Dwip Dalal

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GitHub LinkedIn Google 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, Deep Learning for Computer Vision)
- **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 the 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 **Citibank's 2023 Summer Internship** for the **Analyst role** (declined).
- **10/10 GPA for two consecutive semesters** (6^{th} & 7^{th}), 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)
  Created a dataset to evaluate MLLMs on long-range, sparse, grounded sequential decision-making tasks. Demonstrated the inadequacy of traditional reasoning methods (CoT, Reflection, etc) in this context and introduced the Verbalization of Path (VoP) method, which elicits latent world knowledge from MLLMs to achieve state-of-the-art performance on instruction-free, goal-oriented outdoor navigation tasks within Street View environments [2].
- **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 input adaptation [1]; built a multi-agent framework for compositional reasoning via joint image–language decomposition [3]; authored a survey on agentic systems for automating data science workflows [4]; and improved post-hoc model explainability by introducing spatial-awareness and optimizing concept discovery for maximum faithfulness [5].
- **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 generation tasks [7, 14], reinforcement learning for control [13], video processing in low-resource constraints [16], self-supervised and cross-modal representation learning [9], normalizing flow for constrained geometry, density estimation and path-planning [6, 11], and multilingual topic modeling [12].
- **ML Research Intern @ University of British Columbia (MITACS GRI)** (May '23 – Aug'23)
  Mentor: Prof. Yankai Cao
  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, LLMs, [8, 10] and deception detection, multitask learning, language model merging [15]. 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** (Paper)
   Dwip Dalal, *G. Vashishtha, U. Mishra, J. Kim, M. Kanda, H. Ha, Svetlana Lazebnik, Heng Ji, Unnat Jain*
   Under review at ICLR 2026
2. **Can MLLMs Find Their Way in a City? Exploring Emergent Navigation from Web-Scale Knowledge**
   Dwip Dalal, *Utkarsh Mishra, Narendra Ahuja, Nebojsa Jojic*
   Under review at EACL 2026
3. **Divide and Reason: Joint Image and Language Decomposition for Compositional Reasoning**
   Dwip Dalal, *Madhav Kanda, Zhenhailong Wang, Heng Ji, Unnat Jain*
   Under review at EACL 2026
4. **A Dataset-Centric Survey of LLM-Agents for Data Science** (Paper)
   Dwip Dalal*, *Chuxuan Hu*, *Xiaona Zhou**
   Under review at Transactions on Machine Learning Research (TMLR)
5. **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)
6. **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

7. **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 2023) [ORAL PRESENTATION]
8. **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 2023)
9. **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 2024)
   Featured in WACV Daily and Best of WACV 2024
10. **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 2023)

Workshop Papers

11. **ODESolvers are also Wayfinders: Neural ODEs for Multi-Agent Pathplanning** (Paper)
    Dwip Dalal*, *Progyan Das**, *Anirban Dasgupta*
    Published at NeurIPS 2023 Workshop - Deep Learning and Differential Equations III
12. **MMT: A Multilingual and Multi-Topic Indian Social Media Dataset** (Paper)
    Dwip Dalal, *Vivek Srivastava, Mayank Singh*
    Published at Proceedings of EACL 2023 workshop - Cross-Cultural Considerations in NLP
13. **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
14. **Enhancing Cameras with Conditional Diffusion Model** (Extended Abstract + Poster)
    Dwip Dalal, *Gautam Vashishtha, Prajwal Singh, Shanmuganathan Raman*
    Published at the CVPR 2023 workshop - Computational Cameras and Display CCD
15. **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

16. **VPTDrone: Video Processing Toolkit for Smart Surveillance Drone** (Paper)
***Dwip Dalal**, Anirban Dasgupta*
`Published at 7th 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 Sanjeev Kumar, CTO of DELL, and Prasad Malempati, Sr. Manager of Accenture, San Francisco.
- **Startup Contributions — 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 end-to-end video anomaly detector. At Necesario, built models for image enhancement. At JK Lakshmi, built anomaly detection system for sensor data.

Projects

- **Open-source 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. Built 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 Agents; Advanced Topics in NLP; LLM Applications
- **IITGN:** Optimization for ML; LLMs; Digital Image Processing; Data Structures and Algorithms; Control Theory; Linear Algebra; Multivariable Calculus; Complex Analysis; Differential Equations; Probability; Numerical Methods

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, UIUC:** CS 444 Deep Learning Computer Vision (Fall'25), 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)
- Core Member Hackrush'23 & '24, Annual Machine Learning Hackathon, IIT Gandhinagar
- Represented IIT Gandhinagar in the Inter-IIT Tech Meet in 2021, 2022, 2023 (Leader).
- Selected among the top 30 semi-finalist teams out of 100K participants in Accenture Innovation Challenge AIC'22

Skill Summary

- **Platforms & Frameworks:** PyTorch**, TensorFlow**, OpenVINO**, Unity, MATLAB, Google Cloud, ROS
- **Architectures:** LLMs**, Multi-Agent**, CLIP**, Diffusion Model**, Vision Transformers**, Transformers**, GANs**, VAEs**, CNN**, LSTM**, Neural ODE, Diffeomorphic flows

** *Very Proficient*