

GAYATHRY R MENON

Infectious Disease Modeling | Computational Statistics | Hybrid Statistical-AI Modeling

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Kerala , India

RESEARCH PROFILE

I am an active PhD aspirant and applied statistical researcher working at the intersection of computational statistics, machine learning, deep learning, and natural language processing, with a core focus on hybrid statistical-AI modeling for complex health and environmental systems. My work integrates hierarchical and spatio-temporal statistical frameworks with modern deep learning and NLP-based approaches to build interpretable, uncertainty-aware predictive models for epidemiological and biomedical decision support. I am particularly drawn to combining mechanistic, model-based reasoning with data-driven learning using this hybrid lens to study outbreak dynamics, transmission forecasting, and clinical risk prediction. I am currently seeking a fully funded PhD position to extend this research trajectory within a department offering strong computational infrastructure and an active research culture in biostatistics, epidemiology, or computational health modeling.

EXPERIENCE

Bagchi School of Public Health, Ahmedabad University, India

August 2026 – Present

Project Research Associate - Infectious Disease Modeling

Hybrid

- Project: Measles Transmission Patterns Under Migration at the Subnational Level (Catalyst Grant supported by the Measles Analytics Hub, Imperial College London)

College of Health, Lehigh University, USA

July 2025 – August 2026

Research Assistant – Infectious Disease Modeling

Remote

- Applied Bayesian hierarchical and state-space models to Hong Kong influenza surveillance data, quantifying a post-pandemic subtype replacement (posterior share: 86.0%) and a 4-week shift in seasonal timing.
- Built a Bayesian forecasting framework for short-term subtype prediction, outperforming baseline methods on calibration accuracy.
- Implementing hierarchical and time-series modelling approaches to quantify uncertainty in outbreak dynamics.
- Developed reproducible Python pipelines (PyMC, GAMs) supporting multiple infectious disease modeling projects.

Dia-Heals – Public Health Innovations and Research Centre

Dec 2024 – May 2025

Research Assistant – Clinical Risk Modelling

Kerala, India

- Developed a machine learning framework (SVM, KNN, Random Forest) for diabetic lower limb amputation risk, achieving ROC-AUC of 0.79.
- Identified blood glucose and CRP as dominant predictors and uncovered gender-specific risk patterns using SHAP analysis, published in Physica Scripta (2026).

International Student Project Programme 2024

May 2024 – Sept 2024

Research Intern – Climate-Health Modelling

PKRU, Thailand

- Modeled nonlinear climate and air-quality effects on COVID-19 transmission across two South Korean cities using GAMs (63% and 48% explained deviance).
- Found region-specific risk drivers climate in Daegu, air pollution in Seoul informing an early-warning system framework; published in BMC Public Health (2026).

International Student Project Programme 2025

Feb 2025 – August 2025

Instructor – Applied Data Science

Remote

- Mentored international students in applied statistical modelling and machine learning through lectures and case studies.

PUBLICATIONS & MANUSCRIPTS

- [1] **Gayathry R. Menon**, Sayooj Aby Jose, Hsuan-Wei Lee, Asaph Young Chun, A. Jirawattanapanit. Measuring the Impact of Climate Factors and Air Quality on COVID-19 Transmission Dynamics: A Tale of Two Cities in Pandemic Preparedness. *BMC Public Health*, IF : 4.4. doi: 10.1186/s12889-026-27995-w. [🌐]
- [2] **Gayathry R. Menon**, Sayooj Aby Jose, Sweetymol Jose, Jobin K. Thomas. (2026) Predicting Lower Limb Amputation Risk Based on Clinical Factors and Wound Characteristics Using Machine Learning. *Physica Scripta*, IF: 2.6. doi:10.1088/1402-4896/ae4ae5 [🌐]
- [3] Sayooj Aby Jose, R. Raja, S. Patrick-Nelson, Srinidhi A., **Gayathry R. Menon** A. Jirawattanapanit (2025). Mathematical Modeling on Human Papillomavirus (HPV): Transmission Dynamics and Impact on Cervical Cancer. *Jambura Journal of Bioinformatics*, SJR: 0.287. doi: 10.37905/jjbm.v6i4.29641 [🌐]
- [4] **Gayathry R. Menon**, Sayooj Aby Jose, Hsuan-Wei Lee, Asaph Young Chun. Bayesian Evidence for Post-Pandemic Influenza Subtype Replacement and Phenological Reorganization in Hong Kong. *BMC Medicine*, IF: 8.7 (**Under Review**)
- [5] Sweetymol Jose, Jobin K. Thomas, **Gayathry R. Menon**, Sayooj Aby Jose. Understanding Clinical Predictors of Diabetic Wound Healing Using Integrated Analytical Approaches. (**Manuscript in Preparation**)

TECHNICAL & METHODOLOGICAL EXPERTISE - AREAS OF INTEREST

- **Statistical Modelling** : Bayesian hierarchical modelling, Generalized Additive Models (GAMs), Regression analysis (linear, logistic, multivariate), Survival analysis, Time series modelling (ARIMA, forecasting), Hypothesis testing, Design of experiments
- **Machine Learning & AI** : Supervised and unsupervised learning, Tree-based models (Random Forest, XGBoost, LightGBM, CatBoost), Support Vector Machines, Deep learning (PyTorch, TensorFlow, Keras), Transformer-based NLP, Hybrid statistical-ML frameworks
- **Computational Tools** : Python, R, SPSS, Tableau, PowerBI
- **Applied Research Areas**: Risk modelling, Spatiotemporal analysis, Predictive modelling under uncertainty, Health and environmental data systems, Multimodal data integration

RESEARCH PROJECTS

- **Master's Thesis – Hybrid Statistical-ML Framework for Malware Detection** 2024
MGU, School of Mathematics and Statistics
 - Built a hybrid anomaly-detection and Markov-chain framework for dynamic malware classification, validated using XGBoost and multivariate outlier techniques — demonstrating hybrid statistical-ML approaches generalize beyond health applications to security-critical classification tasks.
- **Climate-COVID Interaction Modeling: Nonlinear Environmental Effects on SARS-CoV-2 Transmission** ISPP 2024
PKRU, Thailand
 - Applied K-means clustering and gradient boosting to isolate nonlinear climate-COVID relationships in South Korea, identifying environmental thresholds relevant to regional pandemic preparedness planning.

ONGOING RESEARCH

- **Cascading Viral Replacement Dynamics in Human Influenza Subtypes** Jan 2026 – Present
Lead Modeling Contributor SNU (Korea) & Lehigh Collaboration
 - Designing a two-phase analytical framework to investigate subtype replacement dynamics among human Influenza A (H1N1, H3N2) and Influenza B lineages using respiratory specimen surveillance data.
 - Developing a hybrid forecasting framework that integrates Bayesian Student-t state-space modelling with deep learning architectures (LSTM and Transformer) to improve long-term influenza forecasting while preserving probabilistic uncertainty quantification.

PRESENTATIONS / INVITED TALKS

- **Presentation**, Presented a work " Mapping the Hotspot: A Nonlinear Blueprint of Environmental Risk in the Daegu Epicenter at International Conference On Mathematics And Statistics (ICMS 2025), October 30,31 2025.
- **Resource Person**, International Student Project Programme 2025 (ISPP), *Phuket Rajabhat University, Thailand*. Conducted a technical session on Integrating Data Science and Modeling for Pandemic Preparedness and Response, May 2025.
- **Presentation**, Presented a talk titled “Analyzing COVID-19 Spread in South Korea with Climate Factors Using Machine Learning” at the VI Ecuadorian Mathematics Conference (ESPOCH 2024), held virtually from November 25–29, 2024.

EDUCATION

- **Mahatma Gandhi University** 2022- 2024
Master of Science in Statistics
◦ CGPA: 6.82/10
Kottayam, Kerala India
- **Mahatma Gandhi University** 2019- 2022
Bachelor of Science in Mathematics
◦ Grade: 6.38 /10
Kottayam ,Kerala ,India
- **IELTS Academic:** Overall Band 6.5 (CEFR Level B2), with Speaking 7.5

ACHIEVEMENTS

- Special Student Award, School of Mathematics and Statistics, Mahatma Gandhi University – Selected for international research internships, recognized for excellence in academics and research potential.
- Selected Candidate of International Students Project Programme 2024: Department of Mathematics, Faculty of Education, Phuket Rajabhat University, Thailand.
- Competition Achievement :Third Prize in paper presentation competition conducted by School of Mathematics & Statistics, Mahatma Gandhi University.
- Competition Achievement: Second Prize in Essay Competition conducted by School of Mathematics & Statistics, Mahatma Gandhi University.
- Organizing Committee member for International Seminar on Global Horizon: Exploring Research Opportunities.

VOLUNTEER & COMPERING EXPERIENCE

- Compered an international seminar on global horizon : Exploring Research Opputunities organized in hybrid mode by the School of Mathematics & Statistics and School of Data Analytics, M.G University.
- Compered various sessions of the 41st Annual Conference of ISMS and National Conference on Emerging Developments in Medical Statistics and Biostatistics in the Era of Data Science hosted by School of Mathematics and Statistics, and School of Data Analytics ,Mahatma Gandhi University , Kottayam .
- Team leader at the Campaign conducted by National Service Scheme DB college unit 2019 for medical help by providing financial aid

ADDITIONAL INFORMATION

- **Peer Reviewer:** *Springer Nature; Franklin Open; Wiley journals.*
- **Languages:** *English : Professional Proficiency ; Malayalam : Mother tongue; Hindi : Intermediate*

REFERENCES

1. **Dr. Sayooj Aby Jose** 
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2. **Dr. Hsuan-Wei Lee** 
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4. **Dr. K. K. Jose**

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5. **Dr. Sweetymol Jose**

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