

# GURU KALYAN JAYASINGH

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## SUMMARY

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PhD researcher in applied mathematics and statistical modeling, skilled in Python and data analysis. Experienced in stochastic modeling, machine learning methods, and time-series analysis.

## EDUCATION

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**University of California San Diego** 2022-2027

PhD in Applied Physics and Fluid Turbulence

**Indian Institute of Technology Bombay, India** 2017-2022

Dual Degree (B.Tech + M.Tech) in Engineering Physics (Nanoscience Specialization) (GPA = 3.78)

Awarded Institute Silver Medal (Top of class in Physics Department) and Best Master's Thesis Award

## SKILLS & CERTIFICATIONS

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**Languages & Platforms:** Python (7+ years), C/C++, Mathematica (1+ year)

**Python Libraries:** PyTorch, NumPy, Pandas, SciPy, scikit-learn, Matplotlib, Seaborn

**Machine learning:** Supervised Learning (regression), XGBoost, Decision Trees, Neural networks (RNNs, LSTM)

**Quantitative:** Stochastic processes, Data Analysis, Numerical Methods, Monte Carlo methods, Time-series analysis

## INDUSTRY EXPERIENCE

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**TAU Systems Inc. — Artificial Intelligence/Machine Learning Intern | Carlsbad, CA** Jun - Sep 2026

- Developing a physics-informed ML pipeline to predict electron bunch properties from laser/plasma parameters, including preprocessing, feature engineering, drift correction, and ML-based optimization for TAU's compact laser-plasma accelerator.

## DATA SCIENCE AND MACHINE LEARNING EXPERIENCE

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**Structural Health Monitoring and Fault Detection from Time Series**

**Tools:** Python, PyTorch (LSTM), scikit-learn, NumPy, Pandas, SciPy (Welch PSD/FFT), Matplotlib

- Designed an end-to-end statistical analysis pipeline on a 34.8M-entry sensor dataset, performing data cleaning, exploratory data analysis, and anomaly detection.
- Applied regression modeling (multivariate sequence prediction) to predict system responses from input variables; evaluated model fit using MSE diagnostics.
- Engineered spectral features and built a multinomial classifier achieving 85.29% accuracy across 17 states, applying hypothesis testing to validate separation.

**Neural Forecasting Competition: Graph-RNN for High-Dimensional Time Series**

**Tools:** Python, PyTorch (GRU, Graph Convolutions), NumPy, Pandas, Matplotlib

- Built a predictive model for forecasting ECG (clinical) signals from multi-channel neural activity data, applying Graph RNN architecture ( $R^2 = 0.80$ ).
- Performed exploratory data analysis across recording sessions; identified and addressed distribution shifts in longitudinal data collection. Implemented 3-layer GRU with graph convolutions; addressed out-of-distribution generalization challenges from distribution shifts across recording sessions.
- Outperformed standard statistical baselines (ARIMA, ETS); ranked 17th globally among competing teams.

**Golden Handcuffs: Quantifying Mortgage Rate Lock-In Effects on Housing Supply**

**Tools:** Python, FRED API, scikit-learn, XGBoost, SHAP, statsmodels, Pandas, Matplotlib

- Built an automated pipeline pulling 24 FRED macroeconomic series and assembled a 67-variable national/state-level panel dataset.
- Applied PCA, LASSO, and K-means clustering to identify latent macro structure, test lock-in signal strength, and classify states by economic profile.
- Project found XGBoost outperformed SARIMAX by 30%+ (national) and 70%+(state) on RMSE; lock-in effect amplified by weak labor markets, and industry structure shapes listing volumes nonlinearly — detectable by XGBoost but invisible to SARIMAX.

## RELEVANT RESEARCH EXPERIENCE

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**Statistical Mechanics and Stochastic Modeling of Transition to Fluid Turbulence**

- Developed novel stochastic and regression models to characterize system transitions, applying statistical inference and hypothesis testing to validate predictions against experimental data.
- Demonstrated generalizability of statistical methods across different physical systems; resolved inconsistencies in prior analyses. Results published in Physical Review Letters. [[Paper Link](#)] [[News Coverage](#)]

## AWARDS

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- Institute Silver Medal and Best Master's Thesis, IIT Bombay (top of Physics class)
- Ranked 3rd all-India in the Indian Young Physicists League (IYPL), a national theoretical physics competition.
- Achieved 99.62 percentile in JEE Advanced (2017) among 200,000 applicants.
- Ranked in the Top 1% in NSEC/NSEP, the national qualifiers for INPhO/INChO, and advanced to the INChO.