

RAHUL BISWAS

Postdoctoral Scholar | Department of Neurology, Weill Institute for Neurosciences
University of California, San Francisco

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RESEARCH INTERESTS

Statistical causal inference from neural time series; computational neuroscience; AI and machine learning for biomedical applications; AI-assisted digital health and remote diagnostics.

EDUCATION

PhD, Electrical and Computer Engineering <i>University of Washington, Seattle</i> <i>Thesis: Causal Functional Connectivity from Neural Dynamics</i>	<i>June 2024</i>
Master of Science, Statistics <i>University of Washington, Seattle</i>	<i>March 2023</i>
Master of Statistics <i>Indian Statistical Institute, Kolkata</i>	<i>May 2016</i>
Bachelor of Statistics <i>Indian Statistical Institute, Kolkata</i>	<i>May 2014</i>

ACADEMIC AND PROFESSIONAL APPOINTMENTS

Postdoctoral Scholar <i>Department of Neurology, University of California, San Francisco</i> <i>Mentor: Dr. Reza Abbasi-Asl</i>	<i>July 2024 to Present</i>
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Computational Neuroscience:

- Leading development of the CITS (Causal Inference in Time Series) algorithm for nonparametric causal modeling of high-resolution neural time series.
- Co-leading investigation of chronic pain neural dynamics using unique EEG and ECoG datasets from the UCSF Pain Study, in collaboration with Dr. Prasad Shirvalkar.
- Co-leading analysis of visual cortex functional circuitry and arousal dynamics in mice using calcium imaging and Neuropixels datasets.
- Co-leading AI-based reconstruction of visual experience from fMRI data using biologically constrained generative video models, in collaboration with Dr. Jack Gallant (UC Berkeley).

Computational Digital Health:

- Designed the core algorithmic framework for home-based cardiovascular diagnostics (US Provisional Patent, Feb 2026); leading clinical validation at the UCSF Cardiovascular Care and Prevention Center in collaboration with Dr. Julio Lamprea.
- Co-leading development of AI-assisted remote skin lesion diagnostics in collaboration with Dr. Maria Wei, UCSF Dermatology and San Francisco Veterans Affairs.

Research Data Scientist, WOC Federal Appointee <i>U.S. Department of Veterans Affairs, Veterans Health Administration</i> <i>VISN 21-Station 662, San Francisco Office of Research and Development</i> <i>Collaborating with Dr. Maria Wei, UCSF Dermatology</i>	<i>May 2026 to May 2029</i>
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PhD Researcher

March 2018 to June 2024

Department of Electrical and Computer Engineering, University of Washington, Seattle

Advisor: Dr. Eli Shlizerman

- Developed the Time-Aware PC (TPC) algorithm and statistical network modeling methods for neural time series, published in PLoS Computational Biology and Statistics and Computing.
- Led fMRI studies mapping directional functional connectivity differences in Alzheimer's disease, Mild Cognitive Impairment, and cognitively normal subjects.
- Characterized directed network dynamics in mouse visual cortex using Allen Institute Neuropixels electrophysiology datasets.
- Published 5 peer-reviewed journal articles during doctoral training.

Graduate Research Assistant

July 2015 to May 2016

Statistical and Mathematics Unit, Indian Statistical Institute, Kolkata | Supervisor: Dr. Anil K. Ghosh

Research Intern

May 2015 to July 2015

Department of Statistics, Columbia University, New York City | Supervisor: Dr. Bodhisattva Sen

Biostatistics Research Intern

May 2014 to June 2014

Departments of Epidemiology and Biostatistics, Johns Hopkins Bloomberg School of Public Health | Supervisor: Dr. Xiangrong Kong

Biomedical Signal Processing Intern

May 2013 to December 2013

Systems Science and Informatics Unit, Indian Statistical Institute, Bangalore | Supervisor: Dr. Kaushik Majumdar

PUBLICATIONS

Preprints and Manuscripts Under Review

1. **Biswas, R.**, Senevirathne, H.W., Wang, Y., Zhang, J., Mukherjee, S., & Abbasi-Asl, R. (2026). State-Dependent Organization of Microscale Functional Circuitry in Visual Cortex. bioRxiv preprint. Submission to Nature Neuroscience in preparation.
2. **Biswas, R.**, Sripada, S., Mukherjee, S., & Abbasi-Asl, R. (2025). CITS: Nonparametric Statistical Causal Modeling for High-Resolution Neural Time Series. Nature Communications (under review). arXiv preprint.

Peer-Reviewed Journal Articles

3. **Biswas, R.**, & Sripada, S. (2025). Alterations in causal functional brain networks in Alzheimer's disease: A resting-state fMRI study. Journal of Dementia and Alzheimer's Disease.
4. Liu, T., Mukherjee, S., & **Biswas, R.** (2024). Tensor Recovery in High-Dimensional Ising Models. Journal of Multivariate Analysis.
5. **Biswas, R.**, & Mukherjee, S. (2024). Consistent Causal Inference from Time Series with PC Algorithm and its Time-Aware Extension. Statistics and Computing.
6. **Biswas, R.**, & Sripada, S. (2023). Causal Functional Connectivity in Alzheimer's Disease Computed from Time Series fMRI Data. Frontiers in Computational Neuroscience.
7. **Biswas, R.**, Thoma, M., & Kong, X. (2023). Functional data analysis to characterize disease patterns in frequent longitudinal data: application to bacterial vaginal microbiota patterns using weekly Nugent scores and identification of pattern-specific risk factors. BMC Medical Research Methodology.
8. **Biswas, R.**, & Shlizerman, E. (2022). Statistical Perspective on Functional and Causal Neural Connectomics: The Time-Aware PC Algorithm. PLoS Computational Biology.
9. **Biswas, R.**, & Shlizerman, E. (2022). Statistical Perspective on Functional and Causal Neural Connectomics: A Comparative Study. Frontiers in Systems Neuroscience.
10. Sarkar, S., **Biswas, R.**, & Ghosh, A.K. (2020). On some graph-based two-sample tests for high dimension, low sample size data. Machine Learning, 109, 279-306.

11. **Biswas, R.**, Khamaru, K., & Majumdar, K. (2014). A peak synchronization measure for multiple signals. *IEEE Transactions on Signal Processing*, 62(17), 4390-4398.

Selected Conference Proceedings

12. Bhosale, P., & **Biswas, R.** (2022). Relationship between a student's social media use and academic performance. *AIP Conference Proceedings*, 2471(1), 020008.
13. **Biswas, R.**, & Shlizerman, E. (2020). Neuro-PC: Causal functional connectivity for neural dynamics. *BMC Neuroscience*, 21(Suppl 1), p.104. 29th Annual CNS Meeting.
14. **Biswas, R.** (2014). Binary sentiment classification of documents. 7th International Conference of the ERCIM Working Group on Computational and Methodological Statistics, University of Pisa.

Citation metrics (March 2026): 130+ citations · h-index: 6 · i10-index: 5 (Google Scholar) · Field Citation Ratio 5.19x above field average (Dimensions) · Altmetric top 15% globally for two independent papers.

PATENTS AND INTELLECTUAL PROPERTY

US Provisional Patent Application

March 2026

"Multiagent Systems and Methods for Performing Automated Data Science Research with Robustness Assurances"

Inventors: Reza Abbasi-Asl, Rahul Biswas. Assigned to The Regents of the University of California.

Leading validation and implementation at UCSF of a multi-agent AI system that automates and robustly validates data science research across high-stakes regulated domains including healthcare, while preserving patient privacy.

US Provisional Patent Application

February 2026

"Methods and Systems for Assessing Blood Pressure Measurement Technique"

Inventors: Julio A. Lamprea Montealegre, Reza Abbasi-Asl, Rahul Biswas. Assigned to The Regents of the University of California.

Designed the core algorithmic framework for blood pressure measurement assessment; leading clinical validation at the UCSF Cardiovascular Care and Prevention Center.

GRANTS AND FUNDING

NIH R01 Research Grant

In Review

Chronic Pain Neural Dynamics, UCSF | Co-PIs: Dr. Reza Abbasi-Asl, Dr. Prasad Shirvalkar

Role: Key Personnel

NIH K99/R00 Pathway to Independence Award

In Review

Role: Principal Investigator

PRESENTATIONS AND SEMINARS

Visiting Seminars

"Inferring Functional Circuitry from Neural Time Series Based on Markovian Structural Causal Model"

June to July 2025

- Brain and Mind Centre, University of Sydney, Australia (June 20, 2025)
- Neuroscience Research Australia (NeuRA) / University of New South Wales, Sydney (June 30, 2025)
- Performance and Expertise Research Centre, Macquarie University, Australia (July 7, 2025)

"Causal Functional Connectivity from Neural Dynamics"

October to December 2024

- Department of Statistics and Data Science, National University of Singapore
- Chulalongkorn University Neuroscience Center, Bangkok, Thailand
- Department of Applied Mathematics, Mahidol University International College, Bangkok, Thailand (honorarium and travel support provided)
- Indian Statistical Institute, Kolkata
- Indian Institute of Science, Bangalore

"Causal Functional Connectivity from Neural Dynamics: Application to Alzheimer's Disease"

January 2023

- Department of Psychology, University of Washington, Seattle

Poster Presentations

- Conference on Cognitive Computational Neuroscience (CCN 2026), New York University (submitted, April 2026)
- Computational and Cognitive Neuroscience Meeting (CNCM 2026), University of California, Irvine (submitted, April 2026)
- Organization for Human Brain Mapping Annual Meeting, Brisbane, Australia (June 2025)
- Society for Neuroscience Annual Meeting (SfN 2024), Chicago
- 29th Annual Computational Neuroscience Meeting (CNS 2020)

Other Oral Presentations

- Dynamic Brain Workshop, Allen Institute and University of Washington, Seattle (August 2018). "Identifying Visual Processing Streams in the Rodent Brain: A Decoding Approach" -- Won Best Collaborative Project Prize
- "Functional Data Analysis in Characterizing Bacterial Vaginosis Patterns and Identifying Pattern-Specific Risk Factors", Johns Hopkins Bloomberg School of Public Health (May 2015)

HONORS AND AWARDS

- **Best Collaborative Project Prize**, Dynamic Brain Workshop, Allen Institute and University of Washington, Seattle (2018)
- **NSF Travel Award**, Frontier Probability Days Conference, Oregon State University (2018)
- **Departmental Fellowship**, University of Washington, Seattle (2016)
- **INSPIRE Scholarship**, Department of Science and Technology, Government of India (2011 to 2016): Nationally competitive scholarship awarded to the top fraction of science students in India, selected from a national pool.
- **NIUS Fellowship**, Tata Institute of Fundamental Research, India (2012)
- **Certificates of Merit**, Regional Mathematical and Physics Olympiads, India (2010)

TEACHING EXPERIENCE

Predoctoral Instructor

June 2022 to August 2022

Department of Applied Mathematics, University of Washington, Seattle

- Sole instructor for Introduction to Differential Equations and Applications (undergraduate level).
- Supervised a teaching assistant; received student evaluation rating of 4.7 out of 5.0.
- Received a note of appreciation from the Chair of Applied Mathematics.

Predoctoral Teaching Associate

September 2016 to June 2024

Departments of Statistics and Electrical and Computer Engineering, University of Washington, Seattle

- Assisted in teaching more than 20 courses at the undergraduate, master's, and doctoral levels covering data science, machine learning, and analytical methods.
- Led class sections, managed online discussion forums, and graded coursework.

MENTORING

Current Mentees

- **UC Berkeley Undergraduate Research Apprentice Program (URAP)**, 2025 to present. Primary supervisor on behalf of the Abbasi-Asl Lab: independently designed evaluation criteria, reviewed applications, conducted interviews, and made final selection decisions. Mentees: Jonah Cha, Smriti Rangrajan, Sameer Rahman, Joshua Edwards, Jessica Lyu, Aarush Khare.

Former Mentees

- Yuerou Tang, Postbaccalaureate Research Assistant, UC Berkeley (October 2025 to February 2026)
- Naomi Donovan, PhD Research Assistant, UCSF (July 2024 to 2025)
- Hasika Senevirathne, Postdoctoral Researcher, National University of Singapore (2025)

- Yujing Wang, Research Assistant, National University of Singapore (2024 to 2025)
- Tianyu Liu, PhD Research Assistant, National University of Singapore (2023)
- Zhang Jiang, Research Assistant, National University of Singapore (June 2023 to June 2024)
- Yash Chainani, Yunmin Kim, Tishani Weerasuriya, Nicholas Lawrence, Undergraduate Researchers, UC Berkeley Undergraduate Research Apprentice Program (URAP), 2024
- Chavisa Arpavoraruth, Teaching Assistant, University of Washington (June 2022 to August 2022)

SERVICE

Peer Review

- Ad hoc reviewer, journals: IEEE Transactions on Signal Processing, Frontiers in Neuroscience, Frontiers in Artificial Intelligence, Frontiers in Endocrinology, Frontiers in Global Women's Health, Frontiers in Psychology, Brain Connectivity, Brain and Behavior
- Ad hoc reviewer, conferences and workshops: NeuroAI Workshop at the Association for the Advancement of Artificial Intelligence Annual Conference (AAAI 2026) (3 papers reviewed)

Editorial Service

- Editor, Frontiers in Computational Neuroscience

Leadership and Outreach

- President, Science and Consciousness (Registered Staff Organization), University of California, San Francisco (2024 to present)
- President, Science and Consciousness (Registered Student Organization), University of Washington, Seattle (2018 to 2024)

OPEN-SOURCE SOFTWARE

- **CITS algorithm** (Python package): github.com/biswasr/cits
- **Time-Aware PC algorithm** (Python package, PyPI: timeawarepc): github.com/shlizee/TimeAwarePC. Publicly available since April 2022; independently downloaded and applied by researchers internationally.

TECHNICAL SKILLS

- **Statistical Methods:** Statistical Causal Inference, Causal Discovery, Time Series Analysis, Functional Data Analysis, High-Dimensional Statistics, Machine Learning
- **Programming:** Python, MATLAB, R, SAS, Java, C
- **ML/AI Frameworks:** PyTorch, Transformers, Diffusers, Scikit-learn, PyTorch Lightning
- **Infrastructure:** Git, ClearML, Docker, Kubernetes, Azure, AWS, GCP, HPC schedulers (SGE, Slurm)
- **Data Modalities:** fMRI, Calcium imaging, Neuropixels, EEG, ECoG