NATIONAL CONFERENCE ON
STATISTICAL METHODS AND APPLICATIONS IN INTERDISCIPLINARY AREAS
(SMAIA-2025)
APRIL 11-12, 2025

ORGANIZED BY
DEPARTMENT OF STATISTICS, UNIVERSITY OF DELHI - 110007

PROCEEDINGS OF SMAIA - 2025

The Department of Statistics, University of Delhi, successfully organized a two-day national conference titled Statistical Methods and Applications in Interdisciplinary Areas **(SMAIA-2025)** on April 11–12, 2025. The conference brought together leading academicians, researchers, and practitioners from across the country to discuss the growing relevance of statistical methods across diverse domains in the modern data-driven era.

The session wise detail is given as under:

DAY 1- April 11, 2025

Inaugural Session

The conference was inaugurated in the presence of eminent personalities including **Dr. Dalip Singh**, Additional Director General, Ministry of Statistics and Programme Implementation; **Prof. Ashish Sen Gupta** (Augusta University); **Prof. Padam Singh** (former member, Indian Statistical Commission); and **Prof. Naveen Kumar**, former Dean, Faculty of Mathematical Sciences, University of Delhi.

Prof. Ranjita Pandey, Head of the Department of Statistics, welcomed all dignitaries and participants. In his inaugural address, **Dr. Dalip Singh** emphasized the growing importance of data science in the age of ChatGPT and AI, and underscored the need for “Right Collaboration” and “Right Data” in official statistics through tools like the Statistical Business Register and the Ministry’s Data Innovation Lab.

Keynote Session

Chair: Prof. Ashis SenGupta, ISI Kolkata
Speaker: Prof. Padam Singh, ADG ICMR
Title: Global Hunger Index (GHI) Reminds the Phrase 'Lies, Damned Lies, and Statistics'
Dr. Padam Singh delivered a powerful critique of the Global Hunger Index (GHI), questioning both its methodology and its relevance to India's current hunger realities. His address highlighted how the GHI disproportionately relies on child undernutrition indicators such as stunting and wasting, while failing to capture broader aspects of food insecurity. He underscored that despite India's strong economic standing and agricultural capacity, the country's poor GHI ranking is largely a product of flawed and outdated data practices. Dr. Singh called for the development of a more scientifically rigorous and context-sensitive national hunger index. He emphasized that policymakers and statisticians must collaborate to construct reliable tools that more accurately measure progress toward food security and hunger eradication.

Technical Session TS01: Statistical Computing
Chair: Prof. Padam Singh, ADG ICMR
This session emphasized the growing role of machine learning, Bayesian methods, and statistical computing in analyzing large and complex datasets, offering practical insights into their applications across diverse sectors.

Invited Speaker: Ashis SenGupta – ISI Kolkata
Title: AI in SML for Big Manifold Data Analytics: Bliss or Blight?
Prof. SenGupta began the session with insights into the integration of AI and Statistical Machine Learning, focusing on manifold-valued data analysis. He underscored the need for methodological rigor and cautioned against relying blindly on AI, advocating its role as a supportive tool alongside expert-driven statistical inference.

Invited Speaker: Prof. Athar Ali Khan – Aligarh Muslim University
Title: Bayesian Modelling with Stan
Prof. Athar Ali Khan delivered a clear talk on using Stan for Bayesian modeling, highlighting its advantages over BUGS and JAGS and its integration with R and Python. He illustrated its use in regression, survival models, and custom Bayesian structures, and introduced LOO-CV for model evaluation, showcasing Stan's efficiency and transparency in handling complex data.

Invited Speaker: Prof. Naveen Kumar – University of Delhi
Title: Explaining Machine Learning Decisions
Prof. Naveen Kumar delivered a compelling talk on the role of Explainable AI, stressing the need for transparency in ML and DL models, especially in critical domains. Through real-world cases, he highlighted the benefits and risks of interpretability tools, urging caution against overly persuasive but inaccurate explanations.

Contributory Speaker: Manya Gupta – University of Delhi
Title: Big Mart Sales Prediction using Machine Learning Algorithms
Ms. Manya gave a well-structured talk on retail sales forecasting using machine learning, showcasing a Kaggle dataset and a complete modeling pipeline. Her analysis found Random Forest and XGBoost to be the most effective, with strong potential for inventory and supply chain optimization.

Contributory Speaker: Mansi Singh – University of Delhi
Title: Predicting Bank Loan Default Using Machine Learning Algorithms
Ms. Mansi used machine learning to predict loan default risks, finding Random Forest to be the most accurate model, showcasing the potential of data-driven methods to improve lending transparency and reduce financial risk.

Contributory Speaker: Mehul Sharma – University of Delhi
Title: Predicting the Success of Bank Telemarketing using Machine Learning
Mr. Mehul gave a data-driven talk on optimizing bank telemarketing using ML, showing how LightGBM outperformed traditional models in predicting term deposit subscriptions. His work underscored the value of advanced algorithms for customer segmentation and optimization.

Technical Session TS02: Agricultural and Forestry Statistics
Chair: Rajesh Kumar, Forest Survey of India
This session showcased the application of statistical methods in agriculture and forestry, highlighting the importance of advanced modeling and forecasting techniques for better resource management and policy-making.

Invited Speaker: Rajesh Kumar – Forest Survey of India
Title: National Forest Inventory Befitting Changing Requirement
Mr. Rajesh emphasized evolving forest inventory methods, highlighting systematic and stratified sampling, remote sensing, and multi-source inventories for better data precision and sustainable resource management. He noted that sampling designs rely on forest heterogeneity.

Invited Speaker: Dr. Raman Nautiyal – Indian Council of Forestry Research and Education
Title: Estimation of Parameters Through Rates and Ratios: A Case Study from the Forestry Sector of India
Dr. Nautiyal discussed data collection challenges in India's informal forestry sector and projected timber demand for 2030 using proxy-based estimation techniques. His work led to India's first formal timber forecast for international reporting, highlighting the role of innovative statistical methods in resource planning.

Invited Speaker: Prof. Manish Sharma – SKAUST Jammu
Title: Agricultural Crop Modelling Through Time Series and Machine Learning Models
Prof. Manish compared time series and machine learning models for forecasting crop yields in Jammu and Kashmir. He found that machine learning models, especially TDNN, outperformed others in capturing temporal dependencies, highlighting the potential of hybrid statistical-ML frameworks in agricultural analytics.

Contributory Speaker: Pranjul Kotwal – SKAUST Jammu
Title: Statistical Assessment of Apple Production in Jammu and Kashmir
Mr. Prajual discussed the importance of apple cultivation in Jammu and Kashmir, which produces 75% of India's apples. His analysis, using time series and neural networks, highlighted production volatility and recommended policy interventions to stabilize output and support 5 lakh families dependent on the crop.

Contributory Speaker: Varnika Sharma – UHF Nauni
Title: Enhancing Oilseeds Yield Forecasting in India: Overcoming SES Flat Forecasts with Bootstrap Forecasting
Ms. Varnika evaluated forecasting models for oilseeds production, highlighting the limitations of SES. She improved accuracy using Bootstrap Forecasting, offering probabilistic forecasts with better confidence intervals, providing a more robust tool for agricultural yield.

Contributory Speaker: Divyam Sharma – SKAUST Jammu
Title: Prediction of Area and Production of Pearl Millet (Bajra) in Jammu & Kashmir
Mr. Divyam analyzed five decades of data on pearl millet in Jammu and Kashmir, applying ARIMA models for area and production forecasting. His study found ARIMA (1,1,3) and ARIMA (2,1,2) to be the most accurate. The findings supported efforts to promote millets and improve strategic agricultural interventions in semi-arid zones.

Contributory Speaker: Nishant Jasrotia – SKAUST Jammu
Title: Forecasting Walnut Production in Jammu and Kashmir using Time Series and Artificial Neural Network Models
Mr. Nishant compared ARIMA, ARIMAX, and ML models for walnut production forecasting, finding that ML models, especially TDNN, better captured nonlinear growth patterns, highlighting their potential for long-term crop planning and climate adaptation.

Contributory Speaker: Yashvant Yadav – University of Delhi
Title: Small Area Estimation Techniques in National Forest Inventory: A Review and Application for Growing Stock in Northern India

Mr. Yashvant presented on improving forest stock estimates using Small Area Estimation (SAE) methods, applying Fay-Herriot and spatial models to enhance precision in Himachal Pradesh, Uttarakhand, and Jammu & Kashmir for better forest management and climate reporting.

Technical Session TS03: Design of Experiments

Chair: Dr. Cini Varghese – ICAR-IASRI

The session provided valuable insights into the latest experimental design methodologies, especially for agricultural, sensory, and breeding trials, contributing to more efficient and cost-effective statistical practices in experiment planning and analysis.

Invited Speaker: Dr. Cini Varghese – ICAR-IASRI

Title: Analysis of Neutrosophic Data Derived from Designed Experiments

Dr. Varghese introduced neutrosophic logic to handle uncertainty in experimental data, emphasizing its advantages over mid-value approximation. She covered neutrosophic hypothesis testing, NANOVA, and demonstrated its application using a diabetic animal trial and various experimental designs.

Invited Speaker: Dr. Mohd. Harun – ICAR-IASRI

Title: Designing of Experiments for Breeding Trials

Dr. Harun discussed designing efficient breeding trials to estimate combining ability and identify superior parental lines. He explained triallel and tetra-allele crosses, using triangular association schemes and Kronecker products, and highlighted resource optimization and R packages for selecting suitable designs.

Invited Speaker: Dr. Anindita Dutta – ICAR-IASRI

Title: Efficient Two-Way Designs for Eliminating Heterogeneity with Multiple Units per Cell

Dr. Dutta discussed Generalized Row-Column (GRC) designs to address two sources of variation in experiments, focusing on SIGRC designs and factorial constructions like $2^4/2^2$. She also demonstrated the use of WebGRC for design cataloguing and layout generation.

Contributory Speaker: Neethu R.S. – ICAR-IASRI

Title: Optimal Covariate Designs (OCDs) Balanced for Indirect Effects

Ms. Neetu presented optimal covariate designs (OCDs) to improve precision by accounting for indirect influences of neighboring treatments. She explained construction techniques using Hadamard and orthogonal matrices, introduced W matrices for modeling indirect effects, and showed how OCDs can extend to block and crossover designs.

Contributory Speaker: Boyina Devi Priyanka – ICAR-IASRI
Title: Partially Balanced Designs for Multi-Session Sensory Trials
Ms. Priyanka addressed challenges in conducting sensory trials with many products, especially when resource limitations restrict fully balanced designs. She proposed using partially balanced designs, constructed through initial sequences or arrays, to manage carry-over effects efficiently across multiple sessions.

Contributory Speaker: Anushka Garg – ICAR-IASRI
Title: Designing Asymmetrical Factorial Experiments Involving Order-of-Addition Effects with Some Components
Ms. Anushka focused on designing factorial experiments where the order of adding components affects outcomes, particularly in asymmetric cases. She demonstrated the application of D-optimal designs to reduce experimental runs while preserving estimation efficiency.

Contributory Speaker: Shreya Sharma – University of Delhi
Title: Minimum Cost Trend Free 16-run Fold-over Design
Ms. Shreya presented a 16-run fold-over design algorithm that minimizes level changes and reduces experimental costs. Her method, evaluated using CD^2 and level-change metrics, proved more cost-effective and statistically balanced than traditional designs.

Technical Session TS04: Econometrics and Inference
Chair: Dr. D.K. Jain – National Dairy Research Institute, Karnal
This session provided a comprehensive look at econometric modeling, measurement error handling, and the application of advanced statistical techniques across various domains.

Invited Speaker: Prof. Shalabh – IIT Kanpur
Title: Goodness-of-Fit Measure for Nonparametric Regression with Measurement Error Model
Prof. Shalabh discussed the limitations of the traditional R^2 in nonparametric regression with measurement error and introduced a novel goodness-of-fit statistic as a robust alternative for assessing model performance in uncertain, imprecise real-world datasets.

Invited Speaker: Prof. Anoop Chaturvedi – University of Allahabad
Title: A Shrinkage-Based Approach to Optimal Weight Selection in Model Averaging (Online)
Prof. Chaturvedi introduced a shrinkage-based model averaging method that balances weights for better prediction. Using penalty functions and an unbiased MSE estimator, the approach outperformed traditional methods in high-dimensional settings, supported by theory and simulations.

Invited Speaker: Dr. D.K. Jain – National Dairy Research Institute, Karnal
Title: An Overview of Econometric Modelling – Problems and Prospects
Dr. Jain emphasized the need for conceptual clarity in econometric modeling, addressing misconceptions and methodological gaps while advocating for a return to strong theoretical foundations for future advancements in the field.

Contributory Speaker: Pragya Goyal – Panjab University
Title: Performance of Biased Estimator in Linear Measurement Error Model (online)
Ms. Pragya presented the weighted mixed Liu estimator for linear models with measurement error, showing its superiority over conventional estimators in reducing bias and improving efficiency, especially in the presence of multicollinearity and stochastic restrictions.

Contributory Speaker: Raghvendra Chaubey – University of Delhi
Title: Regression Analysis of Ukraine-Russian War on Indian Economy
Mr. Choubey analyzed the economic impact of the Russia-Ukraine conflict on India using regression analysis, highlighting significant effects on trade, currency fluctuations, global price hikes, and disruptions in key import sectors like fertilizers and fuel.

Contributory Speaker: Lalit Mohan Joshi – University of Delhi
Title: An Application of Ordinal Regression to Extract Social Dysfunction Levels Through Behavioral Problems
Mr. Joshi presented an ordinal regression model to classify social dysfunction levels based on behavioral indicators, offering a statistical framework for understanding behavioral problems as predictors of social challenges in psychological and sociological assessments.

Contributory Speaker: Kartik Waliya – Meerut College
Title: Inference on Burr-Hatke Exponential Model Using Progressive Censored Data
Mr. Kartik presented methods for making inferences on the Burr-Hatke Exponential model using progressively censored data. His work focused on parameter estimation and confidence intervals, improving analysis in reliability studies with incomplete data.

Technical Session TS05: Survey Sampling I
Chair: Dr. Deepak Singh – ICAR-IASRI
This session provided valuable insights into the challenges and innovations in survey sampling, particularly in handling non-response, constructing indices, and improving estimation accuracy, showcasing advanced methodologies for survey-based data analysis.

Invited Speaker: Prof. Narinder Kumar – Panjab University
Title: Sequential Approach for Selecting the Subset of Populations (online)
Prof. Narinder Kumar introduced a sequential method to identify the exponential population with the largest scale parameter, showing improved efficiency in both complete and incomplete data through simulations and real-world datasets.

Invited Speaker: Dr. Deepak Singh – ICAR-IASRI
Title: Construction of Survey Weighted Composite Indices for Survey Data
Dr. Deepak introduced a novel index construction technique that incorporates survey weights and auxiliary variables, overcoming limitations of conventional PCA. The proposed survey-weighted regression-based indices provide better accuracy and representative rankings in complex survey.

Invited Speaker: Dr. Abhay Pratap Pandey – University of Allahabad
Title: Novel Class of Estimation for Population Variance Using Simulation with Random Non-Response
Dr. Abhay introduced a new class of variance estimators combining ratio and regression techniques, demonstrating improved efficiency and adaptability in scenarios with random non-response.

Invited Speaker: Dr. Bharti – ICAR-IASRI
Title: Calibration Estimator in Dual Frame Surveys
Dr. Bharti proposed a calibration-based estimator for dual frame surveys, particularly under two-stage sampling with auxiliary information at the secondary level. The method enhances precision and coverage, offering a practical approach for improving population total and mean estimation in real surveys.

Contributory Speaker: Pooja Maurya – Banaras Hindu University
Title: A Class of Memory Type Estimator of Population Mean in Presence of Nonresponse and Measurement Error
Ms. Pooja proposed an exponentially weighted moving average (EWMA) based estimator for population mean estimation that accommodates both nonresponse and measurement error. Simulations showed it offers greater efficiency and lower MSE compared to traditional methods.

Contributory Speaker: Harsh Tripathi – Symbiosis International
Title: Application of New Acceptance Sampling Inspection Plan for Generalized Exponential Distribution
Mr. Harsh introduced a Modified Chain Sampling Inspection Plan (MChSIP) based on the Generalized Exponential Distribution, using mean lifetime as the quality measure. He illustrated its effectiveness in industrial quality control with a real-life application.

Technical Session TS06: Distribution Theory

Chair: Dr. Naresh Chandra – Banasthali Vidyapith

The session explored advances in distribution theory, focusing on lifetime data, stress-strength reliability, and censored data, with both theoretical and applied contributions.

Invited Speaker: Dr. Naresh Chandra – Banasthali Vidyapith

Title: Analysis of Length-Biased Weighted Wilson Hilferty Distribution under Adaptive Type-II Progressive Censoring

Dr. Naresh presented statistical inference methods for the Length-Biased Weighted Wilson Hilferty (LBWWH) distribution under an adaptive Type-II progressive censoring scheme. Both MLE and Bayesian methods were discussed, with simulations and a real-life dataset demonstrating the comparative performance and practical relevance of the approaches.

Invited Speaker: Dr. Abhimanyu Singh Yadav – Banaras Hindu University

Title: On Characterizations and Inferential Exploration of a Super Heavy-Tailed Distribution under Progressive First-Failure Censoring Scheme

Dr. Abhimanyu explored the use of a Log-Cauchy-based super heavy-tailed distribution for modeling survival data. The presentation included MLE, Bayesian estimation via MCMC, and predictive inference. Simulation studies and a real dataset validated the proposed methodologies for handling censored lifetime data.

Contributory Speaker: Sandipan Maiti – Alliance University

Title: The Modified XGamma Distribution: Properties and Applications

Mr. Sandipan introduced a modified XGamma distribution that blends features of the exponential and xgamma distributions. The presentation covered its mathematical properties, inferential techniques, and practical applications in survival analysis through real-life data examples.

Contributory Speaker: Om Prakash Prajapati – Banaras Hindu University

Title: A New Extended Rayleigh Distribution and its Applications

Mr. Prajapati proposed a G-method-derived extension of the Rayleigh distribution, evaluating MLE, MPS, and LSE estimation techniques. Simulation and real data supported the model's flexibility and efficiency in reliability analysis.

Contributory Speaker: Surath Chakraborti – Student Member IAI

Title: Some Distributional Properties and Applications of New Size-Biased Kumaraswamy-G Distribution

Mr. Surath introduced a size-biased Kumaraswamy-G distribution, highlighting its hazard rate characteristics and estimation techniques. Real datasets confirmed its superior performance in modeling lifetime data.

Contributory Speaker: Mustafa – University of Delhi
Title: Introducing Accelerated Ailamujia Distribution with Multiple Parameter Estimation Techniques
Mr. Mustafa presented a novel distribution for dynamic reliability modeling, including its application within a Non-Homogeneous Poisson Process (NHPP) context. The study employed various parameter estimation strategies and real-world engineering data.

Contributory Speaker: Mohd Amir – Aligarh Muslim University
Title: Characterization of Some Mid-Truncated Continuous Distribution
Mr. Amir introduced mid-truncated versions of classical distributions using conditional expectations of order statistics. The methodology offers robust modeling in scenarios where extremes are trimmed or censored.

Contributory Speaker: Aashutosh Kumar – Banaras Hindu University
Title: A New Exponentiated Lifetime Distribution: Characterizations, Estimation, and Its Application to Real Data (online)
Mr. Aashutosh proposed the Exponentiated Kappa distribution, examining its entropy, moments, and hazard functions. Bayesian estimation under gamma priors and comparative analysis on real datasets highlighted its applicability in survival and reliability studies.

Technical Session TS07: Survey Sampling II
Chair: Prof. Diwakar Shukla – Dr. H.S. Gour Vishwavidyalaya
The session covered advanced survey sampling methods using graph theory, model-assisted estimation, and machine learning, with applications in forestry and population studies.

Invited Speaker: Prof. Diwakar Shukla – Dr. H.S. Gour Vishwavidyalaya
Title: Parameter Estimation using Graph Sampling
Prof. Diwakar introduced a matrix-based node sampling method for estimating parameters in graph-structured populations, useful for analyzing complex relationships in networks, with applications in epidemiology and social sciences.

Invited Speaker: Dr. Rahul Banerjee – ICAR-IASRI
Title: Robust Integration of Probability Samples for Enhanced Efficiency in Estimation
Dr. Rahul introduced an M-estimator-based method for integrating two probability samples using shared auxiliary variables. Simulation results and real data illustrated the method's robustness and improved efficiency.

Invited Speaker: Dr. Neha Garg – IGNOU
Title: Estimation of Population Mean under Modified Correlated Measurement Errors Model in Sample Surveys
Dr. Neha proposed new estimators under a Modified Correlated Measurement Errors (MCME) model, proving their superiority over existing methods using theoretical derivations and simulation studies.

Contributory Speaker: Kamal Pandey – Forest Research Institute
Title: Random Forest Regression Model for Estimation of Growing Stock in Gujarat using Small Area Estimation (online)
Mr. Kamal combined Random Forest Regression with Small Area Estimation (SAE) techniques and remote sensing data to estimate forest growing stock. The model demonstrated high predictive reliability across forest compartments and ecological zones.

Contributory Speaker: Renu Kumari – Central University of Haryana
Title: Optimum Classes of Memory-type Estimators of Population Mean for Temporal Surveys
Ms. Renu Kumari proposed Exponentially Weighted Moving Average (EWMA)-based memory-type estimators for improving mean estimation in temporal surveys. Simulation results affirmed their improved accuracy under simple random sampling.

Technical Session TS08: Financial Statistics
Chair: Prof. Ranjita Pandey – University of Delhi
The Financial Statistics session covered investment behavior, market volatility, and banking risks, emphasizing advanced statistical methods and their real-world applications.

Invited Speaker: Prof. Jitendra Kumar – Central University of Rajasthan
Title: Exploring the Time Series for the Modelling of Cryptocurrency
Prof. Jitendra analyzed cryptocurrency volatility using advanced GARCH models and regime-switching frameworks, capturing inter-currency dynamics and time-varying volatility to aid investor forecasting.

Invited Speaker: Dr. Jutimala Bora – Dibrugarh University, Assam
Title: An Analytical Study of Portfolio Selection Behaviour Among the College Students
Dr. Jutimala's study on college faculty in Assam revealed a strong preference for risk-free investments, driven by financial security needs. Despite financial awareness, especially women avoided risky assets, emphasizing capital safety in portfolio choices.

Invited Speaker: Dr. Kiran Mishra – Banaras Hindu University
Title: Transition Risks of Banking Lending in Asia and Europe
Dr. Kiran introduced a scenario-based indicator using loan data and GHG intensity to assess climate transition risks in banking. Covering 2012–2022 data from Asia and Europe, the study highlighted the need for banks to integrate climate risk into lending decisions.

Contributory Speaker: Sayani Dey – University of Delhi
Title: Adaptive Volatility Estimation of the Bayesian GARCH Model under Structural Breaks and Outliers
Ms. Sayani introduced a Dynamic Contaminated Bayesian GARCH model that handles volatility clustering, structural breaks, and outliers in financial data. Using MCMC, the model showed robust forecasting, especially during market shocks.

Technical Session TS09: Statistics and Applications
Chair: Prof. Manisha Pal, St. Xavier's University
The session highlighted the wide-ranging use of statistical methods across healthcare, probability, economics, and technology, blending theory with practical analytics.

Invited Speaker: Prof. Manisha Pal – St. Xavier's University
Title: Optimum Mixture Designs for Dose-Response Models
Prof. Manish discussed optimal experimental designs for non-linear dose-response models in drug mixtures, using the LL2 model and potency-adjusted proportions. D- and Ds-optimal designs improved estimation accuracy, aiding efficient biomedical research.

Invited Speaker: Prof. Surinder Kumar – Baba Saheb Bhim Rao Ambedkar University
Title: Sigma Field, Borel Field, Random Variable, and their Relationship (online)
Prof. Surinder's talk explored core concepts in probability theory, explaining sigma fields, Borel fields, and measurable variables. It offered valuable insights for students and early researchers into the foundations of statistical modeling.

Invited Speaker: Dr. Toralima Bora – Dibrugarh University
Title: Fuzzified Iterative Methods and Its Practical Application: A Comparative Study using Statistical Techniques
Dr. Toralima applied fuzzified iterative methods to study investment behavior among college faculty during economic uncertainty. Her analysis showed a strong preference for risk-averse strategies, highlighting the importance of financial security in decision-making.

Contributory Speaker: Michelle Scaria – Manav Rachna University
Title: Healthcare Analytics Made Precise: A Study on Point Estimators Using Python
Mr. Michelle demonstrated using Python for precise point estimation on large healthcare datasets, processing over 100,000 records to derive key metrics. The talk highlighted Python's scalability and practicality in real-time health data analytics.

Contributory Speaker: Saloni Mendiratta – Manav Rachna University
Title: Bridging Game Theory and Optimization: The Aumann-Shapley Paradigm
Ms. Saloni applied cooperative game theory and the Aumann-Shapley value to address cost-sharing in joint ventures, ensuring fair distribution of gains and costs, with applications in utility management and network traffic routing.

Contributory Speaker: Vineeta Yadav – Manav Rachna University
Title: The Relationship Between Literacy Rate and Income 2021–22 (In Indian States)
Ms. Vineeta found a strong positive link between state-wise literacy rates and per capita income, highlighting regional disparities and the role of education in economic growth, with implications for targeted policies.

With the conclusion of the technical sessions on Day 1, the conference seamlessly transitioned into a vibrant **Cultural Evening** that celebrated artistic expression and community spirit. The programme commenced with an elegant dance tribute that set a graceful tone for the night. This was followed by a mesmerizing classical performance that captivated the audience with its precision and emotive depth. The atmosphere further blossomed with heartfelt poetry recitations and soulful musical renditions, each reflecting a rich blend of cultural pride and personal storytelling. The evening concluded with a spirited group dance, uniting performers and spectators in a shared sense of joy and festivity. This cultural celebration not only offered a refreshing contrast to the academic rigor of the day but also left a lasting impression of harmony, creativity, and collective celebration.

DAY 2- April 12, 2025

Technical Session TS10: Official Statistics and Applications
Chair: Prof. Manash Pratim Barman – Dibrugarh University
The session focused on advanced statistical methods applied to demographic and health-related issues in India, combining rigorous modeling with meaningful policy implications.

Invited Speaker: Prof. Tirupathi Rao Padi – Pondicherry University
Title: Stock Prediction through Hidden Markov Modelling

Prof. Tirupathi Rao discussed the application of Hidden Markov Models (HMMs) to predict stock market behavior. By incorporating stochastic transitions, emission probabilities, and probabilistic state estimation, his model offered enhanced forecasting capabilities over traditional regression, aiding investors in minimizing risk.

Invited Speaker: Prof. Manash Pratim Barman – Dibrugarh University
Title: Development of Health-Related Quality of Life Measuring Instrument for Elderly in Assam
Prof. Barman presented a validated tool designed to assess health-related quality of life among the elderly in Assam. Based on data from 1,200 individuals and grounded in factor analysis, the instrument proved reliable for future geriatric assessments in public health research.

Invited Speaker: Dr. Himanshu Tolani – UPES
Title: Contributing Factors for Reduction in Maternal Mortality Ratio in India (online)
Dr. Himanshu's Bayesian spatio-temporal analysis used NFHS and SRS data to identify state-wise disparities in maternal mortality. Institutional delivery and skilled birth attendance were found to be the most significant system-level factors influencing MMR reduction.

Contributory Speaker: Akshita Bhatia – St. Xavier's College
Title: Official Statistics in Action: Field-Level Insights from PLFS Survey
Ms. Akshita proposed AI-driven tools to enhance data collection in PLFS surveys. Techniques like voice recognition and WhatsApp bots improved respondent engagement and data accuracy, especially among women in rural areas.

Contributory Speaker: Kiran Joshi – Lal Bahadur Shastri Govt. PG College
Title: Government Initiatives for Development of Rural Economy in Uttarakhand: An Statistical Overview
Ms. Kiran Joshi provided a statistical overview of government initiatives aimed at developing Uttarakhand's rural economy, highlighting their impact and areas for improvement.

Contributory Speaker: Sunil Kumar – University of Delhi
Title: Spatial and Temporal Patterns of the Elderly Population in India
Mr. Sunil's study examined elderly demographic shifts across India from 1961 to 2021. Using spatial autocorrelation, the analysis revealed regional clustering patterns and informed the need for state-specific aging policies.

Contributory Speaker: Suraj Kathait – Amity University
Title: Determinants of Under-Five Mortality in India: Analysing Key Factors
Mr. Suraj used the Cox Proportional Hazards model and Kaplan-Meier estimates to assess

under-five mortality. Maternal education, wealth index, and birth size emerged as critical determinants, highlighting urban-rural disparities.

Contributory Speakers: Mahi Gupta and Namita Jalan – University of Delhi
Title: Understanding the Trend of Juvenile Apprehensions in India
Presenters used ARIMA and Holt's models were used to forecast juvenile crime, with findings showing a decline in cases and Holt's model being more practical for future predictions.

Technical Session TS11: Survey Sampling III
Chair: Prof. Neeraj Tiwari – Soban Singh Jeena University
This session emphasized the advancement of survey sampling methods tailored to real-world challenges, rare populations, and complex estimation problems.

Invited Speaker: Prof. Neeraj Tiwari – Soban Singh Jeena University
Title: Randomized Response Technique (RRT) for Sensitive Survey Data: A Review
Prof. Neeraj reviewed several RRT models that enhance respondent privacy while collecting sensitive data. He discussed their statistical strengths and real-life applications in social and behavioral studies.

Invited Speaker: Prof. Raosaheb V. Latpate – Savitribai Phule Pune University
Title: Inverse Adaptive Cluster Sampling and Two-Stage Inverse Adaptive Cluster Sampling
Prof. Latpate introduced a hybrid sampling technique for rare populations, blending inverse and adaptive cluster methods. Monte Carlo simulations validated the method's efficiency in ecological surveys.

Invited Speaker: Dr. Kaustav Aditya – ICAR-IASRI
Title: Calibration Estimator of Population Total by Double Use of Auxiliary Information in Two-Stage Sampling Design
Dr. Aditya proposed a novel estimator using both the value and rank of auxiliary variables to enhance two-stage sample estimates. Simulation studies confirmed its superiority over conventional approaches.

Contributory Speaker: Tanushree Yadav – University of Allahabad
Title: Extreme Order Statistics-Based Inference for Weibull Distribution under Ranked Set Sampling
Ms. Tanushree introduced inference methods using highest and lowest order statistics under Ranked Set Sampling for skewed data distributions. Her work outperformed traditional techniques in precision.

Contributory Speaker: Dr. Tulika Dutta – Directorate of Economics and Statistics
Title: Calibration Estimator of Finite Population Variance under Stratified Random Sampling
Ms. Dutta's estimator leveraged strong auxiliary correlations to improve variance estimation in stratified samples. Empirical validation showed reduced MSE compared to standard variance estimators.

Contributory Speaker: Sunil Kumar Yadav – Banaras Hindu University
Title: Construction of Almost Unbiased Estimator for Unknown Population Mean using Two Auxiliary Variables (online)
Mr. Sunil proposed a new estimator for simple random sampling without replacement, demonstrating through theoretical analysis and empirical validation its enhanced accuracy and lower bias compared to existing methods.

Contributory Speaker: Mamta Kumari – Baba Saheb Bhim Rao Ambedkar University
Title: Variance Estimation Using Dual Auxiliary Variables for Time Scale Survey
Ms. Kumari advanced the EWMA framework by incorporating dual auxiliary variables into a memory-type variance estimator, achieving greater efficiency as evidenced by simulation results.

Technical Session TS12: Artificial Intelligence (AI)
Chair: Prof. Ranjita Pandey – University of Delhi
The session demonstrated how AI and statistical models intersect across disciplines including healthcare, fashion, and wavelet analysis, emphasizing modern applications of machine learning and big data analytics.

Invited Speaker: Dr. Aparna Vyas – Manav Rachna University
Title: Statistical Applications of Wavelets (online)
Dr. Aparna discussed the utility of wavelets in statistical data decomposition, emphasizing their role in multi-resolution analysis, denoising, and image compression. The presentation highlighted wavelet thresholding techniques and their critical applications in storing and analyzing digital imagery.

Invited Speaker: Dr. Shruti Garg – Birla Institute of Technology
Title: Transforming Trends: The Role of Artificial Intelligence in the Fashion Industry (online)
Dr. Shruti explored the integration of AI in the fashion industry, focusing on trend forecasting and virtual try-ons, emphasizing its impact on enhancing consumer experience and streamlining design processes.

Invited Speaker: Dr. Sonal Trivedi – VIT Bhopal University
Title: An Empirical Investigating to Explore the Role of Customer Involvement, Engagement and Perceived Quality in Enhancing IoT-Based Healthcare Benefits (online)
Dr. Sonal presented a Smart PLS-based empirical study on how customer engagement and perceived quality affect the effectiveness of IoT healthcare solutions. The talk highlighted structural path models, HT ratios, and implications for patient-centric healthcare delivery.

Contributory Speaker: Supriya Sony – Sarala Birla University
Title: Autoencoder-Driven Voice Analysis for Non-Invasive Diabetes Prediction (online)
Ms. Sony demonstrated how deep learning-based autoencoders can process and extract features from human voice signals to detect early signs of diabetes. This innovative approach offers a promising non-invasive diagnostic tool, blending speech processing with medical AI.

Contributory Speaker: Pawan Kumar Patidar – Poornima University
Title: The Intersection of AI and Diabetes Prevalence: A Novel Cheetah-Optimized Model (online)
Mr. Patidar presented a novel cheetah-optimized model, a bio-inspired AI algorithm for predicting diabetes prevalence using clinical and demographic data. His model improved the accuracy and speed of prediction, suggesting real-world utility in healthcare risk assessment.

Technical Session TS13: Reliability and Economic Statistics
Chair: Prof. Jitendra Kumar – Central University of Rajasthan
This session covered recent advancements in reliability estimation, lifetime modeling, and socio-economic statistics, reflecting the robustness of statistical approaches in engineering and labor research.

Invited Speaker: Prof. Kanchan Jain – Panjab University
Title: Parametric Estimation for Reliability Function of Phased Mission Systems with Series Network (online)
Prof. Kanchan discussed methods for estimating the reliability of systems that operate in multiple phases, often found in aerospace and defense sectors. Her approach, using parametric models and series networks, aids in pre-emptive failure detection and improves system design.

Invited Speaker: Dr. Ram Niwas – Goswami Ganesh Dutta Sanatan Dharma College
Title: Reliability Analysis of a Markov Model Having Cost-Free Warranty with Waiting Repair Facility
Dr. Ram examined product reliability under warranty scenarios using Markov models. His analysis included repair waiting times and system availability, offering practical insights for manufacturers on designing warranty policies and optimizing maintenance strategies.

Contributory Speaker: Mohd. Azeem – Aligarh Muslim University
Title: Adaptive Lifetime: Enhancing Survival and Reliability Models, System Reliability Optimization and Simulation
Mr. Azeem proposed adaptive lifetime models that integrate survival analysis with system reliability engineering. Using simulations, he demonstrated how these models improve performance prediction and risk assessment in mission-critical systems.

Contributory Speaker: Ketan Nagar – Chaudhary Charan Singh University
Title: Reliability Estimation in Lindley Distribution using Block Progressively Censored Samples
Mr. Ketan focused on improving reliability estimates for life data modeled by the Lindley distribution. He utilized block progressive censoring schemes to obtain more precise estimates, particularly useful in experiments where full data collection is impractical.

Contributory Speaker: Falguni Chaturvedi – Mewar University
Title: A Study of Labour Force Participation in Rural Sector of India
Ms. Falguni presented a statistical analysis of labor force participation in rural India, identifying key demographic and socio-economic factors influencing employment trends. Her study offered policy recommendations for improving rural labor engagement.

Contributory Speaker: Risha Podder – IIM Calcutta
Title: Social Disparities and Employment Dynamics in India: Insights from Periodic Labour Force Survey Data
Ms. Podder utilized PLFS datasets to analyze employment inequalities based on caste, gender, and region. Her work provided data-backed evidence of systemic disparities and proposed inclusive employment strategies rooted in empirical labor economics.

Contributory Speaker: Ashima Garg – University of Delhi
Title: A Comparative Study on Stress–Strength Modeling Based on Median-Ranked Set Sampling
Ms. Ashima compared traditional and ranked set sampling methods in the context of stress-strength reliability models. Her results indicated that median-ranked set sampling significantly improves estimation efficiency with smaller sample sizes.

Contributory Speaker: Ms. Manawati Panwar – JECRC University
Title: Digitalization and Sustainability: A Statistical Correlation Analysis Across Global Economies (online)
Ms. Manawati conducted a global-level analysis to understand how digital transformation correlates with sustainability outcomes. Using statistical tools like correlation matrices and principal component analysis, she revealed patterns supporting the role of technology in sustainable development.

Technical Session TS14: Prof. AK Bansal Memorial Session

Chair: Prof. Sudhansu Sekhar Maiti – Visva-Bharati University

This memorial session honored Prof. A.K. Bansal's legacy by focusing on Bayesian reliability approaches, enhancing traditional statistical tools with contemporary Bayesian frameworks for quality control and risk management.

Invited Speaker: Prof. Sudhansu Sekhar Maiti – Visva-Bharati University

Title: A Class of Bayesian Exponentially Weighted Moving Average Control Charts: An Improvement over Classical Approach

Prof. Maiti introduced a Bayesian refinement of the traditional EWMA control charts, enhancing sensitivity in detecting process shifts. His approach yielded quicker anomaly detection in manufacturing and healthcare monitoring systems.

Invited Speaker: C. Satheesh Kumar – University of Kerala

Title: On Bivariate Doubly Generalized Yule Distribution (online)

Mr. Satheesh introduced the doubly generalized Yule distribution for modeling bivariate over-dispersed count data, offering improved flexibility and fit for complex datasets, with applications in AI-based analytics and probabilistic modeling.

Technical Session TS15: Health Statistics

Chair: Prof. David Hanagal – Savitribai Phule Pune University

This session focused on studies bridging health, demography, and statistical modeling, exploring public health objectives, disease risk factors, and disparities in healthcare access.

Invited Speaker: Prof. David Hanagal – Savitribai Phule Pune University

Title: Analysis of Kidney Infection Data using Correlated Compound Geometric Frailty

Prof. Hanagal proposed a new frailty model for survival analysis, improving model fit through Bayesian MCMC estimation. Real-world application to kidney infection data validated the model's efficacy.

Invited Speaker: Dr. Dharmendra Kumar Yadav – NIHF

Title: Prevalence of Non-Communicable Disease and its Determinants among Reproductive Aged Women in India: Evidence from Indian Demography Health Survey-5

Dr. Dharmendra analyzed NFHS-5 data to identify lifestyle and demographic risk factors for NCDs among Indian women. The study called for urgent policy measures focused on behavioral interventions.

Contributory Talk: Ankush Singh – Banaras Hindu University
Title: Trends, Economic Inequalities and Predicted Probabilities in Maternal Health Care Services in India, 2005–2021
Mr. Ankush used NFHS data and concentration indices to reveal socioeconomic disparities in maternal health service use. Regression models highlighted persistent inequality despite overall service improvements.

Contributory Talk: Shubham Pathak – Banaras Hindu University
Title: Spatial Pattern and Associated Factors of Adequate Quality of Antenatal Care Utilization in India
Mr. Shubham applied spatial analytics to identify regional gaps in antenatal care quality and its association with education, income, and healthcare infrastructure.

Contributory Talk: Chandra Bhan Yadav – University of Delhi
Title: On the Identification of Prognostic Factors for the Spread of Infectious Diseases with Carrier Using Logistic Regression
Mr. Chandrabhan developed a time-dependent logistic regression model on COVID-19 patients to identify prognostic factors like diabetes, vaccination status, and asymptomatic carriers. The findings inform targeted intervention strategies.

Contributory Speaker: Meenakshi Gautam – ISM Dhanbad
Title: Inference on the Mean Parameter of Zero-Inflated Rayleigh Model with Applications to Environmental Data (online)
Ms. Meenakshi addressed environmental data modeling challenges using a zero-inflated Rayleigh distribution, offering improved inference for datasets with excess zeros.

Contributory Speaker: Abu Bakar – Aligarh Muslim University
Title: Moments on k-th Upper Record Values from Weibull–Exponential Pareto Distribution (online)
Mr. Bakar derived expressions for the moments of k-th upper record values from the Weibull–Exponential Pareto distribution, offering useful tools for modeling extreme events in environmental and engineering contexts.

Technical Session TS16: Statistical Modelling
Chair: Prof. Dibyojyoti Bhattacharjee, Assam University
This session highlighted modern developments in statistical modelling with applications spanning experimental design, environmental forecasting, sports analytics, and data reduction techniques.

Invited Speaker: Prof. Somesh Kumar – IIT Kharagpur
Title: New Powerful Test for Heteroscedastic Two-Way ANOVA Models (online)
Prof. Somesh addressed the issue of unequal variances in two-way ANOVA with unbalanced designs, proposing likelihood ratio and multiple comparison-based tests. He employed a parametric bootstrap approach to handle intractable test distributions, achieving greater power and robustness in heteroscedastic settings.

Invited Speaker: Prof. Dibyojyoti Bhattacharjee – Assam University
Title: Statistics in Sports: On Quantifying the Pressure Experienced by Team Chasing, in Limited Overs Cricket
Prof. Bhattacharjee proposed a dynamic "pressure index" to assess the pressure on the chasing team in limited overs cricket. The index was calculated ball-by-ball and enabled assessment of performance under pressure, prediction of match outcomes, and identification of turning points.

Invited Speaker: Dr. Gajendra Pratap Singh – Jawaharlal Nehru University (JNU)
Title: Simulating Rainfall with Petri Net Modelling and Markov Chains
Dr. Gajendra presented a hybrid modelling framework using Markov Chains and Petri Nets to simulate and forecast rainfall. The approach captured the stochastic and dynamic nature of rainfall processes, providing both analytical depth and visual clarity.

Invited Speaker: Dr. Rajendra Prasad – University of Delhi
Title: Exploratory Factor Analysis: Theoretical Framework and Hands-on Practice through SPSS
Dr. Rajendra provided participants with a theoretical foundation and practical training in Exploratory Factor Analysis (EFA). Dr. Prasad explained factor extraction methods, rotation techniques, and result interpretation using SPSS.

Contributory Speaker: Smriti Singh, Atish Chand Choubey and Sanjeev Kesarwani – University of Allahabad
Title: Statistical Predictions on Environmental Hazards
Ms. Smriti presented predictive models for the Air Quality Index (AQI) in Uttar Pradesh based on ten years of data. She compared traditional and machine learning methods and found Random Forest and Support Vector Regression to outperform others in AQI forecasting accuracy.

Technical Session TS17: Bayesian Statistics
Chair: Arvind Pandey, CURAJ
This session focused on the application of Bayesian inference across survival models, queueing systems, system reliability, and censored data analysis.

Invited Speaker: Prof. Gajendra K. Vishwakarma – IIT Dhanbad
Title: Bayesian State Space Modelling for Gene Expression Data Analysis (online)
Prof. Vishwakarma presented a Bayesian state-space model tailored to analyze time series gene expression data. The approach accounted for noise and uncertainty, enhancing the biological relevance of inferred expression patterns.

Invited Speaker: Prof. Arvind Pandey – CURAJ
Title: A Study on Comparisons of Additive Regression Frailty Models to Counter Heterogeneity
Prof. Arvind presented Bayesian frailty models using weighted Lindley distributions to handle unobserved heterogeneity in survival data, with MCMC-based estimation and validation through a kidney infection case study.

Contributory Speaker: Vaishali Saxena – CCS University
Title: Bayesian Study on Two-Phase Repair Mechanisms in Cold Standby Systems
Ms. Vaishali presented a Bayesian analysis of repairable systems with two non-identical units and dual-phase repair for the priority unit. MTSF and profit functions were computed using both MLE and Bayesian methods with gamma priors, supported by regenerative point techniques.

Contributory Speaker: Yashi Vaish – Banasthali Vidyapeeth
Title: Bayesian Analysis of State-dependent M/M/1 Queueing Models under Asymmetric Loss Functions
Ms. Yashi explored Bayesian estimation of traffic intensity (ρ) in M/M/1 systems with state-dependent services. The study applied MCMC to assess estimates under entropy, precautionary, and DeGroot loss functions, reflecting server efficiency variations.

Contributory Speaker: Subhankar Dutta – Maulana Azad National Institute of Technology
Title: Bayesian and Non-Bayesian Inference for Proportional Reverse Hazard Rate Model under Unified Progressive Hybrid Censoring with Partially observed competing Risks data
Mr. Subhankar analyzed inference techniques for proportional reverse hazard models with competing risks under progressive hybrid censoring. Both Bayesian and frequentist approaches were discussed, with attention to latent failure and censored data.

Contributory Speaker: Qazi Azhad Jamal – Shiv Nadar Institution of Eminence
Title: Bayesian Estimation of Unit-Weibull Distribution Based on Dual Generalized Order Statistics with application to the cotton production data
Mr. Qazi Azhad presented Bayesian estimation for the Unit-Weibull distribution and applied the model to cotton production data, showcasing the utility of order statistics in Bayesian contexts.

Contributory Speaker: Swati – CCS University
Title: Inferential Stochastic Analysis of a Complex System Composed of Series and Parallel Sub Systems

Ms. Swati presented a detailed stochastic analysis of hybrid systems composed of series and parallel subsystems, applying Bayesian inference for reliability modeling.

Technical Session TS18: Survey Sampling IV
Chair: Prof. Med Ram Verma – ICAR-IASRI
This session presented novel estimation techniques in survey sampling, emphasizing auxiliary variable usage, memory-type estimators, and finite population inference.

Invited Speaker: Prof. Med Ram Verma – ICAR-IASRI
Title: Sample Allocation Proportional to Coefficient of Variation Under Cost Constraints
Prof. Verma introduced a cost-effective stratified sampling approach that allocates samples based on variability (coefficient of variation) within strata, improving statistical precision without increasing costs by focusing resources on more variable strata.

Invited Speaker: Dr. Prayas Sharma – BBAU Lucknow
Title: Enhanced Mean Estimation Using Memory Type Estimators with Dual Auxiliary Variables
Dr. Prayas proposed memory-based EWMA estimators that utilized two auxiliary variables. The approach improved sensitivity to subtle mean changes, with theoretical and simulation-based validation showing reduced MSE over existing estimators.

Invited Speaker: Prof. Om Mishra – University of Delhi
Title: भारतीय ज्ञान परंपरा और अनुप्रयुक्त सांख्यिकी
Prof. Om highlighted ancient Indian contributions to applied statistics through classical texts. He emphasized historical practices aligned with modern inference, classification, and decision-making, urging interdisciplinary integration in contemporary research.

Contributory Speaker: Akansha Agarwal – Vikram University
Title: Predictive Estimation of Finite Population Mean in Two Phase Sampling with known coefficient of variation of first and second both type Auxiliary variable (online)
Ms. Akansha proposed a novel estimator using known coefficients of variation from dual auxiliary variables under two-phase sampling. Bias and MSE derivations, along with empirical validation, confirmed the estimator's superiority.

Contributory Speaker: Sania Chaudhary – Manav Rachna University
Title: Difference-Cum-Ratio Type Estimators
Ms. Sania developed a hybrid estimator combining ratio and difference methods. Theoretical analysis showed reduced MSE under specific conditions, offering a simple yet efficient alternative to traditional estimators.

Contributory Speaker: Neha Jaiswal – Banaras Hindu University
Title: On Estimation Procedures of Stress-Strength Reliability for Perk Distribution with

Applications (online)
Ms. Neha presented estimation procedures for stress-strength reliability using the Perk distribution, highlighting its practical applications in industrial reliability studies.

Valedictory Session: This session marked the formal conclusion of the academic proceedings of the seminar. The session brought together participants, session chairs, speakers, and organizers to reflect on the success and key takeaways of the event.

Prof. Diwakar Shukla, Prof. D.K. Jain, Prof. David Hanagal, Prof. Tirupathi Rao Padi, and Prof. Ranjita Pandey graced the occasion and addressed the gathering. Other esteemed dignitaries and invited guests shared their experience, appreciating the high quality of research presentations and the vibrant exchange of ideas across sessions. They commended the diversity of topics covered, ranging from theoretical advancements to real-world applications in areas such as Bayesian statistics, survey sampling, environmental modelling, and sports analytics. Special acknowledgements were extended to the organizing committee, technical support teams, and student volunteers for their seamless coordination and hospitality. Certificates of participation were distributed, and select presentations were recognized for their scholarly contribution and clarity.

The session concluded with a call for continued academic collaboration and knowledge sharing, emphasizing the importance of interdisciplinary research and innovation in statistics.

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