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
  CGPA: 4.0/4.0 (Computer Vision, DL for CV: A+, Adv. NLP: A)
- **Indian Institute of Technology Gandhinagar (IIT-GN)** **2020 – 2024**
  B.Tech in Mechanical Engineering with Minor in Computer Science
  Institute Gold Medalist; Overall CGPA: 9.10/10; Minor CGPA: 10/10

Interest Areas

Multimodal Learning, VLMs, Agentic Systems, MLLM Reasoning, Generative AI,

Awards & Achievements

- Incoming summer intern at Microsoft Research (Redmond), focusing on LLM agents and reasoning.
- Awarded the **Institute Gold Medal @ IIT Gandhinagar**, for highest CGPA in the discipline.
- 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.
- Secured 1^{st} **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**.
- Nominated by IIT Gandhinagar for the prestigious **Pre-Doctoral Research Assistant Program** at **Microsoft Research, India**.
- Secured 1^{st} **rank** in **Undergraduate Research Showcase'23 @ IITGN** for research work on AI-enabled on-device drones.
- Selected for **Citi Bank's 2023 Summer Internship** for the **Analyst role**.
- Secured **10/10 GPA for two consecutive semesters** (6^{th} & 7^{th}), each comprising rigorous 26-credit course work.
- **MITACS Globalink Research Fellow** at the **University of British Columbia**, mentored by **Prof. Yankai Cao** and **Dr. Dongsheng Xiao**.
- 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^{st} **rank** in **Hackrush'22**, the flagship annual machine learning hackathon of IIT Gandhinagar.
- Secured 1^{st} **rank** in IITGN Summer Project for building the most efficient NLP classification model.
- Secured 1^{st} **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 Assitant, University of Illinois Urbana-Champaign** (Aug '24 – Present)
  Mentor: Prof. Svetlana Lazebnik, Prof. Unnat Jain, Prof. Heng Ji, Dr. Nebojsa Jojic
  Working with Dr. Nebojsa Jojic (Senior Principal Researcher, Microsoft) on VLM-based outdoor navigation. Collaborating with Prof. Unnat Jain and Prof. Heng Ji on a project focusing on multimodal perception using a multi-agent framework for compositional reasoning [10].

- **Research Assitant, 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, Dr. Dongsheng Xiao ***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 *1.5 years exp.*
  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 image, for the De-Factify 3.0 @AAAI'24.

Publications

[1] **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]

[2] **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)

[3] **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

[4] **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)

Workshops

[5] **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

[6] **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

[7] **Learning to Stabilize: Comparative Analysis of Reinforcement Learning and Traditional Methods for Swirling Pendulum Control**
Dwip Dalal*, Shubhankar Riswadkar, Harish J Palanthandalam-Madapusi* (Paper)
Published at IEEE Indian Control Conference 2023

[8] **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

[9] **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

Under Review

[10] **Divide and Reason: Joint Image and Language Decomposition for Compositional Reasoning**
Dwip Dalal, Madhav Kanda, Zhenhailong Wang, Heng Ji, Unnat Jain
Submitted to Association for Computational Linguistics (ACL 2025)

[11] **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*
Submitted to Association for Computational Linguistics (ACL 2025)

[12] **Flow Symmetrization for Parameterized Constrained Diffeomorphisms** (Paper)
Dwip Dalal*, Aalok Gangopadhyay*, Progyan Das*, Shanmuganathan Raman*
Submitted to the Computer Graphics Forum

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. Submitted to Advances in Space Research journal and under deployment at ISRO.

- **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)
  Mentor: Dr. Fannikiran Maddukuri
  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.
- **Computer Vision Intern @ Aivid Techvision** (May '22 – July '22)
  Developed an end-to-end video anomaly detection model for surveillance videos using MIL ranking loss. Reduced the inference time to 53% by pruning the model using OpenVINO for real-time anomaly detection.
- **Computer Vision Intern @ Necesario Innovations** (Dec '21 – Jan '22)
  Built a model for noise reduction using VAEs and a model for image enhancement (LDR to HDR) and super-resolution using conditional GANs. Deployed these models on the Jetson Nano board for real-time inference.
- **Data Science Intern @ JK Lakshmi Ltd.** (Aug '21 – Nov '21)
  Performed anomaly detection using statistical algorithms on a large-scale dataset collected by 26 sensors.

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 Generative Models**, Topics in LLM Agent**, Advance Topics in NLP **(A)**, Computer Vision **(A+)**
- **IITGN:** Optimization for Machine Learning, Large Language Models, Digital Image Processing, Data Structures and Algorithms, Control Theory, Linear Algebra and Single Variable Calculus, Multivariable Calculus, and Complex Analysis, Ordinary Differential Equations, Probability, Statistics, and Numerical Methods,
- **Online:** Deep Learning Specialization by Andrew Ng [Certificate], NLP Stanford CS224N, Aerial Robotics, Computational Motion Planning, Robotics: perception, Robotics: Estimation and Learning ** *Spring 2025*

Teaching Experience

- **Instructor, SC 336: Mathematics of Machine Learning | Fall, 2023** (certificate)
  - Instructed IIT Gandhinagar's first student-led, fully accredited short course, with record registrations of 170 students across undergraduate and graduate years.
- **Reviewer of conference and workshops**
  - Conference: NeurIPS 2024, AISTATS 2025, ICML 2025, ACL 2025, ICCV 2025
  - Workshops: DeFactify 3.0 @ AAAI'24, NLP+CSS @ NAACL'24
- **Teaching Assistant of ES413 Deep Learning Course | Spring, 2024**
- **Teaching Assistant of CS328 Data Science Course | Spring, 2023**
- **AI Lab, IITGN, Presentations**: `Diffusion Model and Manifold Learning`; `VisionLLM`; `Diffusion LM`.

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 & Hackrush'24**, 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
- Selected and attended the Amazon ML summer school.

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*