

# SOMJIT ROY

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## RESEARCH INTERESTS AND SKILL SET

My research focuses on advancing next-generation statistical modeling frameworks that bridge data-driven learning with scientific reasoning. I develop novel methodologies to address complex, real-world problems spanning materials discovery, physics, geophysics, chemical informatics, bioinformatics, and gene expression modeling. Positioned at the intersection of Scientific Machine Learning and Bayesian Modeling & Computation, my skills include Scientifically Guided Probabilistic Inference, Physics-Informed Modeling, Variational Inference, Tree-based Models, and Bayesian Optimization; aiming to build interpretable, scalable, and scientifically grounded learning systems.

## EDUCATION AND TRAINING

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| <b>Texas A&amp;M University</b> , College Station, Texas, USA                                    | 2023 — present  |
| <b>Doctor of Philosophy (Ph.D.) in Statistics</b>  | GPA: 4.00/4.00  |
| Advisors: <b>Bani K. Mallick</b> (TAMU Statistics) & <b>Debdeep Pati</b> (UW-Madison Statistics) |                 |
| Area of Study: Probabilistic Scientific Machine Learning and Computational Bayes                 |                 |
| <b>University of Calcutta</b> , Kolkata, West Bengal, India                                      | 2021 — 2023     |
| <b>Master of Science (MSc.) in Statistics (Ranked First Class First)</b>                         | GPA: 8.15/10.00 |
| <b>St. Xavier's College</b> , Kolkata, West Bengal, India  | 2018 — 2021     |
| <b>Bachelor of Science (BSc.) in Statistics (Hons.)</b>  | GPA: 8.63/10.00 |

## EXPERIENCE

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| <b>Los Alamos National Laboratory</b>  | May 2025 — Aug 2025 |
| <b>Graduate Summer Intern</b>  | Los Alamos, NM, USA |
| <ul style="list-style-type: none"><li><b>SPINWAVE: Scalable Physics-Informed Neural Operator for Seismic WAVE Modeling.</b></li></ul>  |                     |
| • Advised by <b>Kai Gao</b> & <b>Ting Chen</b> in Earth and Environmental Sciences (EES-16) division. Developed a scalable framework for seismic wave modeling using Physics-Informed Neural Operators (PINO), for solving the acoustic wave partial differential equation in complex, heterogeneous media.                                    |                     |
| <b>Tata Electronics Pvt. Ltd.</b>  |                     |
| <b>Data Science Intern</b>   | May 2021 — Aug 2021 |
| Bengaluru, KA, India   |                     |
| <ul style="list-style-type: none"><li><b>Statistical Analysis and Optimization of Sandblasting &amp; Anodizing.</b></li></ul>  |                     |
| • Supervised by <b>Nagasubramanian Kothandaraman</b> (Tata Electronics Pvt. Ltd.) & <b>Subhamoy Maitra</b> (ISI, Kolkata). Identified key factors influencing material surface properties (gloss and texture) and optimized process parameters using machine learning architectures, achieving a reduction of two man-days in production time. | ↗                   |

## PAPERS AND MANUSCRIPTS

Convention: ★ → Scientific Machine Learning, ⚡ → Bayesian Modeling & Computation, ✎ → Variational Inference, ★ → Bayesian Optimization, and ★ → Quantum Cryptography.

7. **Roy, S.**, Gao, K., & Chen, T. (2025+). SPINWAVE: Scalable Physics-Informed Neural Operator for Seismic WAVE Modeling. (*In preparation*). ★
6. **Roy, S.**, Dey, P., Mallick, B. K., Pati, D., & Arróyave, R. (2025+). Multi-Property Materials Discovery using Bayesian Symbolic Trees. (*In preparation*). ★ ★
5. **Roy, S.**, Jaiswal P., Bhattacharya, A., Pati, D., & Mallick, B. K. (2025+). On Frequentist Regret Analysis of Fractional Gaussian Process Thompson Sampling. (*To be submitted*). ★ ★

4. Roy, S., Dey, P., Pati, D., & Mallick, B. K. (2025+). Hierarchical Bayesian Operator-induced Symbolic Regression Trees for Structural Learning of Scientific Expressions. (*Submitted*).  arXiv:2509.19710  [SBSS Student Paper Award 2026, American Statistical Association; Selected for refereed oral presentation at ASA's SDSS 2026].  
3. Roy, S., Dey, P., Pati, D., & Mallick, B. K. (2025+). A Generalized Tangent Approximation Based Variational Inference Framework for Strongly Super-Gaussian Likelihoods. (*Submitted*).  arXiv:2504.05431   
2. Kumar, A., Maitra, S., & Roy, S. (2024). Almost Perfect Mutually Unbiased Bases that are Sparse. *Journal of Statistical Theory and Practice* **18**, 61. 
1. Chaudhury, S., Kumar, A., Maitra, S., Roy, S., & Sen Gupta, S. (2022). A Heuristic Framework to Search for Approximate Mutually Unbiased Bases. In *Cyber Security, Cryptology, and Machine Learning. (CSCML) 2022. Lecture Notes in Computer Science*, vol **13301**. Springer, Cham. 

## OPEN SOURCE SOFTWARE

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On Github: **HierBOSSS** (Roy, S. & Dey, P., 2025), **TAVIE-SSG** (Roy, S. & Dey, P., 2025).

R Packages on CRAN: **bayesestdft** (Roy, S. & Lee, S. Y., 2025), **GoodFitSBM** (Ghosh, S., Roy, S., & Pati, D., 2024), **gamblers.ruin.gameplay** (Roy, S., 2022), **YatesAlgo.FactorialExp.SR** (Roy, S., 2021, [Selected for a talk in the **useR** regional conference in Basel, Switzerland, July 2023]).

## TECHNICAL SKILLS

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- Programming Languages: Python, R, JAVA, C, C++.
- Statistical & Machine Learning Tools: RStudio, RStan, RShiny, mcmc, coda, PyMC, PyTorch, PyTorch Lightning, TensorFlow, SciPy, scikit-learn.
- High-Performance & Cluster Computing: Linux/Unix environments, MPI/OpenMP parallelization, CUDA -GPU programming, PyTorch DDP.
- Version Control & Documentation: Git, Markdown, LATEX.

## AWARDS AND FELLOWSHIPS

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- SBSS Student Paper Award 2026, American Statistical Association. 
- NSF Travel Grant & TAMU Statistics Department Student Travel Award (for IISA 2024). 
- Awarded Targeted Proposal Teams (TPT) grant & scholarship by Texas A&M University. 
- Selected to attend CMS<sup>3</sup>-FAST Summer School (2024) in Texas A&M University. 
- Awarded the R.C. Bose Memorial Book Prize (2022) by Calcutta Statistical Association. 
- Awarded the IASc-INSA-NASI Science Academies Summer Research Fellowship (2022). 
- Recipient of the OPHI, University of Oxford - Summer School Grant (2022). 
- Awarded the IAOS 2022 Conference and Travel Grant (2022) by the World Bank. 

## TALKS AND PRESENTATIONS

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- JSM 2026: Invited Award Presentation for Section on Bayesian Statistical Science (SBSS) Student Paper Award. On *Hierarchical Bayesian Operator-induced Symbolic Regression Trees for Structural Learning of Scientific Expressions*. (Boston, MA, USA).
- SDSS 2026: Refereed Invited Talk on *Hierarchical Bayesian Operator-induced Symbolic Regression Trees for Structural Learning of Scientific Expressions*. (Milwaukee, WI, USA).

- **STAT CAFÉ 2025:** On *Bayesian Symbolic Trees for Structural Learning of Scientific Expressions*. (College Station, TX, USA).
- **SIAM 2025:** Invited Talk on *Physics-Informed Neural Operators for Seismic Wave Modeling*. (UT Austin, TX, USA).
- **LANL Student Symposium 2025:** Poster on *Physics-Informed Neural Operators for Seismic Wave Modeling*. (Los Alamos, NM, USA).
- **IISA 2024:** On *Tangent Approximation for Variational Inference in different Exponential Families*. (Kochi, KL, India).

## LEADERSHIP AND PROFESSIONAL ACTIVITIES

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- **Workflow Workshop Organizer (2024—2025),** as a part of Statistics Graduate Student Association (SGSA), Texas A&M University.
- **Organizing Committee Member (2019—2020),** as a part of the annual fest *epsilon delta* organized by Department of Statistics, SXC Kolkata.

## REFERENCES

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- **Bani K. Mallick**

Department Head; Susan M. Arseven ‘75 Chair in Data Science and Computational Statistics; University Distinguished Professor; Regents Professor; Director, Center for Statistical Bioinformatics; Director, Texas A&M TRIPODS Data Science Institute (FIDS); Editor-in-Chief, SIAM/ASA Journal of Uncertainty Quantification Department of Statistics, Texas A&M University, College Station, TX 77843, USA

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- **Debdeep Pati**

Professor, Department of Statistics, University of Wisconsin–Madison, Madison, WI 53706, USA

✉ [dpati2@wisc.edu](mailto:dpati2@wisc.edu)