

Kapil Gupta

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Research Interests

Spatial Statistics, House Price Dynamics, Spatio-Temporal Modelling, Clustering and Classification, Sports Analytics, Applications of Variable Selection Methods.

Education

- Indian Institute of Management Bangalore, India
 - Doctoral Candidate in Decision Sciences Area (Cumulative GPA: 3.66/4) (Expected) Mar 2025
 - Recipient of the Director's Merit List Award in both the years during the coursework
 - Thesis: Analysing House Price Dynamics using Novel Spatio-Temporal Methods
 - Committee members: Dr. Soudeep Deb, Dr. Venkatesh Panchapagesan, Dr. Kunal Dasgupta, Dr. Anand Deo
- Indian Institute of Technology Delhi, India
 - Master of Science in Mathematics (Cumulative GPA: 7.52/10) Jul 2016–May 2018
 - Thesis: Numerical Solutions of Singularly Perturbed Linear Problems in One Dimension, Advisor: Dr. S. Chandra Sekhara Rao
- Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram, India
 - Bachelor of Technology in Computer Engineering (Cumulative GPA: 7.55/10) Aug 2012–May 2016
 - Thesis: The cd-coloring of bipartite graphs, Advisor: Dr. Shalu M A

Publications

- Gupta, K., Krishnamurthy, V., Deb, S. (2024). What elements of the opening set influence the outcome of a tennis match? An in-depth analysis of Wimbledon data, [IIMB Management Review \(ABDC ranking B\)](#). [early view]
- Gupta, K.(2022). An integrated batting performance analytics model for women's cricket using Principal Component Analysis and Gini scores, [Decision Analytics Journal](#). [publication]
- Deb, S., Gupta, K.(2024). Has there been improvement in Indian Smart Cities towards Quality of Education through Smart Classrooms for Children especially Poor Children, like decline in dropout rate, etc. if any?, [Smart City Mission, Ministry of Housing and Urban Affairs](#). [publication]

Working Papers

- Gupta, K., Deb, S. (2024+) A divide-and-conquer approach for spatio-temporal analysis of large house price data from Greater London. Under review at [Annals of Operations Research \(ABDC ranking A\)](#). [Pre-print]
- Bag, S., Gupta, K., Deb, S. (2024+). A review and recommendations on variable selection methods in regression models for binary data. Under resubmission at [International Statistical Review \(ABDC ranking A\)](#). [Pre-print]
- Gupta, K., Deb, S., Panchapagesan, V. CPRI-Office: A new commercial property rental index for Indian cities using spatio-temporal modelling techniques. [Pre-print]

Manuscript in preparation

- Gupta, K., Deb, S., Panchapagesan, V. Residential Real Estate Market Dynamics in Bangalore: Do Residuals Hold the Key?.
Abstract: Our study contributes to recent statistical research in real estate by uncovering spatial and temporal dependence patterns in residential prices. We introduce a novel statistical model that effectively captures these dependencies using a separable Gaussian spatio-temporal process with an additive mean structure and various residual structures. We then compare model fit and predictive accuracy across these different residual choices within Bangalore's residential real estate market.
- Gupta, K., Deb, S., Panchapagesan, V. Spatial Modelling of Residential Real Estate Prices in Bengaluru, India.
Abstract: We propose a Bayesian spatial model to capture the dynamic patterns of real estate prices. By leveraging a Gaussian spatial process, we incorporate an additive mean structure with a random error component to account for spatial dependencies. Initially, key variables are identified using random forest importance scores, followed by the application of a spatially or temporally varying model. When applied to transaction data from Bengaluru's 165 micromarkets and 1,127 projects (2017-2023), the models demonstrates both flexibility and computational efficiency.

Work in progress

- Gupta, K., Deb, S. Unveiling dynamics: A mixture model approach for addressing missingness in spatio-temporal data.
Abstract: This study addresses the challenge of missing spatio-temporal data in housing market analysis, where property transactions occur infrequently. Common assumptions in spatio-temporal analysis do not hold in this context, risking the oversight of valuable insights. We propose a novel spatio-temporal mixture model that distinguishes between observed and unobserved data, incorporating a latent variable to account for missing data points.
- Gupta, K., Banerjee, S. Bayesian Matrix Clustering with Matrix-Variate t-Distribution.
Abstract: We present a Bayesian nonparametric matrix clustering approach using the matrix-variate t-distribution to analyze latent

heterogeneity in matrix data. This method effectively captures heavy tails and correlations, enhancing clustering robustness. We develop a Markov chain Monte Carlo (MCMC) algorithm for posterior sampling, enabling simultaneous inference on the number of clusters and their configurations, with established convergence properties.

- **Gupta, K.** A Robust Multilevel Modeling Approach to Ranking Women's Batting Performances in Cricket.

Abstract: Historically, women's cricket has received less attention than men's. This study introduces an advanced ranking system for women batters in ODIs, utilizing a two-level negative binomial model to account for runs, strike rates, and variables like not-out status and opposition strength. This model provides a more accurate and equitable ranking compared to simpler approaches, offering valuable insights for enhancing the recognition of women's contributions.

Teaching Experience at IIM Bangalore

Course Instructor

- *Introduction to Regression Models (Foundations of Management course for undergraduates)* Apr 2024
- Overall Rating: 3.83/5 (No. of respondents: 35)
- *Probability and Statistics (Pre-doctoral course)* Sep–Nov 2023
- Overall Rating: 4.25/5 (No. of respondents: 12)
- *Quantitative Techniques (PGP preparatory course)* Jun 2023
- Overall Rating: 4.5/5 (No. of respondents: 26)
- *R for Data Science (PGPBA preparatory course)* Jun 2023
- Overall Rating: 4.3/5 (No. of respondents: 65)
- *Calculus (PhD preparatory course)* Jun 2023
- Overall Rating: 3.6/5 (No. of respondents: 11)

Teaching Assistant

- *Sports Analytics (PGP)* Jun–Aug 2023, 2024
- *Multivariate Data Analysis (PGPBA)* Jun–Aug 2023
- *Data Science Doctrines: Prediction, Inference, and Causality (PGPBA)* Oct–Dec 2022
- *Decision Sciences II (PGP)* Oct–Dec 2022
- *Decision Sciences I (PGP)* Jul–Sep 2022

Research and Industry Experience

- **National University of Singapore** Singapore
Research Associate Jan 2025–Present
- Analysing the improvement in quality of education through smart classrooms.
- **Smart City Mission, Ministry of Housing & Urban Affairs, India** New Delhi, India
Research Consultant Feb 2024–Jul 2024
- Analysing the improvement in quality of education through smart classrooms.
- **Real Estate Research Initiative(IIMB-RERI)** Bangalore, India
Research Consultant Mar 2023–Present
- Working on the development of a commercial rental index through spatio-temporal modeling.
- **Indxx, LLC** Gurgaon, India
Senior Data Analyst, Engineering Division Jun 2018–Jul 2020
- Developed and calculated In-house and client based indices using SQL.
- **Indian Institute of Science Education & Research** Bhopal, India
Summer Research Intern, Department of Mathematics May 2014–Jun 2014
- Reading project in ordinary differential equations under the guidance of [Dr. Ashish Gupta](#).

Presentation and Talks

- **IISA 2024 Conference, Cochin University of Science and Technology, India** Dec 2024
"Spatial Modelling of Residential Real Estate Prices in Bengaluru, India".
- **MathSport Asia 2024, IIM Udaipur, India** Dec 2024
"A Robust Multilevel Modeling Approach to Ranking Women's Batting Performances in Cricket".
- **India Management Research Conference 2024, IIM Ahmedabad, India** Dec 2024
"Spatial Modelling of Residential Real Estate Prices in Bengaluru, India".
"A divide-and-conquer approach for spatio-temporal analysis of large house price data from Greater London". Dec 2024
- **Doctoral Colloquium on Management and Development, Institute of Rural Management Anand** Nov 2024
"A divide-and-conquer approach for spatio-temporal analysis of large house price data from Greater London".
- **BNP Networking Workshop 2024, National University of Singapore** Aug 2024
"A divide-and-conquer approach for spatio-temporal analysis of large house price data from Greater London".
- **(Poster) BAYSM 2024, Ca' Foscari University of Venice, Italy** Jun 2024
"A mixture model approach for addressing missingness in spatio-temporal data".

- **(Poster) ISBA satellite workshop, Università della Svizzera italiana, Lugano**
"A mixture model approach for addressing missingness in spatio-temporal data". Jun 2024
- **JOINT EVENT: 2023-ORSI & 2023-ICBAI, IISC Bangalore, India**
"A Novel Spatio-Temporal Statistical Model to Analyze Real Estate Market in Bengaluru, India". Dec 2023
- **Annual International Research Conference (AIRC), IIM Lucknow, India**
"A Novel Spatio-Temporal Statistical Model to Analyze Real Estate Market in Bengaluru, India". Dec 2023
- **Indo-German workshop on Data Mathematics and Scientific Computing , IIT Tirupati, India**
"Efficient Divide-and-Conquer Approach for Spatio-Temporal Modeling of Real Estate Data". Sep 2023
- **Invited Talk: 6th International Conference on Econometrics and Statistics, Tokyo, Japan**
"Efficient Divide-and-Conquer Approach for Spatio-Temporal Modeling of Real Estate Data". Aug 2023
- **IMR Doctoral Conference, 2023, IIM Bangalore, India**
"What elements of the opening set influence the outcome of a tennis match? An in-depth analysis of Wimbledon data". Feb 2023
- One of the 10 papers accepted out of 98 submissions.
- **Management Doctoral Colloquium Shodh Samagam, IIM Visakhapatnam, India**
"Measuring Batting Performance in Women's Cricket - An In-Depth Analysis of One-Day International Matches". Dec 2021
- **8th MathSport International Conference, University of Reading, UK**
"Does the outcome of a tennis match hinge on the opening set? An in-depth analysis of the Wimbledon data". Jun 2021

Awards and Honours

- **Best Research Paper in Real Estate (Less Developed Countries) Award in Real Estate Track**
India Management Research Conference, IIM Ahmedabad (IMRC 2024) Dec 2024
- **Honorable Mention for Best Research Paper in Data Science & Artificial Intelligence Track**
India Management Research Conference, IIM Ahmedabad (IMRC 2024) Dec 2024
- **Special Prize Award : Advance Research Paper Track**
DOCMAD, IRMA, Anand, India Nov 2024
- **The Florintree Scholarship Award, Indian Institute of Management Bangalore**
- The aim of the award is to promote excellence in management research. Sep 2024
- **Doctoral Student Research Paper Awards of 2024, Indian Institute of Management Bangalore**
- The award aims to recognize good journal papers in the field of management research. Sep 2024
- **ISBA Travel Award: BNP Networking Workshop 2024**
- Awarded 800 USD travel support by the Bayesian Nonparametric Section of ISBA. Jul 2024
- **First Best Paper Award : PhD Scholar Category**
JOINT EVENT: 2023-ORSI & 2023-ICBAI, IISC Bangalore, India Dec 2023
- **Director's Merit List Award**
Indian Institute of Management Bangalore Jun 2021 & 2022
- **Employee of the Year - Entrepreneurship**
Indxx, LLC Nov 2019

Professional Memberships

- *The International Society for Bayesian Analysis (ISBA)* Jan 2024-Present
- *The junior section of the International Society for Bayesian Analysis (j-ISBA)* Jan 2024-Present
- *International Indian Statistical Association (IISA)* Dec 2022-Present
- *Institute of Mathematical Statistics (IMS)* Dec 2021-Present

Positions of Responsibility

- **Reviewer:**
Research in Transportation Business & Management Journal Jan 2024
Scientific Reports Nov 2024
- **Session Moderator (Young Researchers from India)** **Online**
International Day of Women in Statistics and Data Science Oct 2023
- **Session Chair (Spatial Statistics Session)** **Tokyo, Japan**
6th International Conference on Econometrics and Statistics Aug 2023
- **Indian Institute of Management Bangalore** **Bangalore, India**
PhD Students Academic Representative Nov. 2020–Oct. 2021
- **Indian Institute of Technology Delhi** **Delhi, India**
MSc Mathematics Class Representative Jul 2016–May 2018

Media Coverage

o Smart cities boost: IIM-B study shows 22% rise in school enrolments, faster crime-solving, The Indian Express	Dec 27, 2024
o Whitefield, Outer Ring Road, and South Bengaluru drive office rental boom in IT capital, The Indian Express	Nov 29, 2024
o India's office rentals see 3.6% growth; Pune, Chennai, Bengaluru top performers, The Hindu	Nov 29, 2024
o Office rentals rising steadily in top 10 Indian cities, Pune leads: Report, The Economic Times	Nov 30, 2024
o Pune tops commercial property rental index 2024, The Times of India	Nov 30, 2024
o Bengaluru scores above all on positive office rent growth on most quarters, Deccan Herald	Nov 30, 2024

Computer Skills

R, SQL, \LaTeX , Python, MATLAB, C, C++, Microsoft Office.

References

Prof. Soudeep Deb Associate Professor Decision Sciences Area Indian Institute of Management, Bangalore Email: soudeep@iimb.ac.in	Prof. Venkatesh Panchapagesan Professor Finance & Accounting Area Indian Institute of Management, Bangalore Email: Venky@iimb.ac.in
Prof. Rishideep Roy Lecturer School of Mathematics, Statistics and Actuarial Science University of Essex, Colchester Campus Email: rishideep.roy@essex.ac.uk	Prof. Anand Deo Assistant Professor Decision Sciences Area Indian Institute of Management, Bangalore Email: anand.deo@iimb.ac.in