Dwip Dalal

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Github LinkedIn G-Scholar Website

Education

- **University of Illinois Urbana-Champaign (UIUC)** **2024 – Present**
  Ph.D., Electrical and Computer Engineering; Advisor: Prof. Svetlana Lazebnik
  CGPA: 4.0/4.0 (A+: Computer Vision, DL for CV)
- **Indian Institute of Technology Gandhinagar (IIT-GN)** **2020 – 2024**
  B.Tech in Mechanical Engineering with Minor in Computer Science
  Institute Gold Medalist; Overall CGPA: 9.1/10; Minor CGPA: 10/10

Interest Areas

Multimodal Learning, Vision–Language–Action models, VLMs, Agentic Systems, MLLM Reasoning

Awards & Achievements

- Recipient of the **Dilip and Sandhya Sarwate Graduate Fellowship** at UIUC 2024-2025, awarded to outstanding incoming graduate students in the area of signal processing.
- Awarded the **Institute Gold Medal @ IIT Gandhinagar**, for highest CGPA in the discipline.
- 1st **position** out of 200 participants in a machine learning hackathon organized by **SmartSense Consulting Solutions Pvt. Ltd.**, earning a **job offer for the role of ML Engineer II** (declined).
- Institute nomination for **Pre-Doctoral Research Assistant Program** at **Microsoft Research, India**.
- 1st **rank** in **Undergraduate Research Showcase'23 @ IITGN** for work on AI-enabled on-device drones.
- Selected for **Citi Bank's 2023 Summer Internship** for the **Analyst role** (declined).
- **10/10 GPA for two consecutive semesters** (6th & 7th), each comprising rigorous 26-credit course work.
- **MITACS Globalink Research Fellow** at **University of British Columbia**, mentored by Prof. Yankai Cao.
- Awarded **Shastri Indo-Canadian Institute Scholarship** for continuing my research at the **University of British Columbia** as a "promising researcher".
- Received **Travel Award** from IIT Gandhinagar for attending **ACL 2023 conference** in Toronto.
- Achieved 1st **rank** in **Hackrush'22**, the flagship annual machine learning hackathon of IIT Gandhinagar.
- 1st **rank** in IITGN Summer Project 2021 for building the most efficient NLP classification model.
- Secured 1st **rank** in the competitive programming contest @ IITGN, participated by B.Tech, MTech, and Ph.D.
- Selected among the Top 3 teams for **Innovation-Driven Entrepreneurship (IDE) 4.0**: The National Bootcamp at Bangalore, based on the proposal of using AI for intelligent business planning and financial management.

Research Experience

- **Research Intern, Microsoft Research Redmond** (May '25 – Present)
  Mentor: Dr. Nebojsa Jojic (Senior Principal Researcher)
  Developed StreetNav, an MLLM-based agent that achieves state-of-the-art performance on instruction-free, long-range, goal-oriented outdoor navigation in Street View environments. Currently focusing on policy optimization to further enhance MLLM-based outdoor navigation.

- **Research Assistant, University of Illinois Urbana-Champaign** (Aug '24 – Present)
  Mentor: Prof. Svetlana Lazebnik, Prof. Unnat Jain, Prof. Heng Ji
  Currently developing Vision–Language–Action (VLA) models for grounded decision-making. Previously, improved visual grounding in multimodal LLMs through attention-guided, test-time input adaptation [1]; built a multi-agent framework for compositional reasoning via joint image–language decomposition [2]; authored a survey on agentic systems for automating data science workflows [3]; and enhanced post-hoc model explainability by introducing spatial-awareness and optimizing concept discovery for maximum faithfulness. [4].

- **Research Assistant, IIT Gandhinagar** (Nov '21 – Mar '24)
  Mentor: Prof. Shanmuganathan Raman, Prof. Anirban Dasgupta, Prof. Mayank Singh, Prof. Harish PM
  Worked on diffusion model for image-to-image conversion tasks, [[1], [8]], reinforcement learning for control [7], video processing in low-resource constraints [9], self-supervised and cross-modal representation learning [3], normalizing flow for constrained geometry, density estimation and path-planning [[5], [12]], and multi-lingual topic-modeling [6].

- **ML Research Intern @ University of British Columbia (MITACS GRI)** (May '23 – Aug'23)
  Mentor: Prof. Yankai Cao ***Location: Vancouver***
  Developed a joint representation learning framework for video and spike-train data using contrastive loss, enabling video generation from learned signal representations. The project focused on generating behavioral videos of mice conditioned on neural spike-train data.

- **NLP Research Intern @ AI Institute, University of South Carolina** (Aug '22 – Feb'24)
  Mentor - Prof. Amit Sheth (Director of AIISC institute @ UoSC), Prof. Amitava Das, Dr. Aman Chadha

  Worked on multimodal fact verification, paraphrase generation, semantic role labeling, QA generation, LLM, [[2], [4]] and deception detection, multitask learning, language model merging [11]. Also, launched **DeHate** shared task, a challenge focused on the automatic blurring of offensive segments of hateful images, for the De-Factify 3.0 @AAAI'24.

Publications

Under Review

1. **Constructive Distortion: Improving MLLMs with Attention-Aware Image Warping**
   Dwip Dalal, *G. Vashishtha, U. Mishra, J. Kim, M. Kanda, H. Ha, Svetlana Lazebnik, Heng Ji, Unnat Jain*
   Under review at Neural Information Processing Systems (NeurIPS, 2025)
2. **Divide and Reason: Joint Image and Language Decomposition for Compositional Reasoning**
   Dwip Dalal, *Madhav Kanda, Zhenhailong Wang, Heng Ji, Unnat Jain*
   Under review at Empirical Methods in Natural Language Processing (EMNLP 2025)
3. **A Dataset-Centric Survey of LLM-Agents for Data Science** (Paper)
   Dwip Dalal*, *Chuxuan Hu**, *Xiaona Zhou**
   Under review at Empirical Methods in Natural Language Processing (EMNLP 2025)
4. **Towards Spatially-Aware and Optimally Faithful Concept-Based Explanations** (Paper)
   Shubham Kumar, ***Dwip Dalal***, *Narendra Ahuja*
   Under review at International Conference on Computer Vision (ICCV 2025)
5. **Flow Symmetrization for Parameterized Constrained Diffeomorphisms** (Paper)
   Dwip Dalal*, *Aalok Gangopadhyay**, *Progyan Das**, *Shanmuganathan Raman*
   Under review at Transactions on Machine Learning Research (TMLR)

Conference Papers

6. **Single Image LDR to HDR Conversion using Conditional Diffusion** (Paper)
   Dwip Dalal, *Gautam Vashishtha, Prajwal Singh, Shanmuganathan Raman*
   Published at the International Conference on Image Processing (ICIP'23) [ORAL PRESENTATION]
7. **FACTIFY-5WQA: 5W Aspect-based Fact Verification through Question Answering** (Paper)(Demo)
   Anku Rani, SM Tonmoy, ***Dwip Dalal***, *Shreya Gautam, Megha C., Aman Chadha, Amit Sheth, Amitava Das*
   Published at the Main Conference of Association for Computational Linguistics (ACL'23)
8. **Learning Robust Deep Visual Representations from EEG Brain Recordings** (Paper)
   Prajwal Singh, ***Dwip Dalal***, *Gautam Vashishtha, Shanmuganathan Raman, Krishna Prasad Miyapuram*
   Published at the Winter Conference on Applications of Computer Vision (WACV'24)
   Featured in WACV Daily and Best of WACV 2024
9. **FACTIFY3M: A Benchmark for Multimodal Fact Verification with Explainability through 5W Question-Answering** (Paper)
   M Chakraborty, K Pahwa, A Rani, S Chatterjee, ***Dwip Dalal***, *H Dave, ... A Chadha, Amit Sheth, Amitava Das*
   Published at the Conference of Empirical Methods in Natural Language Processing (EMNLP'23)

Workshop Papers

10. **ODESolvers are also Wayfinders: Neural ODEs for Multi-Agent Pathplanning** (Paper)
    Dwip Dalal*, *Progyan Das**, *Anirban Dasgupta*
    Published at NeurIPS'23 Workshop - Deep Learning and Differential Equations III
11. **MMT: A Multilingual and Multi-Topic Indian Social Media Dataset** (Paper)
    Dwip Dalal, *Vivek Srivastava, Mayank Singh*
    Published at Proceedings of EACL'23 workshop - Cross-Cultural Considerations in NLP
12. **Learning to Stabilize: Comparative Analysis of Reinforcement Learning and Traditional Methods for Swirling Pendulum Control** (Paper)
    Dwip Dalal, *Shubhankar Riswadkar, Harish J Palanthandalam-Madapusi*
    Published at IEEE Indian Control Conference 2023
13. **Enhancing Cameras with Conditional Diffusion Model** (Extended Abstract + Poster)
    Dwip Dalal, *Gautam Vashishtha, Prajwal Singh, Shanmuganathan Raman*
    Published at the CVPR'23 workshop - Computational Cameras and Display CCD
14. **SEPSIS: I can catch your lies - A new paradigm for Deception Detection** (Paper)
    Anku Rani, ***Dwip Dalal***, *Shreya Gautam, Pankaj Gupta, Vinija Jain, Aman Chadha, Amit Sheth, Amitava Das*
    Published at SRW ACL 2025
15. **VPTDrone: Video Processing Toolkit for Smart Surveillance Drone** (Paper)
    Dwip Dalal, *Anirban Dasgupta*
    Published at 7^{th} Joint International Conference on Data Science & Management of Data

Internships

- **ML Research Intern @ Physical Research Laboratory, ISRO** (Jan '23 – July '23)
  Mentor: Prof. Dibyendu Chakarabarty (PI, ISRO Aditya-L1 Mission)
  Implemented transformer-based pipeline with Bayesian inference on data from India's maiden solar probe, the Aditya-L1, to predict anomalous geomagnetic storms with uncertainty quantification.
- **ML Research Intern @ Tata Consultancy Services (TCS Research)** (Oct '22 – April '23)
  Mentor: Dr. Manasi Patwardhan
  Designed a transformer-based architecture for product copy generation, trained on the FACAD dataset. Fine-tuned BLOOM and ResNet models using the CLIP loss function to enable effective cross-modal learning.
- **AI Research Intern @ Defense Research and Development Organization (DRDO)** (Jan '22 – Aug '22)
  Developed an RL framework using the actor-critic method in a Pybullet environment with simulated physics to learn drone swarm navigation. Designed effective policies via experimentation with simulation on Unity (with MLAgents).
- **Software Engineer Intern @ Eficens Systems** (May '22 – Aug '22)
  Developed an intelligent network threat detection platform to red-flag anomalies with Mr. Sanjeev Kumar, CTO of DELL, and Prasad Malempati, Sr. Manager of Accenture, San Francisco.
- **Startup AI Architect — built core AI systems** (Aug '21 – July '22)
  Worked at 3 early stage teams to develop foundational architecture; 2 startups — Aivid Techvision and Necesario Innovations — and an enterprise team at JK Lakshmi Ltd. At Aivid, built and deployed end-to-end video anomaly detector. At Necesario, built models for image enhancement and deployed on Jetson Nano. At JK Lakshmi, built and deployed anomaly detection system for sensor data.

Projects

- **Opensource Contribution @ OpenVINO** (Merged PR)
  Implemented text generation demos using GPT-2 with OpenVINO, and age-gender recognition with OpenVINO; additionally, worked on fixing continuous integration issues with Dr. Adrian Boguszewski.
- **NeuralSight: Computer Vision Algorithm Library** (Repository)
  Integrated a suite of deep learning and classical image processing techniques.
- **JointGYM: Reinforcement Learning Algorithm Library** (Repository)
  A collection of reinforcement learning algorithms: actor-critic model, Q-learning techniques, Pybullet-based simulation environment, and inverse kinematics algorithms, providing robust solutions for complex control problems.
- **Jacobian Transpose Method for Controlling Robotic Manipulators (Prof. Chetan Pahlajani)** (Code)
  Performed path tracking on a two-arm robotic manipulator using the Jacobian transpose method. Made a simulation by implementing the FABRIK algorithm and modeling it in real-world scenarios.

Relevant Courses

- **UIUC:** Deep Learning Computer Vision **(A+)**; Computer Vision **(A+)**; Topics in LLM Agent; Advanced Topics in NLP; LLM Applications
- **IITGN:** Optimization for ML; LLMs; Digital Image Processing; DSA; Control Theory; Linear Algebra; Multivariable Calculus; Complex Analysis; Ordinary Differential Equations; Probability; Statistics; Numerical Methods
- **Online:** DL Specialization by Andrew Ng [Certificate], Aerial Robotics, Computational Motion Planning, Perception

Teaching Experience

- **Instructor, SC 336: Mathematics of Machine Learning | Fall, 2023** (certificate)(Page 25)
  - Instructed IIT Gandhinagar's first student-led, fully accredited short course, with class size of 170 students.
- **Reviewer:** EMNLP'25, NeurIPS'25, ICCV'25, ACL'25, AISTATS'25, ICML'25, NeurIPS'24
- **Teaching Assistant of UIUC:** CS449 Artificial Intelligence (Spring'25)
- **Teaching Assistant IIT Gandhinagar:** ES413 Deep Learning (Spring'24), CS328 Data Science (Spring'23)

Social Initiatives, Leadership & Innovation

- **President of Society for Machine Learning & Artificial Intelligence**, IIT Gandhinagar (Mar'22 - Mar'23)
- **Core Member of Algorithms and Competitive Coding Club**, IIT Gandhinagar (Jun'22 - Mar'23)
- **Core Member of Robotics Club (Mean Mechanics)**, IIT Gandhinagar (Jun'22 - Mar'23)
- Problem Setter, Hackrush'23 & '24, Annual Machine Learning Hackathon, IIT Gandhinagar
- Represented IIT Gandhinagar in the Inter-IIT Tech Meet in 2021, 2022, 2023 (Leader).
- Selected in the top 30 semi-finalist teams out of 100K participants in Accenture Innovation Challenge AIC'22

Technical Skills

- **Programming Languages:** Python**, C++, Java, C, SQL, JavaScript
- **Platforms & Frameworks:** PyTorch**, TensorFlow**, OpenVINO**, Scikit-learn**, OpenCV**, Unity, MATLAB, Google Cloud, ROS, Git, GitHub, Linux
- **Architectures:** LLM**, Multi-Agent**, CLIP**, Diffusion Model**, Vision Transformers**, Transformers**, GANs**, VAEs**, CNN**, LSTM**, Neural ODE, Diffeomorphic flows

** *Very Proficient*