Preet Baxi

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SUMMARY

Innovative Data Scientist and ***Algorithm Developer*** with ***5+*** years of experience***.*** Proven expertise in ***scientific computing,*** building and optimizing complex data pipelines, business data analysis and developing algorithms using ***Python, C++, MATLAB, R, Parallel Computing, data structures*** and ***machine learning techniques.***

EDUCATION

PhD *in* ***Physics*** *and* ***Scientific Computing*** *(CGPA: 3.55/4)* Aug. 2022 – Sep. 2026 *(Expected)*
University of Michigan - Ann Arbor, MI, USA

EXPERIENCE

Graduate Student Research Assistant (GSRA) Jan. 2025 – Present
Prof. Stefanus Jasin, University of Michigan - Ann Arbor, MI, USA

- Developed a ***universal AI-assisted heuristic-generation framework*** for ***stochastic inventory optimization,*** enabling language-model agents to autonomously design and refine decision policies under demand uncertainty, fully adaptable to parameter changes without code modification.
- ***Improved heuristic efficiency*** by ***38 %*** and ***reduced expected total-cost variance*** across simulation trials through adaptive parameterization and optimizers. *(Final Draft ready for publication)*
- Conducting an ***experimental study on prompt-injection behavior*** in LLM-based résumé evaluation, examining how manipulative instructions affect model reasoning and ranking in single- and multi-prompt settings.

Graduate Student Research Assistant (GSRA) Jul. 2022 – Dec. 2024
Prof. Keith Riles, University of Michigan - Ann Arbor, MI, USA

- Devised a unique ***"Grouped semi-coherent search algorithm"*** to detect continuous GW signals from high spin-down neutron stars using ***Python,*** and ***FFT-based data segmentation*** techniques, achieving improved **(50 %)** ***detection statistic*** by balancing computational cost through ***template spacing*** and parameter optimization.
- Architected scalable algorithms using Python***, C, machine learning techniques***, and ***parallel computing*** for data generation, signal detection, and hardware monitoring, achieving ***95 % accuracy*** in pulsar filtering and enhancing detector calibration using ***data structures, SFT and F Statistic methods***, and ***matched filtering***.

LIGO Fellow (Visiting Student Researcher, Caltech) Jan. 2024 – Jul. 2024
Laser Interferometer Gravitational-wave Observatory (LIGO) – Richland, WA, USA

- Engineered ***machine learning-based*** search and diagnostic algorithms using ***scikit-learn*** and ***TensorFlow*** to analyze over ***200+ electronic channels***, employing advanced anomaly detection models to isolate and resolve ***4*** previously ***undetected noise sources***, improving overall system ***performance by 45 %*** and reducing error rates.
- Designed and validated **predictive models** simulating analog voltage propagation by optimizing filter configurations and data sampling strategies, resulting in a ***60 % improvement*** in ***signal processing*** accuracy and robust noise mitigation across complex datasets to characterize a new Anti-Aliasing chassis instrument.

Research Student (Indian Academy of Sciences Fellow) May. 2019 – Jun. 2022
Prof. Chandrakant Mishra, Indian Institute of Technology (IIT) Madras – Chennai, TN, India

- Formulated and optimized ***parameter estimation algorithms*** using ***Cramer Rao bounds*** and advanced ***Monte Carlo techniques*** to achieve a ***97 % accuracy rate*** in extracting source properties across various detector systems.
- Accelerated data analysis and visualization ***speeds by 30 %*** by designing ***custom algorithms*** based on ***Bayesian Statistical Methods***, leading to faster and more reliable research outcomes.

Preet Baxi (preetb@umich.edu)

PROJECTS

AI-Driven Trading Platform from Financial News

- Built an end-to-end automated trading system that ingests ***real-time financial headlines***, applies NLP-based ***sentiment scoring***, and runs ***predictive models*** to forecast ***short-term market movements***. Integrated API-linked brokers for autonomous order execution. Back tests demonstrated a ***20 % improvement in Sharpe ratio*** and ***consistent alpha generation*** across multiple market regimes.

Enhancing Minesweeper Solvers with Parallel Computing: A Deep Dive into CUDA and OpenMP Implementations

- Innovated parallel Minesweeper solvers using ***CUDA*** and ***OpenMP*** to optimize game performance, achieving up to ***1769x speedup*** over the sequential version by leveraging GPU and multi-threaded CPU architectures for efficient mine detection, game state propagation, and synchronization management.

Characterizing the Detection Capabilities and Reach of Supermassive Binary Black Holes in the LISA Frequency Band

- Crafted and implemented ***numerical simulation models*** and ***signal processing algorithm*** using ***Python*** and ***LALSuite*** to model and analyze gravitational wave signals, using ***data visualization*** to evaluate detection accuracy and optimize parameter estimation for Super-massive Binary Blackholes in LISA band.

PUBLICATIONS AND PRESENTATIONS

- **P. Baxi** and K. Riles, *"Hardware Injection Monitoring Updates during O4a and improvements from O3",* (Sent for paper publication in Classical Quantum Gravitation Journal.).
- Divyajyoti, **P. Baxi**, CK Mishra, KG Arun, "*Detectability of gravitational higher order modes in the third-generation era",* **Physical Review D Journal, 104, 084080** – **October 2021**, https://doi.org/10.1103/PhysRevD.104.084080.
- **P. Baxi**, R. Jain, Y. Dhadke, Y. Chhabra and V. H. Khatawate , *"Design and Analysis of Bell-Parabolic De Laval Rocket Exhaust Nozzle",* ***IEEE - ICNTE*** – **July 2021**, https://doi.org/10.1109/ICNTE51185.2021.9487717.

LEADERSHIP EXPERIENCE

Team Lead and Aerodynamics Head – DJS Skylark – Aeromodelling team – SAE Aero Design East Competition

- Led a team of ***30*** to design and build ***RC aircraft***, implementing innovative techniques that reduced ***assembly time to 10 seconds*** and increase ***loading capacity by 11 units***, securing ***2nd*** place globally.

SKILLS and INTERESTS

- *Programming and Software Development:* **Python, MATLAB, C/C++, R, SQL, Mathematica, HTML, Fortran, algorithm design, data structures, numerical computing, and object-oriented programming**
- *Data Analysis and Visualization:* **Pandas, NumPy, SciPy, Matplotlib, Seaborn, data wrangling, exploratory data analysis, time-series analytics, correlation modeling, feature engineering, and statistical visualization**
- *Quantitative Modeling and Machine Learning:* **TensorFlow, PyTorch, Scikit-Learn, Keras, XGBoost; time-series forecasting, predictive analytics, reinforcement learning, anomaly detection**
- *Statistical and Computational Techniques:* **Bayesian inference, Monte Carlo simulation, stochastic optimization, regression modeling, hypothesis testing, Scientific Computing**
- *Finance and Trading:* **Algorithmic trading systems, portfolio optimization, market microstructure analysis**
- *High Performance Computing:* **CUDA, MPI, OpenMP**
- *Tools and Others:* **SolidWorks, Ansys, RPA, XFLR, Hyper Mesh, LaTeX, MS Office**
- *Operating Systems:* **Unix/Linux, macOS, Windows**
- *Professional Skills:* **Problem-Solving, Analytical Thinking, Collaboration and Communication, Leadership and Teamwork, Technical Writing, Documentation, Strategy Development, Creativity and Innovation**
- *Private Pilot in Training*