

# Swapnaneel Bhattacharyya

## Curriculum Vitae

5/159 Netaji Lane  
Baidyabati, Hooghly, 712222  
<https://swapnaneel13.github.io/>  
✉ [swapnaneelbhattacharyya@gmail.com](mailto:swapnaneelbhattacharyya@gmail.com)

### Education

- 2024–2026 **Master of Statistics (M.Stat.)**, *Indian Statistical Institute (ISI)*, Kolkata.
- **First Year: 93.2%**
  - Currently in 2nd year with specialization in *Theoretical Statistics*.
  - Dissertation Advisors: Dr. Aaditya Ramdas (CMU) and Dr. Ambarish Chattopadhyay (ISI).
- 2021–2024 **Bachelor of Statistics (B.Stat.) (Hons.)**, *Indian Statistical Institute (ISI)*, Kolkata.
- **Overall Score: 91.16 %**;
  - Secured the **First Position** in the B.Stat. (Hons.) 2021-2024 Batch.
  - Received **ISIAA - Mrs. M.R.Iyer Memorial Gold Medal Award** for the **outstanding overall performance in B.Stat. (Hons.) 2021-2024 Program**.
  - Achieved **perfect scores** in **7** core courses.
- 2019–2021 **Higher Secondary (12th Grade) Examination**, *Mahesh Sri Ramakrishna Ashram Vidyalaya*, Rishra, WB, India
- Scored **97.6 %**, securing **11th** position in the state out of  $\sim 600,000$  candidates.
- 2013–2019 **Secondary (10th Grade) Examination**, *Mahesh Sri Ramakrishna Ashram Vidyalaya*, Rishra, WB, India
- Scored **94 %**, with **perfect score** in **Mathematics**.

### Areas of Interest

- Conformal Prediction
- Changepoint Detection and Localization
- Sequential Decision Making
- Random Matrix Theory
- Causal Inference
- Reinforcement Learning

### Publication

- **Simultaneous clustering and joint modeling of multivariate binary longitudinal and time-to-event data**: Srijan Chattopadhyay, Sevanee Basu, **Swapnaneel Bhattacharyya**, Manas Pratim Gogoi, and Kiranmoy Das
- Proposed a simultaneous clustering and joint modelling framework to identify latent subgroups in cancer patients from their binary longitudinal outcomes, utilizing the idea of Bayesian data augmentation, followed by subgroup-specific survival analysis.
- **Published in *Lifetime Data Analysis*: Vol 31, Issue 4, October 2025.**
- URL: <https://link.springer.com/article/10.1007/s10985-025-09664-z>

## Preprints

- **Theoretical guarantees for change localization using conformal  $p$ -values (2025):** Swapnaneel Bhattacharyya, Aaditya Ramdas
  - Discovered novel properties of conformal  $p$ -value in the distribution-change setup.
  - Obtained theoretical guarantees, including set-size analysis for the first proposed distribution-free, finite-sample valid confidence set for the distributional change point.
  - Derived a consistent changepoint estimator under mild assumptions, with its rate of consistency.
  - Constructed consistent, finite-sample valid tests for changepoint and exchangeability.
  - Introduced a novel algorithm to optimize the power of conformal tests.
  - <https://arxiv.org/abs/2510.08749>
- **Testing Equality of Medians for Multiple Samples (2025):** Swapnaneel Bhattacharyya
  - Constructed a consistent, distribution-free test for assessing equality of population medians across independent samples, and established additional properties, including its rate of consistency.
  - <https://arxiv.org/abs/2501.05136>
- **Application of Random Matrix Theory in High-Dimensional Statistics (2024):** Swapnaneel Bhattacharyya, Srijan Chattopadhyay, Sevantee Basu
  - Established a novel **variance stabilized CLT of the eigenvalues of Wishart Matrices with Berry–Esseen type bound**, under very mild assumptions, and addressed a large class of high-dimensional inference problems with the help of that CLT.
  - <https://arxiv.org/abs/2412.06848>
- **A Statistical approach to ecological modeling by a new similarity index (2023):** Srijan Chattopadhyay, Swapnaneel Bhattacharyya
  - Constructed a randomization-based similarity index, which outperformed the previous indices for having tunable prevalence dependence.
  - <https://arxiv.org/abs/2304.01944>

## Ongoing Research

- **Online changepoint localization using conformal  $p$ -values (2025+):** Swapnaneel Bhattacharyya, Aaditya Ramdas
  - Developing a theoretically sound and practically effective distribution-free *online* changepoint localization method.
- **A Robust Experimental Design for Improved Covariate Balance (2025+):** Swapnaneel Bhattacharyya, Ambarish Chattopadhyay
  - Developing an experimental design that extends the Finite Selection Model (Morris, 1979; Newhouse et al., 1993) to achieve improved covariate balance across a broad function class of the observed covariates, while remaining practical under time and budget constraints.

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## Academic Achievements

- 2025 Awarded the **prize money for outstanding performance** in **M.Stat. first year**.
- 2024 Secured the **first position** along with scoring the **highest marks in all the subjects** in the **M.Stat. first semester**.
- 2024 Awarded **ISIAA - Mrs. M.R.Iyer Memorial Gold Medal Award** for the **outstanding overall performance** and securing the **first position** in the B.Stat. (Hons.) program (2021-2024) at the Indian Statistical Institute.
- 2024 Invited speaker at the **D.Basu Memorial Talk**, an honor extended annually to top performers in the B.Stat. (Hons.) program at the Indian Statistical Institute.
- 2024 Selected for the **Big Data Summer Institute (BDSI)** at the University of Michigan.
- 2021 – 2024 Awarded the **prize money for outstanding performance** in all semesters in the **B.Stat.** program (2021 - 2024) at the Indian Statistical Institute.
- 2021 Secured **National rank 23** out of  $\sim 10,000$  candidates in the entrance exam of the Indian Statistical Institute.
- 2021 Secured **State rank 11** in the Higher Secondary Examination out of  $\sim 600,000$  candidates.
- 2018 Secured **National Rank 3 (Regional Rank 1)** in the **Regional Mathematical Olympiad**, selected from  $\sim 100,000$  participants in the preliminary exam.

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## Research Internships (On-site)

- 2025 **Department of Statistics and Data Science, Carnegie Mellon University**
  - **Supervisor:** **Dr. Aaditya Ramdas**, Carnegie Mellon University
  - **Brief Description:** Conducted the research leading to the arXiv preprint **Theoretical Guarantees for Change Localization Using Conformal  $p$ -values** (2025).
- 2024 **Big Data Summer Institute (BDSI)**
  - **Supervisor:** **Dr. Veera Baladandayuthapani**, School of Public Health, University of Michigan
  - **Brief Description:** Developed a novel clustering framework for cancer patients from the spatial multiplex images of their lung tissues by extracting spatial information using the nonparametric theory of point processes, and did cluster-wise survival analysis to understand the variations of individual survival probabilities. ([Link of the Poster](#))

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## Talks and Presentations

- 2024 **(Invited talk) Conformal Prediction: A New Paradigm for distribution-free prediction with coverage guarantee in finite samples**
  - At the D.Basu Memorial talk in ISI, Kolkata

- 2024 **(Research work presentation) Clusterwise Survival Analysis of Lung Cancer Data**  
 - At the Big Data Summer Institute, University of Michigan
- 2023 **(Invited talk) Application of Machine Learning in ecological modelling**  
 - At [National Institute for Biomedical Genomics, Kolkata](#)
- 2022 **(Invited talk) Ramsey theory and its applications**  
 - At Open day, ISI Kolkata

## ***Selected Course Projects***

- 2024 **Clustering, Onset and Changepoint Detection of West Bengal rainfall data**  
 - Estimated monsoon onset/departure dates for over a century of West Bengal rainfall data and investigated temporal trends in monsoon timing, duration, and rainfall characteristics.  
 - Developed a new nonparametric hierarchical clustering method for time-series data to identify identical structures in rainfall patterns. ([Available here](#))
- 2023 **A Regression-based approach of Peak Detection in humming audio data**  
 - Developed a new distribution-free method to identify peaks from audio data. ([Available here](#))
- 2023 **Predicting GPS Position, Weather, Number of Covid Cases, and Stock Price using Linear Kalman Filter**  
 - Designed and implemented linear Kalman filter models to perform sequential prediction for GPS, Weather, Number of Covid Cases, and Stock Price. ([Available here](#))

## ***Technical Skills***

Programming R, C, Python

Others LaTeX, R Markdown, HTML

## ***Other Information***

Languages English (Full Professional proficiency), Bengali (Native Language)

Teaching Trained a number of students for Mathematical Olympiads and the entrance examinations of ISI, CMI, and other colleges at undergraduate and master's level.