed on-par with simplex-based solvers
- Achieved a worst-case efficiency of $\mathbf{O(pnlog(n))}$ outperforming all state-of-the-art simplex counterparts
- Established **convergence guarantees** under standard OLS regularity conditions and validated **empirical stability**

Temperred Hamiltonian Monte Carlo (THMC) | Prof. Dootika Vats | IIT Kanpur | Jan'25 - May'25

- Designed a **novel variant of HMC** to enhance sampling efficiency in complex **multi-modal distributions**
- Incorporated **adaptive tempering** into leapfrog integrators, **improving mode traversal** over high energy barriers
- **Proved theoretical guarantees** of reversibility and volume preservation under the proposed THMC dynamics
- Achieved **superior sampling coverage** across 20-mode targets and Neal's Funnel, **outperforming standard HMC**

The Knight and Bishop Algorithm | Research Project | Jan'25 - May'25

- Developed a **hyperparameter tuning scheme** for Magnetic HMC using dual averaging and recursive exploration
- Proved the **invariance and ergodicity** of the Magnetic HMC kernel, necessary for a valid MCMC sampler
- Identified **critical gradient-based failure modes** by benchmarking the algorithm on complex multi-modal targets

No U-Turn Sampler | Prof. Dootika Vats | IIT Kanpur | Jul'24 - Nov'24

- Built a solid foundation in advanced MCMC and implemented the **No-U-Turn Sampler (NUTS)** from first principles
- Mastered the recursive algorithm for **adaptive path-length construction** for hyper-parameter tuning
- Validated the sampler by **replicating experiments** on complex targets, confirming its efficiency over HMC

PHASR | Prof. Indranil Saha | ERA | IIT Kanpur | Sep'23 – Apr'24

First Indian team to qualify for the RoboCup MSL Challenge out of **100+** international applicants

- Designed & developed robots capable of **autonomously** playing football using real-time vision and swarm robotics
- Developed subsystems such as **solenoid based kicking mechanism** and **automated ball handling mechanism**

Ongoing Projects

Barker's DP-SGD | Prof. Dootika Vats | IIT Kanpur Jul'25 - Present

- Developed a **differentially private SGD variant** using a Barker's proposal–inspired robust gradient scaling
- Established **convergence guarantees** of the proposed algorithm **without Lipschitz assumption** on gradients
- **Improved utility–privacy tradeoffs** in model training, achieving faster convergence on similar privacy guarantees

Scholarships

Nalanda Merit Scholarship 2020: Fee waiver worth **INR 3,00,000** for securing 98.4% marks in AISSE

BYJU's Merit Scholarship 2020: Fee waiver worth **INR 1,50,000** for excellent academic performance

Technical Skills

Languages: R, Python, C, C++, LaTeX, MATLAB, HTML, JavaScript, CSS, SQL

Technologies: Bloomberg Terminal, Fusion360, Gazebo, SKLearn, Matplotlib, Quarto, RShiny, PyTorch, TensorFlow

Relevant Course Work

Machine Learning & Algorithms	Applied Statistics	Theoretical Courses
Data Structure and Algorithms	Data Science Labs	Linear Estimations and Modeling
Fundamentals of Computing	Computational Statistics	Applied Stochastic Processes
Introduction to Machine Learning	Time Series Analysis	Theory of Statistics
Probabilistic Machine Learning	Linear Regression and Anova	Real Analysis
Techniques in AI & Data Mining	Non-Linear Regression	Complex Variables
Markov Chain Monte Carlo	Non-parametric Inferrence	Multivariate Analysis

Positions of Responsibility

Editor, Vox Populi | Writing and Investigative Journalism Apr'24 - Apr'25

- Led a **3-tier** team of **40+** Core Group Members & **20+** Asst. Editors working on reports, infographics & videos

Coordinator, Debating Society | Media and Culture Council, IIT Kanpur Apr'24 - Apr'25

- Led a 3-tier team of **40+** students; training for competitive **national and international** debate tournaments