BISWAJIT BERA

PhD Scholar — Computer Vision & Computational Photography

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RESEARCH INTERESTS

Domain Generalization • Computer Vision • Computational Photography • Semi-Supervised Learning • Aerial Imagery Analysis • Deep Learning for Vision Systems • Transfer Learning • Multi-Domain Adaptation

EDUCATION

PhD in Mathematics & Computing *January 2026 – Present*
Indian Institute of Technology (ISM) Dhanbad Supervisor: Dr. Sudhakar Kumawat
- Focus: Domain Generalization in Vision Systems for drone-based aerial imagery and real-world applications
- Developing robust AI models for traffic monitoring, disaster response, and infrastructure assessment

M.Sc. in Mathematics & Computing — CGPA: 8.74/10.0 *July 2023 – May 2025*
Indian Institute of Technology (ISM) Dhanbad
- Coursework: Machine Learning, Deep Learning, Computer Vision, Data Structures, Algorithms, DBMS

B.Sc. in Mathematical Science — CGPA: 9.13/10.0 *Aug 2020 – July 2023*
Vidyasagar University, Midnapore

RESEARCH EXPERIENCE

Junior Research Fellow (JRF) *July 2025 – December 2025*
IIT (ISM) Dhanbad — PI: Dr. Sudhakar Kumawat
- Developed domain-generalized AI models for drone imagery using PyTorch and semi-supervised learning
- Addressed domain shift challenges in diverse Indian landscapes for traffic, disaster, and infrastructure monitoring
- Conducted comprehensive literature review on domain adaptation and generalization in computer vision

Master's Thesis: Multilingual Chatbot for Indian Languages *Jan 2025 – May 2025*
IIT (ISM) Dhanbad
- Fine-tuned LLaMA-3 for real-time translation of low-resource Indian languages using AI4Bharat datasets
- Implemented advanced fine-tuning strategies and evaluated performance across multiple language pairs

Summer Research: Neural Machine Translation *Jun 2024 – July 2024*
IIT (ISM) Dhanbad
- Experimented with RNN/LSTM/GRU encoder-decoder architectures and Transformer models for NMT
- Applied back translation for data augmentation to enhance low-resource language pair performance

SELECTED RESEARCH PROJECT

Geometry-Preserving Contrastive Learning for Aerial Object Detection — *Submitted to ICPR 2026* *Jan 2026*
- Developed novel GPCL framework with dual-level style augmentation for cross-geographic domain generalization
- Achieved 36% improvement on VisDrone→IndraEye transfer (34.2%→46.5% mAP) using IoU-weighted contrastive learning
- Implemented detection-specific consistency regularization combining geometric (IoU) and semantic (KL-divergence) losses
- First work to address cross-geographic aerial detection with geometry-preserving domain generalization

TECHNICAL SKILLS

Deep Learning: PyTorch, TensorFlow, Keras, Hugging Face Transformers, Computer Vision Libraries (OpenCV)
ML/Data Science: scikit-learn, Pandas, NumPy, Matplotlib, Seaborn, Streamlit
Programming: Python, C/C++, SQL, MATLAB, LaTeX

HONORS & ACHIEVEMENTS

- **PhD Offers:** Received offers from IIT Indore (CSE) and IIT Kanpur (Department of Intelligent Systems)
- **Industry Offer:** Selected for Assistant System Engineer-Trainee (Grade Y) at Tata Consultancy Services (TCS)
- **Academic Offer:** Selected for Assistant Professor role at Sri Chaitanya Institute during on-campus placement
- **Champion** – CLASH of T-AI-TANS Hackathon (Saras AI Institute, Aug 2024) – 1st among 300+ teams from IITs/NITs
- **GATE 2024:** AIR 914 in Data Science & Artificial Intelligence
- **IIT JAM 2023:** AIR 365 in Mathematics
- **WB-SET 2024:** Qualified in Mathematical Science (46.67%)