

Zehaan Naik

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Education

PhD	Duke University , Statistical Sciences	2026 – present
BS	Indian Institute of Technology Kanpur , Statistics and Data Science	2022 – 2026
Honors	• Awards: Academic Excellence Award (2022 & 2023) • Minors: Machine Learning and Applications; English Literature	GPA: 9.1/10
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;	arXiv: 2603.19336 ↗
Coordinate Descent Algorithm for Least Absolute Deviations Regression	
Z. Naik , D. Kundu;	arXiv: 2606.13242 ↗
Least Absolute Deviations Estimation for Sinusoidal Models	
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
<i>Received a full-time job offer to join as an associate at the Mumbai office for outstanding performance</i>	
• 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
<i>Got research featured in the Research Symposium on Finance and Economics 2024 by IFMR</i>	
• 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
IIT Kanpur MTH210 - Statistical Computing Spring 2026	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 $O(pn \log(n))$ outperforming all state-of-the-art simplex counterparts • Established convergence guarantees under standard OLS regularity conditions and validated empirical stability	

Tempered 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

- **Improved utility-privacy tradeoffs** in DP-SGD using a Barker's proposal-inspired robust gradient scaling
- Established **convergence guarantees** of the proposed algorithm **without Lipschitz assumption** on gradients

Non-Linear LAD Estimation | Prof. Debasis Kundu | IIT Kanpur

Nov'25 - Present

- Developed a **coordinate descent based ℓ_1** loss optimization strategy for exponential and sinusoidal models

Scholarships

Class of 1968 Creative Research Proposal Prize (2026): Cash prize of **INR 25,000** for my research in LAD Estimation

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 Fundamentals of Computing Introduction to Machine Learning Probabilistic Machine Learning Techniques in AI & Data Mining Markov Chain Monte Carlo Differential Privacy in ML	Data Science Labs Computational Statistics Time Series Analysis Linear Regression and Anova Non-Linear Regression Non-parametric Inference Econometrics	Linear Estimations and Modeling Applied Stochastic Processes Theory of Statistics Real Analysis Complex Variables Multivariate Analysis Inference - I

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