SRIJIT MUKHERJEE

CURRICULUM VITAE

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RESEARCH INTERESTS

Computer Vision, Medical Image Analysis, Multimodal AI, Interpretable Machine Learning, Shape Analysis, Biomedical Signal Analysis

- My research focuses on developing disease-informed and interpretable machine learning and statistical methods for biomedical image analysis, particularly in clinical settings with scarce, noisy, and imperfect data. I incorporate disease etiology, anatomical structure, geometry, and multi-modal information directly into computational models to achieve a balance of performance, robustness, and interpretability. My current research focuses on neonatal hydrocephalus diagnosis and quantitative analysis from low-field MRI, generalizing the framework to histopathology disease grading and biomedical signal (ICP) analysis.

EDUCATION

Fall 2022 - Spring 2027: Ph.D. in Electrical Engineering**,** Pennsylvania State University
- Advisors**:** Prof. Vishal Monga (Penn State), Prof. Steven Schiff (Yale, NIH), Thesis Title: Hydrocephalic Etiology Guided Low-Field MRI Analysis
- *Dissertation Award*: 2026 Dr. Nirmal K Bose Dissertation Excellence Award by Electrical Engineering Department, Pennsylvania State University

Fall 2019 - Summer 2021: Master's in Statistics**,** Indian Statistical Institute, Kolkata, India
- Specialization: Theoretical Statistics, Project: Fish Length Growth Analysis Using Non-Parametric Methods

Fall 2016 - Summer 2019: Bachelor's in Statistics, Indian Statistical Institute, Kolkata, India
- Specialization: Theoretical Statistics, Project: Statistical Learning Model for Cricketer's On-field Performance

TEACHING AND RESEARCH EXPERIENCE

Fall 2026: Teaching Assistant, Electrical Engineering, Pennsylvania State University

- EE350: Continuous-Time Linear Systems, Faculty: Prof. Jeffrey Schiano (Penn State): My duties involve teaching live in-person recitation sessions (twice a week) with around 50 students, creating problems for both homework sessions and four examinations, and grading 140+ students' problems.

Fall 2022 - Summer 2026: Research Assistant**,** Information Processing & Algorithms Laboratory, Pennsylvania State University
(Advisors**:** Prof. Vishal Monga (Penn State), Prof. Steven Schiff (Yale, NIH); Thesis Title: Hydrocephalic Etiology Guided Low-Field MRI Analysis)

- *Disease-Informed and Anatomically Grounded Representation for Diagnosis:* Developed GLAPAL-H, a Global, Local, and Parts-Aware Learner for differentiating healthy, post-infectious, and non-post-infectious hydrocephalus from low-field MRI (N=73 infants), achieving AUC 0.92, outperforming CT and non-CT-based transformer/CNN SOTA baselines. The multi-task architecture explicitly incorporates hydrocephalic etiology through global, local, and anatomical-part representations, while addressing the quality and quantity limitations of low-field MRI. Building on this disease-informed representation framework, developed HydroGeom - a topology- and geometry-aware representation of the brain and CSF, with an efficient HydroNet achieving 87.3% accuracy / AUC 0.88, outperforming SOTA baselines in both disease and pathology behind hydrocephalus detection. Together, these works move beyond black-box image embeddings toward representations that explicitly encode clinically meaningful disease information.

- *Cross-Modal Anatomical Segmentation and Quantitative Biomarker Analysis:* Developed EnSegNet-Cross, a cross-modal enhancement-aware segmentation framework that uses high-fidelity CT-derived structural and topological priors during training to enable anatomically faithful brain/CSF segmentation from low-field MRI alone at inference, achieving 0.85 Dice / 0.93 Volume Score (0.83 Dice on confounded/artifact cases) and outperforming SOTA alternatives, enabling reliable volumetric analysis without exposing pediatric patients to CT radiation. Extended this anatomical quantification paradigm to hemi-brain growth analysis on 75 ESTHI-trial patients, developing an automated AI pipeline for hemi-brain segmentation (0.94 brain / 0.94 CSF Dice) and volume estimation that remains effective in the presence of metallic shunt artifacts, with postoperative hemisphere volume ratios statistically normalizing toward healthy references, validating the unaffected hemisphere as a proxy for whole-brain growth. Across these projects, my work balances performance, robustness, and interpretability by incorporating clinical and anatomical priors directly into AI models rather than relying solely on post hoc explanations.

- *Research Mentoring and Proposal Development:* Mentored two Master's and two Ph.D. students on biomedical AI research projects spanning hemi-brain growth analysis, high-field MRI and CT segmentation, histopathological disease grading (DBIBD-Net), and intracranial-pressure (ICP) data analysis. Guided the students in problem formulation, literature review, methodological development, experimentation, and technical communication. Also contributed to the development of NIH and NSF research proposals, assisting with research framing, methodological design, and technical writing.

Spring 2022 - Summer 2022: Research Assistant (remote)**,** MDRK Consulting LLC, New York
(Advisors**:** Prof. Diganta Mukherjee (Indian Statistical Institute, Kolkata, India))

- Reviewed ad fraud types (spoofed attribution/users) and used detection methods like timestamp filtering and distribution analysis; Developed a probabilistic model with a multivariate normal distribution and applied Mahalanobis Distance and kernel density estimation to detect outliers in installation, impression, and spoofing data; Identified 0.2% of the dataset as severe spoofing outliers, with 3.8% indicating broader fraud risks.

PUBLICATIONS - 4 JOURNAL PAPERS (PUBLISHED = 3, UNDER REVIEW = 1, IN PREPARATION = 2)

- **Mukherjee, S.**, Templeton, K., et al. HydroGeom: Brain and CSF Geometry Aware Representation for Hydrocephalus Diagnosis (in preparation), 2026.

- Luo, Y., **Mukherjee, S.**, et al. DBIBD-Net: A Dual-Branch Multiple-Instance Learning Framework for Histopathological Scoring of Inflammatory Bowel Disease (in preparation), 2026.

- **Mukherjee, S.,** Templeton, K., et al. Hydrocephalic Brain Volume Estimation from Low-Field MRI: Topologically-Enriched Cross-Modal Enhancement and Segmentation (under review at Journal of Neural Engineering), 2026. (preprint)

- **Mukherjee, S.**, Templeton, K., Yu, M., et al. GLAPAL-H: Global, Local, And Parts-Aware Learner for Hydrocephalus Infection Diagnosis in Low-Field MRI. IEEE Transactions of Biomedical Engineering, 2026.

- Bajaj, U., Yu, M., Templeton, K., **Mukherjee, S. (joint first author)**, et al. Hemi-brain growth as a biomarker for whole brain growth. Journal of Neurosurgery: Pediatrics (preprint), 2026.

- Chakraborty, D., Das, S., **Mukherjee, S.**, et al. Triangle-free projective-planar graphs with diameter two: Domination and characterization. Discrete Applied Mathematics 331, 2023.

AWARDS AND RECOGNITION

2022-2026: Pennsylvania State University Graduate Fellowships

2026: Dr. Nirmal K Bose Dissertation Excellence Award

2024: Milton and Albertha Langdon Memorial Graduate Fellowship

2022-2023: Melvin P. Bloom Memorial Graduate Fellowship in Electrical Engineering

2014-2018: Mathematics Olympiad and Competition Awards

2018: Simon Marais Undergraduate Mathematics Competition Awardee

2017, 2018: Madhava Undergraduate Mathematics Competition Awardee

2015: Indian National Mathematical Olympiad Training Camp Participant

2014: Regional Mathematics Olympiad Awardee

ACADEMIC SERVICE AND STEM OUTREACH

Academic Service

2026 Served as a reviewer for IEEE Signal Processing Letters, IEEE Sensors

2026 Served as an official judge in Mathematics for the Pennsylvania Junior Academy of Science (PJAS)

2023–2025 Mathematics Instructor at the Undergraduate Quant Finance Club at Penn State

2023 Served as a reviewer for IEEE CAMSAP

2022-2025 Served as a reviewer for IEEE ICASSP

STEM Outreach (Talks, Software, and Tutorials)

- Built software for medical professionals: Segment-Anything Live App, and educational LLM apps: Annotated PDF Summary, Adaptive Learner App.
- Built tutorials/talks on Large Language Models, Deep Learning, and a community (sm) of 55k+ members by creating content in mathematics and AI.
- Built a 2.4k+ free community of students at srijitmath.com, where I help learners practice solving mathematics problems by hand and grade them at scale.

RELEVANT COURSEWORK AND SKILLS

Mathematics: Real Analysis, Complex Analysis, Abstract Algebra, Discrete Mathematics, Differential Equations, Metric Topology, Game Theory, Convex Optimization

Probability: Probability Theory, Random Graphs, Stochastic Processes, Measure-Theoretic Probability, Martingale Theory, Weak Convergence and Empirical Processes, Random Variables and Stochastic Processes

Statistics: Parametric Statistics, Linear Statistical Models, Decision Theory, Non-Parametric Statistics, Large Sample Theory, Bayesian Inference, Sample Survey, Regression Techniques, Pattern Recognition, Categorical Data Analysis, Statistical Computing, Resampling Techniques, Statistical Methods in Epidemiology and Ecology, Financial Econometrics, Time Series Analysis

Computing, Signal Processing, and Deep Learning: Programming in C, Data Structures, Numerical Analysis, Design & Analysis of Algorithms, Computer Vision I and II, Neural Networks and Deep Learning, Linear Control Systems

Programming: Python, PyTorch, OpenCV, LangChain, Transformers, HuggingFace, Streamlit, Gradio, RShiny, R, C, RStudio, LaTeX