

Prathmesh Bele

PhD Student, National University of Singapore

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Research Interests: Deep Learning, Computer Vision, Generative AI, Multimodal Learning

Education

Aug 2026 Present	National University of Singapore School of Computing <i>Doctor of Philosophy:</i> Computer Science	
Jul 2018 Aug 2023	Indian Institute of Technology Bombay Interdisciplinary Dual Degree <i>Master of Technology:</i> Artificial Intelligence and Data Science • Achieved an CPI of 9.94/10 towards completion of <i>Master of Technology</i> <i>Bachelor of Technology:</i> Mechanical Engineering with Minor in Computer Science and Engineering	Overall CPI: 8.99/10

Research Experience

June 2024 Present	Google DeepMind <i>Pre-Doctoral Researcher</i> Advisors: <i>Prof. Vinay Namboodiri, Dr. Vaibhav Rajan, Prof. Sara Beery</i> → Leveraging sparse Street View via generative cross-view fusion to enhance satellite crop monitoring → Orchestrating curation of 1M+ spatiotemporal crop data points across India, aiming for global scale. → Impacting millions of farmers via core AI research enabling government optimizing resource allocation	Bangalore, India
Aug 2023 Apr 2024	Mercedes-Benz Research and Development India <i>Post Graduate Engineer Trainee</i> Advisor: <i>Dr. Laxmikant Sahoo</i> → Harnessed complex multi-sensor data with the Perception team to drive scalable mapping solutions → Filed a patent for a novel GNN based approach achieving performance parity with production baselines	Bangalore, India
Dec 2021 Apr 2023	IIT Bombay <i>Postgraduate Researcher</i> Advisors: <i>Prof. Biplab Banerjee, Prof. Gemma Roig</i> → Architected resilient models capable of generalizing from single sources under volatile domain shifts → Established novel invariant feature mechanisms, culminating in a top-tier publication [WACV'24]	Mumbai, India

Publications and Patents

- [C] **Learning Class and Domain Augmentations for Single-Source Open-Domain Generalization** [[🔗](#)]
Prathmesh Bele, Valay Bundele, Avigyan Bhattacharya, Ankit Jha, Gemma Roig, and Biplab Banerjee
IEEE/CVF Winter Conference on Applications of Computer Vision [WACV'24]
- [P] **Node and Edge Embedding Learning for Static Obstacle Segmentation**
Prathmesh Bele*, Apurva Kulkarni*, Hitul Desai, Amey Kavde, Dashrath Mali, Laxmikant Sahoo, et. al.
Intellectual Property of India, Reference No. 202341087789 [IP India]

* denotes equal contributions, C = Conference Publication, P = Patent

Selected Research Projects

Multi-Sensor Cross-View Panoramic Synthesis | Google DeepMind

Advisors: *Prof. Vinay Namboodiri, Dr. Vaibhav Rajan*

- Built a diffusion model synthesizing **physically consistent** panoramas from solely low-resolution satellite data.
- Internalized HR structural priors via a **cyclic critic**, eliminating explicit geometry needs at inference.
- Bridged polar aerial and spherical ground geometries using a **coordinate-aware cross-attention** mechanism.
- Outperformed explicitly HR-conditioned baselines across all metrics on a global dataset of **550K** images.

Cross-View Generative Fusion | Google DeepMind

Advisors: *Dr. Vaibhav Rajan, Prof. Sara Beery*

- Pioneering unified **cross-view generative fusion** to overcome fine-grained detail loss in decoupled methods.
- Bridged a critical data gap by curating a **novel dataset** temporally aligning Sentinel-2 with agricultural Street View
- Architecting **discrete diffusion** models to resolve fundamental continuous-discrete latent incompatibilities

Single Source Open Domain Generalization | IIT Bombay

Advisors: [Prof. Biplab Banerjee](#), [Prof. Gemma Roig](#)

- Developed **SODG-Net**, an end-to-end network outperforming benchmarks by **1-14%** in open-domain settings
- Proposed a style synthesis block generating diverse statistical features to effectively simulate novel domains
- Formulated novel weight learning and margin objectives to establish distinct representations for open classes

Graph Neural Networks for Free-space Mapping | MBRDI

Advisor: [Dr. Laxmikant Sahoo](#)

- Proposed a novel **GNN** architecture formulating free-space mapping as a scalable edge-prediction problem [[Patent](#)]
- Architected a dual-path **Graph Attention Network** to independently process node and edge features
- Implemented class-aware edge retention via feature fusion, achieving parity with inflexible rule-based legacy systems

Crop Classification & Data Curation | Google DeepMind

Advisor: [Alok Talekar](#)

- Leveraged **Gemini** to semantically filter Street View imagery, isolating optimal candidates for expert annotation.
- Established comprehensive annotation guidelines to curate a high-quality, ground-level crop dataset.
- Developed a pipeline augmenting scarce satellite data with robust, timestamped, Street View-derived crop labels.

Incremental Domain Adaptation | IIT Bombay

Advisors: [Prof. Biplab Banerjee](#), [Prof. Gemma Roig](#)

- Devised a robust solution establishing **discriminative, domain-invariant** feature spaces under shifting distributions.
- Retained critical prior learnings by aligning model outputs and batch-norm parameters for representative proxy data.
- Leveraged center loss alongside standard cross-entropy to significantly enhance model prediction confidence.

Honors and Achievements

- Among **15**, from **18,000+** applicants, selected for Google's Pre-Doctoral Researcher Program 2024
- Selected among the Top **3000** students nationwide for the exclusive **Amazon Machine Learning Summer School 2022**
- Awarded **INSPIRE Scholarship** for ranking in the **Top 1%** of the Maharashtra Board Class 12th Examinations 2017
- Secured **99.32 Percentile** in JEE Main (**1.5M** entrants) and **98.75 Percentile** in JEE Advanced (**0.2M** entrants) 2018
- Recipient of scholarships for securing **1st Rank** in District-level Maharashtra Talent Search Examination 2015

Notable Positions of Responsibility

- **Reviewer:** CVPR 2026, ECCV 2026, NeurIPS 2026, SPoT Workshop (ICLR) 2026 Present
- **Teaching Assistant, IITB:** Managed tutorials & grading for **150+ students** in ML and Data Science courses 2019-21

Exploratory Research

- **HSI Unmixing:** Developed Vision Transformer for HSI unmixing with adaptive skips connections, with [Prof. B. Banerjee](#)
- **RSVQA:** Built modified DenseNet with attention decoder for Remote Sensing VQA (76.63% acc.), with [Prof. S. Sarawagi](#)
- **Binarized NN:** Implemented Binarized NN via Info Bottleneck for object detection, with [Prof. P. Balamurugan](#)
- **Multimodal Fusion:** Fused LiDAR-HSI via attention for land cover classification (80% acc.), with [Prof. B. Banerjee](#)
- **3D MeshNet:** Constructed MeshNet for 3D object recognition from triangular meshes, Seasons of Code, IITB
- **Taxi Demand:** Predicted NYC taxi demand/duration using LSTM and ARIMA time-series models, with [Prof. A. Sethi](#)
- **Stock Prediction:** Analyzed stock trends using K-Means and LSTM for time-series forecasting, with [Prof. A. Tewari](#)
- **Texture Synthesis:** Implemented patch-based image quilting for texture synthesis and transfer, with [Prof. S Awate](#)

Key Courses Undertaken

Machine Learning Advanced Machine Learning, Automatic Speech Recognition, Fundamentals Intelligent and Learning Agents, Fundamentals of Digital Image Processing, Statistical Machine Learning & Data Mining, Machine Learning for Remote Sensing, Deep Learning - Theory and Practice, Introduction to Machine Learning

CS and Maths Design & Analysis of Algorithms, Operating Systems, Data Structures & Algorithms, Programming for Data Science, Linear Algebra, Calculus, Differential Equations, Numerical Analysis

Technical Skills

Programming Languages Python, C++

Frameworks/Tools PyTorch, TensorFlow, Jax/Flax, MATLAB, Git, $\LaTeX$