

## Curriculum Vitae : Rahul Ghosal

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### DEPARTMENT

Department of Epidemiology and Biostatistics  
Arnold School of Public Health  
University of South Carolina

### CONTACT INFORMATION

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### EDUCATION

- **Ph.D., Statistics, Department of Statistics, North Carolina State University, August 2016 - December 2019.**  
**Advisor:** Dr. Arnab Maity  
**Thesis:** Hypothesis Testing and Variable Selection in Functional Concurrent Regression Model.
- **Master of Statistics (M. Stat.), Indian Statistical Institute, Kolkata. July 2014 - May 2016.**  
**Specialization:** Mathematics, Statistics and Probability
- **Bachelor of Statistics (B. Stat.), Indian Statistical Institute, Kolkata. July 2011 - May 2014.**

### WORK EXPERIENCE

- **Assistant Professor**, Department of Epidemiology and Biostatistics, University of South Carolina, Aug 2022 - Current.
- **Postdoctoral Fellow**, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Jan 2020 - July 2022, Mentor: Dr. Vadim Zipunnikov.
- **Teaching Assistant**, Department of Statistics, N. C. State University, August 15, 2016 - December 2019.
- **Research Intern**, GE Global Research, May-July 2014.

### RESEARCH INTERESTS

- Functional Data Analysis
- Variable Selection
- Distributional data analysis
- Nonparametric Inference
- Shape Restricted Regression
- Bayesian Inference
- Survival Analysis

### PUBLICATIONS

1. Mirzaei, S., Sengupta, D. and **Ghosal, R.** (2020). [Estimating Menarcheal Age Distribution from Partially Recalled Data](#), *Biostatistics*.
2. **Ghosal, R.**, Maity, A., Clark, T. and Longo, S. (2020). [Variable Selection in Functional Linear Concurrent Regression](#), *J. R. Stat. Soc. C*.
3. **Ghosal, R.**, Varma, V. R., Hillel, I., Volfson, D., Hausdorff, J. M., Watts, A. and Zipunnikov, V. (2021). [Distributional data analysis via quantile functions and its application to modelling digital biomarkers of gait in Alzheimer's Disease](#), *Biostatistics*.
4. **Ghosal, R.** and Maity, A. (2021). [Variable Selection in Nonlinear Function-on-Scalar Regression](#), *Biometrics*.

5. Varma, V. R., **Ghosal, R.**, Hillel, I., Volfson, D., Weiss, J., Urbanek, J., Hausdorff, J. M., Zipunnikov, V., and Watts, A. (2021). [Continuous Gait Monitoring Discriminates Community Dwelling Mild AD from Cognitively Normal Controls](#), *Alzheimer's & Dementia: Translational Research & Clinical Interventions*.
6. **Ghosal, R.** and Saha, E. (2021). [Impact of the COVID-19 induced lockdown measures on  \$PM\_{2.5}\$  concentration in USA](#), *Atmospheric Environment*.
7. **Ghosal, R.** and Maity, A. (2022). [A Score Based Test for Functional Linear Concurrent Regression](#), *Econometrics and Statistics*.
8. **Ghosal, R.** and Maity, A. (2022). [Variable Selection in Nonparametric Functional Concurrent Regression](#), *The Canadian Journal of Statistics*.
9. **Ghosal, R.** and Ghosh, S. (2022). [Bayesian Inference for Generalized Linear Model with Linear Inequality Constraints](#), *Computational Statistics & Data Analysis*.
10. **Ghosal, R.**, Varma, V. R., Volfson, D., Urbanek, J., Hausdorff, J. M., Watts, A. and Zipunnikov, V. (2022). [Scalar on time-by-distribution regression and its application for modelling associations between daily-living physical activity and cognitive functions in Alzheimers Disease](#), *Scientific reports*.
11. **Ghosal, R.**, Ghosh, S., Urbanek, J., Schrack, J. A. and Zipunnikov, V. (2023). [Shape-Constrained Estimation in Functional Regression with Bernstein Polynomials](#), *Computational Statistics & Data Analysis*.
12. **Ghosal, R.** and Maity, A. (2023). [Variable Selection in Function-on-scalar Single Index Model via the Alternating Direction Method of Multipliers](#), *TEST*.
13. Saha, E. and **Ghosal, R.\*** (2023). [Gender Difference in the Effects of Chronic Diseases on Daily Physical Activity Patterns in Older Adults: Analysis of Objectively Measured Physical Activity in NHATS 2021](#), *Annals of Epidemiology*.
14. Weaver, R. G., De Zambotti, M., White, J., Finnegan, O., Nelakuditi, S., ... , **Ghosal, R.**, ... , and Parker, H. (2023). [Evaluation of a device-agnostic approach to predict sleep from raw accelerometry data collected by Apple Watch Series 7, Garmin Vivoactive 4, and ActiGraph GT9X Link in children with sleep disruptions](#), *Sleep Health*.
15. **Ghosal, R.**, Matabuena, M. and Zhang, J. (2023). [Functional proportional hazards mixture cure model with applications in cancer mortality in NHANES and post ICU recovery](#), *Statistical Methods in Medical Research*.
16. Weaver, R. G., White, J., Finnegan, O., Nelakuditi, S., ... , **Ghosal, R.**, ... , and Parker, H. (2023). [A Device Agnostic Approach to Predict Children's Activity from Consumer Wearable Accelerometer Data: A Proof-of-Concept Study](#), *Medicine & Science in Sports & Exercise*.
17. White, J., Finnegan, O., Tindall, N., ... , **Ghosal, R.**, ... , and Weaver, R. G. (2024). [Comparison of raw accelerometry data from ActiGraph, Apple Watch, Garmin, and Fitbit using a mechanical shaker table](#), *Plos one*.
18. Weaver, R. G., Chandrasekhar, M., Armstrong, B., ... , **Ghosal, R.**, ... , and Yang, H. (2024). [Jerks are Useful: Extracting pulse rate from wrist-placed accelerometry jerk during sleep in children](#), *Sleep*.
19. **Ghosal, R.** and Matabuena, M. (2024). [Multivariate Scalar on Multidimensional distribution regression](#), *Biometrical Journal*.
20. Dey, D., **Ghosal, R.\***, Merikangas, K., and Zipunnikov, V. (2024). [Functional Principal Component Analysis for Continuous non-Gaussian, Truncated, and Discrete Functional Data](#), *Statistics in Medicine*.
21. Li, K., **Ghosal, R.\***, ... , and Wei, J. (2024). [The Associations of Sensory Impairment with 10-Year Risk of Dementia and Alzheimers Disease: The Health and Retirement Study, 2010-2020](#), *Journal of Geriatric Psychiatry and Neurology*.
22. Cho, E., Saha, E; Matabuena, M; Wei, J. and **Ghosal, R.+** (2024). [Exploring the Association between Daily Distributional Patterns of Physical Activity and Cardiovascular Mortality Risk among Older Adults in NHANES 2003-2006](#), *Annals of Epidemiology*.

\* Equal contribution. + Senior Author.

## CURRENT RESEARCH

- **Ghosal, R.**, Ghosh, S., Schrack, J. A. and Zipunnikov, V. (2024+). Distributional outcome regression and its application to modelling continuously monitored heart rate and physical activity. *Under revision*
- **Ghosal, R.**, Matabuena, M. and Ghosh, S. (2024+). Functional Time Transformation Model with Applications to Digital Health. *Under revision*
- **Ghosal, R.**, Cho, E. and Matabuena, M. (2024+). Survival on Image Regression with Application to Partially Functional Distributional Representation of Physical Activity.
- Matabuena, M., Louzao, C., **Ghosal, R.** and Gude, F. (2024+). Conformal Inference for Personalized Imputation: Applications in Predicting Diabetes Development with Continuous Glucose Monitoring and Distributional Representations.
- Matabuena, M., **Ghosal, R.**, Mozharovskiy, P., Padilla, O. and Onnela, J. (2024+). Conformal uncertainty quantification using kernel depth measures in separable Hilbert spaces.
- Matabuena, M., Vidal, J., **Ghosal, R.** and Onnela, J. (2024+). Deep Learning Framework with Uncertainty Quantification for Survey Data: Assessing and Predicting Diabetes Mellitus Risk in the American Population.
- Dey, D., **Ghosal, R.**\*, and Zipunnikov, V. (2024+). Multivariate Functional Principal Component Analysis for Mixed-type Functional Data.
- Matabuena, M., Carreira-Casais, A., **Ghosal, R.**, ... , and Bohn, L. (2024+). Exploring the Interplay Between Physical Activity, Dietary Patterns, Diabetes, and All-Cause Mortality in the U.S. Population: A Distributional Data Analysis Perspective.

\* Equal contribution.

## OTHER RESEARCH WORKS AND PROJECTS

- **Ghosal, R.**, Bhattacharya, I. and Ghosh, S. (2019). [A Statistical Exploration of Duckworth-Lewis Method Using Bayesian Inference](#), *arxiv*.

## FUNDING

- ASPIRE, Office of Vice President for Research, University of South Carolina. Flexible Statistical Methods for Distributional Data and Survival Outcomes (2023-2024). Role: PI.
- NIH R01, Using Open-Source Technology to Measure Energy Expenditure and Sleep Among Children 3 to 8 Years Old (2023-2028). Role: Co-I.
- NIH R03, Temporal Dynamics and Associations of Device-based Activity Distribution Metrics and Everyday Cognition in Older Adults (2024-2026). Role: Co-I.
- USC School of Medicine, Emerging Physician Scientist Grant, Disparities in Survivorship Care among Childhood Cancer Survivors in South Carolina (2023-2024). Role: Co-I.
- Prisma Health, Hyundai Hope on Wheels, Social Determinants of Health and Adverse Outcomes in Childhood Cancer (2023-2025). Role: Co-I.
- ASPIRE, Office of Vice President for Research, University of South Carolina. Daily Movement Activity Patterns and Cognitive Function in Older African Americans: A Proof-of-Concept Study (2023-2024). Role: Co-I.
- ASPIRE, Office of Vice President for Research, University of South Carolina. Does hearing aid use reduce the risk of incident dementia? Applications of causal inference methods to emulate target trials using observational data (2023-2024). Role: Co-I.

## CONFERENCES/PRESENTATIONS

- “Hypothesis Testing in Functional Linear Concurrent Regression” at *International Indian Statistical Association Conference*, University of Florida, 2018. (Poster)
- “Variable selection in Functional Linear Concurrent Regression” at *Midwest ML Symposium (MMLS)*, Chicago, 2018. (Poster)
- “Variable selection in Functional Linear Concurrent Regression” at *2019 IMS/ASA Spring Research Conference*, Virginia Tech. (Poster)
- “Variable selection in Nonparametric Functional Concurrent Regression” at *Summer Research Conference, (SRCOS)*, University of Kentucky, 2019 . (Poster)
- “Hypothesis Testing in Functional Linear Concurrent Regression” at *Joint Statistical Meetings*, Denver, 2019. (Paper)
- “A Score Based Test for Functional Linear Concurrent Regression” at *ENAR*, 2020. (Paper)
- “Distributional data analysis via quantile functions and its application to modelling digital biomarkers of gait in Alzheimer’s Disease” at *ENAR*, 2021. (Paper)
- “Distributional data analysis via quantile functions and its application to modelling digital biomarkers of gait in Alzheimer’s Disease” at *Georgetown University, Departmental Colloquium Series*, 2021. (Invited Talk)
- “Distributional data analysis via quantile functions and its application to modelling digital biomarkers of gait in Alzheimer’s Disease” at *ICAMPAM*, 2021. (Poster)
- “Enriching event data: A semi-supervised augmentation approach using location information” at *Pro Forum 2021*, 2021. (Presentation)
- “Distributional data analysis via quantile functions and its application to modelling digital biomarkers of gait in Alzheimer’s Disease” at *Joint Statistical Meetings*, 2021. (Paper)
- “Scalar on time-by-distribution regression and its application for modelling associations between daily-living physical activity and cognitive functions in Alzheimers Disease” at *ENAR*, 2022. (Paper, Session organizer)
- “Shape-Constrained Estimation in Functional Regression with Bernstein Polynomials” at *ENAR*, 2023. (Paper)
- “Distributional outcome regression and its application to modelling continuously monitored heart rate and physical activity” at *JSM*, 2023. (Paper, Session organizer)
- “Functional proportional hazard mixture cure model” at *ENAR*, 2024. (Paper)
- “Distributional outcome regression with quantile functions” at *Royal Statistical Society International Conference*, 2024. (Paper)

## TEACHING EXPERIENCE

- ST 350, Economics and Business Statistics, *TA*, Fall 2016.
- ST 350, Economics and Business Statistics, *TA*, Spring 2017.
- ST 701, Statistical Theory I, *Lab Instructor and TA*, Fall 2017.
- ST 421, Introduction to Mathematical Statistics I, *TA*, Spring 2018.
- ST 590, Statistical Methods I, *TA*, Summer I 2018.
- ST 421, Introduction to Mathematical Statistics I, *TA*, Fall 2018.
- ST 421, Introduction to Mathematical Statistics I, *TA*, Spring 2019.
- ST 511-601, Statistical Methods For Researchers I, *TA*, Summer I 2019.
- ST 563, Introduction to Statistical Learning, *TA*, Summer II 2019.
- ST 516-001, Experimental Statistics For Engineers II, *TA*, Fall 2019.
- BIOS 700, Introduction to Biostatistics, *Instructor*, Spring 2023.
- BIOS 701, Concepts and Methods of Biostatistics, *Instructor*, Fall 2023.

- BIOS 811, Survival Analysis II, *Instructor*, Spring 2024.

#### **ACADEMIC ACHIEVEMENTS AND HONORS**

- Nominated member of Mu Sigma Rho, National Honor Society for Statistics.
- Boyd Harshbarger Travel Award, SRCOS (2019).
- NSF Travel Award, IISA (2018) conference.
- Recipient of prizes in form of book grants by Indian Statistical Institute, Kolkata in the 1st year of Master's degree program (2015).
- Recipient of prizes in form of book grants by Indian Statistical Institute, Kolkata in the 1st year of Bachelor's degree program (2011).

#### **TECHNCIAL AND COMMUNICATION SKILLS**

- **Computer Language and applications:** R, MATLAB, Python, SQL.
- **Languages Known:** English, Bengali, Hindi.

#### **POSITIONS OF RESPONSIBILITY**

- Served as a grant reviewer for the Swiss National Science Foundation (SNSF).
- Served as a referee for the following journals: JRSS-B, Nature Communications, Annals of Statistics, Journal of Computational and Graphical Statistics, Electronic Journal of Statistics, Statistics in Medicine, Annals of Operations Research, Journal of Applied Statistics and Journal of statistical Theory and Practice.
- Editorial board member at Scientific Reports.
- Volunteer in Service Raleigh (2019).
- Volunteer in MTRP (Mathemetical Talent Resarch Programme) in ISI kolkata in 2013-2014.