

# Dwip Dalal

Ph.D. ECE @ UIUC, dwip2@illinois.edu

 GitHub  LinkedIn  Google Scholar  Website

## Education

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- **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

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

## Awards & Achievements

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- 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.
- **1<sup>st</sup> 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**.
- **1<sup>st</sup> 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<sup>th</sup> & 7<sup>th</sup>), 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 **1<sup>st</sup> rank** in **Hackrush '22**, the flagship annual machine learning hackathon of IIT Gandhinagar.
- **1<sup>st</sup> rank** in IITGN Summer Project 2021 for building the most efficient NLP classification model.
- Secured **1<sup>st</sup> 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

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- **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 multilingual 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, LLMs, [[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

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### 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 2023) [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 2023)
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 2024)  
*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 2023)

### Workshop Papers

10. **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
11. **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
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 2023 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<sup>th</sup> Joint International Conference on Data Science & Management of Data

## Internships

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- **ML Research Intern @ Physical Research Laboratory, ISRO** (Jan '23 – July '23)  
*Mentor: Prof. Dibyendu Chakrabarty (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 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

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- **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

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- **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
- **Online:** DL Specialization by Andrew Ng [[Certificate](#)], Aerial Robotics, Computational Motion Planning, Perception

## Teaching Experience

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- **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:** CS449 Artificial Intelligence (Spring'25)
- **Teaching Assistant, IIT Gandhinagar:** ES413 Deep Learning (Spring'24), CS328 Data Science (Spring'23)

## Social Initiatives, Leadership & Innovation

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- **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 among the top 30 semi-finalist teams out of 100K participants in Accenture Innovation Challenge AIC'22

## Technical Skills

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