Protyay Dey

protyay.buffalo@gmail.com | linkedin.com/in/protyaydey | github.com/protyayofficial | protyayofficial.github.io

Education

University at Buffalo, SUNY — New York, USA
PhD in Computer Science and Engineering; GPA: 3.79/4.00 — *Aug 2025 – Present*

Indian Institute of Technology Ropar — Punjab, India
MTech in Artificial Intelligence; CGPA: 9.09/10.00 — *Aug 2022 – Jun 2024*

University of Engineering & Management, Jaipur — Rajasthan, India
BTech in Computer Science and Engineering; CGPA: 9.27/10.00; Gold Medalist — *Aug 2017 – Jun 2021*

Research Experience

Computer Vision and Machine Learning Lab, University at Buffalo — New York, USA
Graduate Research Assistant – Generative AI and Multi-Agent Systems — *Aug 2025 – Present*

- Derived closed-form densities for singular correlation matrices and geometry-aware calibration, reaching **2.73× precision** and **8.1× recall** across **9 neuroimaging settings**.
- Formulated **SCAPE** for decentralized small language model reasoning, surpassing token-matched baselines by up to **16.4 percentage points** across **3 model families**.
- Built **EAD**, a label-free runtime controller for multi-agent reasoning, yielding a **7.40-point overall gain** across **6 benchmarks** and **14 baselines**.
- Proposed **MAGNET**, a manifold-aware graph diffusion model for brain connectome generation across **3 cohorts**; increased conditional fidelity by up to **21%**.

Computer Vision and Pattern Recognition Lab, IIT Ropar — Punjab, India
Junior Research Fellow – Federated Learning — *Apr 2025 – Jun 2025*

- Architected **FedRWA** for disjoint-label federated learning across **12 clients** and **313 classes**.
- Raised classification accuracy by **18.6%** and reduced client-wise variance by **57.8%** across **3 backbones**.

Image Processing, Security & Analytics Labs, IIT Ropar — Remote
Research Intern – Applied Deep Learning — *Jul 2024 – Oct 2024*

- Created **SPAIR-Swin** using high-entropy image patches, evaluating performance on **138 camera models**.
- Increased patch-level camera model identification accuracy by up to **20.36%** across **4 forensic benchmarks**.

mVizn Pte. Ltd. — Remote
Machine Learning Intern – 3D Computer Vision — *Jan 2024 – Mar 2024*

- Optimized PointNet++ for indoor point-cloud classification, improving accuracy by **25%** on client-provided data.
- Boosted intersection-over-union for underrepresented classes by **30–45%** through class-imbalance mitigation.

Selected Research Project

Training-Free Quantization for Diffusion Transformers [GitHub] — *Oct – Dec 2025*

- Implemented a **4-stage, training-free W4A8 quantization pipeline** with tensor-train-informed grouping
- Reduced **FID by 1.2%** and **sFID by 1.7%** on ImageNet-256.

Publications & Manuscripts

- **P. Dey***, A. Roy*, H. Cho, W. H. Kim, V. S. Lokhande. "MAGNET: Manifold-Aware Graph Diffusion Network for Connectome Generation." **NeurIPS 2026**. [Project] [arXiv]
- **P. Dey**, R. Chakraborty, V. S. Lokhande. "Ambient Densities on Singular Correlation Strata with Applications in Generative Neuroimaging." *Under review, AISTATS 2027.*
- A. Roy*, **P. Dey***, M. Babbitt, R. Chakraborty, L. Varshney, V. S. Lokhande. "Privacy Considerations in Multi-Institutional Data Harmonization Through a Category-Theoretic Lens." *Under review, ICLR 2027.*
- **P. Dey**, R. Chakraborty, A. S. Jadhav, K. Rana, G. Sharma, P. Goyal. "Camera Model Identification with SPAIR-Swin and Entropy-Based Non-Homogeneous Patches." *Under review, ACM TOMM*, 2026. [arXiv]
- K. Rana*, A. S. Jadhav*, **P. Dey***, V. Rathi, P. Goyal, G. Sharma. "SCMI30-IITRPR: Smartphone Camera Model Identification Dataset Comprising Similar and Random Content Image Sets." **CVIP 2026**. [Preprint]
- **P. Dey**, A. S. Jadhav, K. Rana. "An Effective CNN-Based Approach for Synthetic Face Image Detection in Pre-Social and Post-Social Media Context." **CVIP 2023**. [DOI]

Technical Skills

Languages: Python, C++, C, SQL, JavaScript, TypeScript, LaTeX
ML Libraries: PyTorch, TensorFlow, Scikit-learn, NumPy, Pandas, OpenCV
Research: Agentic AI, Small Language Models, Multi-Agent Systems, LLM Reasoning, Diffusion Models, Generative AI, Optimization
Tools: Git, Linux, GitHub, Jupyter, VS Code, Hugging Face, vLLM
Leadership: IIT Ropar Placement Coordinator (8 mo); ACM Student Chapter Vice Chair (2 yr); GATE CS AIR 405.