

Dibakar Roy Sarkar

Phone: (+1) 443 453 8766 | Email: droysar1@jh.edu
[LinkedIn](#) | [GitHub](#)

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, C++

ML/DL Frameworks: Jax, PyTorch, Scikit-learn, XGBoost, langchain

ML/DL models and algorithms: XGBoost, CNN, UNet, RNN, LSTM, Transformers, DQN, SAC, DDPG, PPO

Mathematical Libraries: NumPy, SciPy, Pandas, SymPy

HPC: CUDA, MPI, Supercomputing (Polaris (ALCF), TACC, Rockfish (JHU))

Other Tools: Git, Jupyter, Docker, LaTeX, Linux/Unix

EDUCATION

Johns Hopkins University

Ph.D., Civil and System Engineering (Focus: ML/AI for Engineering Systems)

Baltimore, MD

Aug 2024 – Present

- Advisor: Dr. Somdatta Goswami — Relevant Coursework: High Performance Computing, Learning, Estimation and Control, Reinforcement Learning

Indian Institute of Technology, Madras

M.Tech., Civil Engineering — CGPA: 9.22/10 (Top 5%)

Chennai, India

Aug 2022 – July 2024

- Relevant Coursework: Advanced Mathematics (Data science), Numerical Methods, Optimization, Programming

Central Institute of Technology, Kokrajhar

B.Tech., Civil Engineering — CGPA: 8.98/10

Assam, India

Jul 2019 – May 2022

- Relevant Coursework: Linear Algebra, Calculus, Probability & Statistics

Central Institute of Technology, Kokrajhar

Diploma, Construction Technology — CGPA: 9.2/10

Assam, India

(Jul 2016 – May 2019)

KEY PROJECTS & RESEARCH

Hybrid Neural-FEM Framework for Fracture Simulation — *Python, FEniCSx* October 2025 – Present

Johns Hopkins University

- Developing a hybrid Neural Operator–FEM methodology to accelerate fracture simulations, reducing computational cost while maintaining predictive accuracy.

ARIA: Adaptive Retrieval Intelligence Assistant — *Python, RAG, LLM* June 2025 – Present

Johns Hopkins University

- Developed RAG-based AI teaching assistant tailored for Statics and Mechanics coursework, implementing semantic search over course materials and problem solutions to provide contextually relevant responses to student queries.
- Deployed production-ready Streamlit application serving 90 students, collecting user interaction data to iteratively improve retrieval accuracy and response quality for engineering problem-solving assistance.

Differential Predictive Control of PDE using Neural Operators — *Python, JAX* June 2025 – Present

Johns Hopkins University

- Implementing neural operator-based model predictive control framework for real-time PDE system optimization.
- Addressing sim-to-real transfer and time-delayed feedback challenges, enabling robust control performance on physical systems with measurement noise and communication delays.

Neural Operators for System Parameter Learning — *Python, JAX, CUDA* August 2024 – Present

Johns Hopkins University

- Developed deep operator networks achieving **95% accuracy** in learning hidden physics and system parameters.
- Technologies: JAX, CUDA, High-Performance Computing, Neural Network Architecture Design, Partial Differential Equations

High-Performance Neural Operators Training — *CUDA, MPI, Supercomputing* Jan 2025 – Present

Johns Hopkins University (Argonne National Laboratory Computing Facility)

- Developed scalable multi-GPU training framework for high-dimensional PDEs on Argonne's Polaris supercomputer
- Optimized memory usage and parallel computing, reducing training time by **83%** (600 node-hours allocation)
- Technologies: CUDA, MPI, Distributed Systems, Performance Optimization

RESEARCH PUBLICATIONS

- Zanotta, P., **Sarkar, D. R.**, Zheng, H., Goswami, S., & Drgoňa, J., "CINOC: Cardinality-Invariant Neural Operator Policies for Scalable PDE Control." *Accepted at International Conference on Machine Learning 2026* - [paper](#)
- Agarwal A., **Sarkar, D.R.**, and Goswami, S., "Multimodal Neural Operators for Real-Time Biomechanical Modelling of Traumatic Brain Injury" *Computer Methods and Programs in Biomedicine (2026): 109398*. - [Code](#)
- Sarkar, D.R.**, Kag, V., Pal, B. and Goswami, S., "Learning Hidden Physics and System Parameters with Deep Operator Networks." *Computer Methods in Applied Mechanics and Engineering 456 (2026): 118926*. - [Code](#)
- Thorpe, A.J., Tretiakov, S., **Sarkar, D.R.**, Kumar, K., and Topcu, U., "Learning Generalizable Neural Operators for Inverse Problems" *arXiv.2512.18120*
- Sarkar, D.R.**, and Goswami, S., "Learning to Control PDEs with Differentiable Predictive Control and Time-Integrated Neural Operators" *arXiv:2511.08992, Accepted at IEEE Conference on Decision and Control 2026* - [Code](#)
- Luo, Y., **Sarkar, D.R.**, Sangree, R. H. and Goswami, S., "ARIA: Adaptive Retrieval Intelligence Assistant–A Multimodal RAG Framework for Domain-Specific Engineering Education" *arXiv preprint arXiv:2604.06179 (2026)*. - [Code](#)
- Sarkar, D.R.**, Basu, S., Manuel, L. and Goswami, S., "Uncertainty-Aware Optimization in Engineered Systems via Gradient Boosting and Differential Evolution." *European Safety and Reliability Conference (2025)* - [Code](#)
- Sarkar, D.R.**, Annavarapu, C. and Roy, P., "Adaptive Interface-PINNs for Inverse Problems: Determining Material Properties for Heterogeneous Systems." *Finite Elements in Analysis and Design 249 (2025): 104373*.
- Roy, S., **Sarkar, D.R.**, Annavarapu, C., Roy, P., Lecampion B. and Valiveti, D.M. "Adaptive Interface-PINNs (AdaI-PINNs) for transient diffusion: Applications to forward and inverse problems in heterogeneous media" *Finite Elements in Analysis and Design 244 (2025): 104305*.
- Sarkar, D.R.**, Annavarapu, C. and Roy, P. "Interface Physics-Informed Neural Networks (I-PINNs) to Solve Inverse Problems in Heterogeneous Materials" *Machine Learning for Computational Science and Engineering* (under review)

AWARDS & RECOGNITION

- Chishiki AI Graduate Fellowship** - (2026-2027) Strengthening Cyberinfrastructure Professional Ecosystem (SCIPE) Chishiki AI Fellowship at The University of Texas at Austin.
- Director's Discretionary Award** - Argonne Leadership Computing Facility (5000 supercomputer node-hours)
- 1st Place** - 2025-2026 Tesseract Hackathon on Building differentiable simulation pipelines (Global Competition)
- 3rd Place** - 2025 NASA and DNV Challenge on Optimization under Uncertainty (Global Competition)
- Finalist** - Whiting School of Engineering Trainee Award (2025) for Traumatic Brain Injury Modeling
- Director's Discretionary Award** - Argonne Leadership Computing Facility (600 supercomputer node-hours)
- Creel Family Engineering Fellowship** - Johns Hopkins University (2024-2025)
- TATA Motors Excellence Scholarship** - ₹150,000 for outstanding academic performance
- 96.96 percentile** - Graduate Aptitude Test in Engineering (GATE 2022) - Top 3% nationwide
- AICTE Post Graduate Scholarship** - All India Council for Technical Education

EXPERIENCE

- Graduate Research Intern** LLNL
Data Science Institute, Lawrence Livermore National Laboratory May 2026 – Present
 - Building Agentic Workflow for Material Science application.
 - Developing Geometry aware Neural Operators for moving interface problems.
- Teaching Assistant** JHU
Failure Mechanics in Materials August 2025 – December 2025
 - Delivered four lectures, graded assignments/exams, designed the course's final project.
- Placement Coordinator** IIT Madras
Student Leadership Role June 2022 – May 2024
 - Established partnerships with **15+ engineering firms**, expanding recruitment network and achieving **100% placement rate**
 - Organized industry-academia sessions for **200+ students**, improving placement success by 25%
- Teaching Assistant** IIT Madras
Construction Materials Laboratory and Surveying Aug 2022 – Nov 2023
 - Instructed **60+ students** in construction materials and surveying laboratories with focus on data analysis
 - Developed computational assignments improving student performance by **25%**

SELECTED CONFERENCE AND POSTER PRESENTATIONS

FEM to Neural Operators: Scientific Machine Learning for Computational Mechanics, at the Spring School 2026 at Bauhaus-Universität Weimar - “ARIA: Adaptive Retrieval Intelligence Assistant—A Multimodal RAG Framework for Domain-Specific Engineering Education”

Engineering Mechanics Institute (EMI) 2025 - “Learning Hidden Physics with Deep Operator Networks”

MACH 2025 - “Real-Time Inference of Defects Using Deep Learning”

MACH 2025 - “Scalable Multi-GPU Training of Neural Operators: Advancing Generalization in High-Dimensional Physical Systems”

SIAM Conference on Computational Science and Engineering (CSE25) - “Surrogate Modeling with Neural Operators”

HPC symposium JHU 2025 - “Scalable Neural Operator Training for High-Dimensional PDEs”

Department of Medicine and Whiting School of Engineering Research Retreat JHU 2025 - “Accelerating Traumatic Brain Injury Modeling with Neural Operators: Toward Personalized Protective Gear Design”

ISTAM 2023 - “On the use of Physics Informed Neural Networks (PINNs) to solve inverse problems in heterogeneous materials”