Dwija Kakkad

Senior undergraduate
Indian Institute of Technology, Kanpur
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Education

Bachelor of Science | Mathematics and Scientific Computing **2021 - present**
Indian Institute of Technology, Kanpur **CPI:** 8.04/10
On track for minors in : Machine Learning and Applications, Philosophy

Publications

Submitted: *Statistical Science*
Dwija Kakkad, Dootika Vats, Exact MCMC for Intractable Proposals, *arXiv preprint*

Research Experience

Multiple Try Metropolis with Bernoulli Factories **Jan'23 - April '23**

Prof. Dootika Vats, IIT Kanpur [report]

- Reviewed literature on various Metropolis-Hastings algorithms and **Bernoulli factories**, and proposed an MCMC algorithm using Multiple Try Metropolis with Bernoulli factories to sample from intractable posteriors.
- Compared the performance of this algorithm to the standard **Barker's algorithm** with Bernoulli factories and showed that an increase in number of proposals **decreases the mean execution time**.

Effects of Acute Stress and Trait Anxiety on Decision Making **Sep'22-Apr'23**

Prof. Arjun Ramakrishnan, IIT Kanpur [report]

- Reviewed literature on **Neuroeconomics**, **Gaussian Process models**, **EEG analysis** and Game Theory.
- Assisted in the **experiment design** and **data collection** of the pilot trials of a dynamic **Penalty Shot** game.
- Performed data cleaning of behavioral data collected and used **linear mixed effects models** and **non-parametric tests** in **R** to analyse the relationships between the affective states and various decision variables.
- Submitted an extended abstract for the same study for **CCN 2023** (Conference on Computational Neuroscience).

Projects

Slice Sampling **Aug'23 - Nov'23**

Prof. Dootika Vats, IIT Kanpur

- Reviewed literature on **Slice Sampling** and **Elliptical Slice Sampling** for continuous and discrete distributions.
- Implemented slice sampling and elliptical slice sampling algorithms for univariate standard normal and multivariate Bayesian logistic regression and compared the performance to the standard Metropolis Hastings algorithm.
- Reviewed literature on **parallel MCMC** using generalized elliptical slice sampling for Bayesian posteriors.

Analysis and Prediction of Stock Market Data **Nov'23**

Prof. Amit Mitra | Course Project

- Analysed NIFTY50 data using time series methods and implemented **ARIMA** modeling for trend forecasting.
- Applied **Keltner Channel Trading Strategy** to interpret and generate buy and sell signals based on market data.

Scoring a company based on ESG factors **Dec'22-Jan'23**

Prof. Suman Saurabh | Finance and Analytics Club

- Performed data extraction and analysis of **annual reports** of companies from 2011-2022 on **S&P BSE500** index.
- Used an **NLP model** to analyze the Environmental, Social and Governance **(ESG)** disclosures in the annual reports.
- Categorized the companies as having high or low ESG disclosure, **developed a portfolio** of high ESG and low ESG firms and compared the portfolio performance on historical data using **ratios and other indicators**.

Portfolio Optimization and Risk Analysis **Jun'22**

Self Project

- Constructed a portfolio of 10 stocks from the NSE500 index and **implemented Markowitz Optimization** on this portfolio to plot the efficient frontier and locate the portfolio having **maximum Sharpe Ratio**.
- Implemented **constant proportion portfolio insurance (CPPI)** trading strategy on this and tested it against historical data to see how well it performs in terms of **returns**, **volatility**, **value at risk** and **drawdown**.
- Created a **risk module** with functions to calculate risk measures like **VaR, CVaR, drawdown** and **semi-deviation**.

Work Experience

Summer Associate **May '24 - July'24**

Finmechanics India

- Developed Excel validation sheets for mark-to-market pricing of **basket vanilla equity options** using **Monte Carlo simulations**, incorporating **implied stock correlations** to accurately model the stock path evolution.
- Gained an understanding of structured products such as **autocallables** and **softcallables** through term sheets, and developed **Python validations** to align system outputs with market standards, reducing the error to **0.1%**.

Relevant Coursework *(*:ongoing)*

Statistics/ML: Probability and Statistics, Time Series Analysis, Introduction to Machine Learning*, Statistical Computing, Statistical & AI Techniques in Data Mining*, Inference 2*

Mathematics: Linear Algebra, Set Theory and Logic, Real Analysis, Abstract Algebra, Complex Analysis, Several Variable Calculus, Ordinary Differential Equations, Partial Differential Equations*

Programming: Data Structures and Algorithms, Numerical Analysis & Scientific Computing, Fundamentals of Computing

Technical Skills

Programming Languages: R, Python, C/C++, Matlab, Java
Software/ Utilities: Git, LaTeX, SQL, Excel-VBA

Scholastic Achievements

- Secured **All India Rank 2426** in **JEE Advanced 2021**, among 1,50,000 shortlisted candidates.
- Secured **All India Rank of 1570** in **JEE Mains 2021**, conducted by **NTA** among 1.1 million candidates.
- Awarded the Innovation in Science Pursuit for Inspired Research Scholarship**(INSPIRE)** for **2021-22 and 2022-23**.

Leadership /Volunteering

Student Guide, Counselling Services **Sep '22 - present**

Coordinator, Stamatics **Aug '22 - Aug '23**

Academic Department Mentor, Academics and Career Council **Aug '23 - Aug '24**

Secretary, Finance and Analytics club **Sep '22 - Mar '22**