Preet Baxi

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SUMMARY

Ph.D. candidate in Physics and Scientific Computing at the University of Michigan with experience in statistical inference, time-series modeling, Bayesian uncertainty quantification, Monte Carlo simulation, and large-scale scientific computing. Built systematic trading, portfolio analytics, and market research pipelines using real-time news, sentiment signals, automated execution, and risk monitoring.

EDUCATION

- ***M.S,*** and ***Ph.D., Physics and Scientific Computing,*** University of Michigan, Ann Arbor | 2022–2026 | GPA: 3.6/4
- ***B.E., Mechanical Engineering,*** University of Mumbai, India | 2017–2021 | GPA: 8.7/10

PROFESSIONAL EXPERIENCE

Physics Research Assistant, *University of Michigan* | July 2022-Present | Ann Arbor, MI

- Developed **low-SNR** signal extraction and parameter-estimation algorithms for **noisy time serie**s using matched filtering, frequency-domain segmentation, and variance-weighted estimation, improving statistical sensitivity by **50%.**
- Built scalable Python/C++ simulation, inference, and monitoring pipelines with MPI/OpenMP and automated workflows, reducing runtime by **70%** and enabling analysis of multi-terabyte, high-dimensional datasets.
- Designed **frequentist** and **Bayesian** methods for robust amplitude/phase recovery, uncertainty quantification, and drift monitoring, validating coherent signal reconstruction over **10^11** cycles across **18** reference signals.

AI Research Assistant, *University of Michigan* | December 2024 - Present | Ann Arbor, MI

- Built a bi-level LLM-guided **simulation-optimization** framework for **stochastic inventory control**, separating policy-structure search from continuous parameter tuning to learn code-based replenishment policies that outperformed optimized base-stock benchmarks by **~22%** on average across **10,064** out-of-sample test instances.
- Designed mechanism-level experiments and stress tests for LLM-based ranking systems, measuring how **strategic prompt injection** affects ranking robustness, threshold errors, and competitive saturation under varying candidate-quality distributions.

Visiting Research Fellow, *LIGO Hanford Laboratory, Caltech* | January 2024 - July 2024 | Richland, WA

- Built ML-based anomaly and drift detection systems across **200+** multivariate time-series channels, improving signal identification and noise isolation by **45%**.

Student Research Assistant, *IIT Madras* | May 2019 - June 2022 | Chennai, TN, India

- Developed parameter-estimation models for weak-signal inference using **Cramér–Rao** bounds, likelihood optimization, and gradient-based estimators, achieving strong estimation performance under low-SNR conditions.
- Built large-scale **Monte Carlo** pipelines with robustness and sensitivity-analysis frameworks to quantify variance, bias, and stability under noise shifts, distributional perturbations, and sparse-data regimes, producing uncertainty metrics for model selection.

SELECTED QUANT RESEARCH PROJECTS

Macro Regime Research and Portfolio Stress Testing

- Built a macro regime-analysis framework using historical recession periods (2000, 2008) to study cross-market behavior, **macroeconomic indicators,** and **sentiment signals** under downturn conditions, with scenario analysis for potential recession-like environments in 2026.
- Applied rolling correlation analysis, volatility clustering diagnostics, factor sensitivity assessment, and scenario-based loss estimation to evaluate portfolio drawdowns, sentiment deterioration, and regime-dependent risk behavior.
- Measured portfolio sensitivity across stress environments using drawdown, volatility, and correlation diagnostics to compare sector and market behavior under adverse macro conditions.

Automated News-Driven Trading Pipeline

- Built and deployed an automated trading pipeline integrating real-time news ingestion, sentiment scoring, signal generation, and broker **API execution** across 30 U.S. equities in a live self-directed account.
- Designed event-driven signal logic using sentiment-derived position scoring, entry and exit thresholds, and profit-target rules while monitoring exposure, position-level risk, and signal quality across active holdings.
- Developed a portfolio analytics and risk-monitoring framework from realized trading activity to estimate monthly returns, benchmark-relative alpha, beta, Sharpe, information ratio, and max drawdown; observed approximately **1.88** annualized Sharpe, **17.8%** annualized alpha versus SPY, **1.43** information ratio and **13.1%** max drawdown over the evaluated period.

PUBLICATIONS

(More Publications here: Google Scholar)

- *Prompt Injection in Automated Résumé Screening with Large Language Models: Single and Multi-Injection Settings*. **ACL, 2026.**
- *Monitoring of Continuous-Wave Hardware Injections in LIGO Interferometers during the O4 Observing Run*. **Classical and Quantum Gravity, under review, 2026.**
- *Detectability of Gravitational Higher-Order Modes in the Third-Generation Era*. **Physical Review D, 2022.**
- *Design and Analysis of Bell–Parabolic De Laval Rocket Exhaust Nozzle*. **IEEE ICNTE, 2021.**

TECHNICAL SKILLS

- **Languages:** Python, C++, SQL, MATLAB, R
- **Libraries/Tools:** NumPy, Pandas, scikit-learn, CUDA, MPI, OpenMP
- **Methods:** Statistical inference, Bayesian estimation, Monte Carlo simulation, optimization, anomaly detection, signal processing, time-series analysis

AWARDS & HONORS

- **2nd Place Worldwide:** SAE Aero Design East Competition, USA, 2019
- **Top Tier Performance (238/300)**: Indian Airforce Aptitude Test (AFCAT)**,** 2021
- **Top 1% in India:** INSPIRE Scholarship National Academic Merit - ClassXII, 2017

INTERESTS

Private Pilot Training, Aeromodelling, Financial Markets, Entrepreneurship