

Anisha Pal

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Research Interests

AI for Ecology, Climate & Sustainability, Syn-real generalization, Robust & Interpretable Machine Learning

Education

Georgia Institute of Technology, Atlanta, GA 2022 – 2024
M.S. in Computer Science with ML specialization GPA 4.0/4.0
Advisor: Prof. Judy Hoffman

Courses: Graduate Algorithms, Machine Learning with Limited Supervision, Machine Learning, Glacier & Ice Sheet Dynamics, Natural Language, Systems for Machine Learning, Interactive Robot Learning

Manipal Institute of Technology, Manipal, India 2016 – 2020
B.Tech, Electronics & Communication Engineering (Minor: Data Science) GPA 9.27/10.0
Top 3% in my batch (55/1957)

Courses: Linear algebra, Probability and Statistics, Time series analysis, Operation Research, Signal Processing, Computer Vision, Data Science, Communication Networks, Computer Architecture, Object Oriented Programming

Publications

Semi-Truths: A Large-Scale Dataset of AI-Augmented Images for Evaluating Robustness of AI-Generated Image detectors Dec 2024

Neural Information Processing Systems (**NeurIPS**) 2024 📄 | 🌐 | 🏠
Anisha Pal*, Julia Kruk*, Mansi Phute, Manogna Bhattaram, Diyi Yang, Duen Horng Chau, Judy Hoffman

SkyScenes: A Synthetic Dataset for Aerial Scene Understanding Oct 2024
European Conference on Computer Vision (**ECCV**) 2024 📄 | 🌐 | 🏠

Sahil Khose*, **Anisha Pal***, Aayushi Agarwal*, Deepanshi*, Judy Hoffman, Prithvijit Chattopadhyay

SegFast-V2: Semantic image segmentation with less parameters in deep learning for autonomous driving Aug 2019

International Journal of Machine Learning and Cybernetics (**IJMLC**) 📄 | 🌐
Swarnendu Ghosh, **Anisha Pal**, Shourya Jaiswal, KC Santosh, Nibaran Das, Mita Nasipuri

SegFast: A faster squeezeNet based semantic image segmentation technique using depth-wise separable convolutions Dec 2018

Indian Conference on Computer Vision, Graphics and Image Processing (**ICVGIP**) 2018 📄 | 🌐
Anisha Pal, Shourya Jaiswal, Swarnendu Ghosh, Nibaran Das, Mita Nasipuri

Work & Research Experience

Scientific ML Engineer, Planette San Francisco, CA
Manager: Dr. Kalai Ramea June 2024 – Present

Project: AI-based Subseasonal Climate Forecasting

- Building AI foundation model to forecast climate variables across subseasonal (2–12 weeks) and long-range (3–18 months) timescales, using spatiotemporal climate data.
- Assisting the founders in drafting NSF, NIST, and NOAA grant proposals for AI-based climate modeling.

Graduate Research Assistant, Hoffman AI Lab, Georgia Institute of Technology Atlanta, GA
Advisor: Prof. Judy Hoffman Jan 2023 – May 2024

Project: Syn-to-Real Generalization

- Led the generation of a synthetic aerial imagery dataset with varying scene layouts, weather, daytime, camera height, and pitch using the CARLA simulator and studied the effects of domain shift due to semantic conditions.
- Demonstrated the effectiveness of targeted data generation strategies such as controlled variations and enhanced rare class representation, in improving syn-to-real generalization across multiple benchmarks and models, achieving notable gains in both zero-shot and low-shot settings.

Project: AI-generated Image Detection & Stress Testing

- Designed a dataset of AI-augmented images and an autonomous pipeline for performing LLM prompt-guided, targeted perturbations on diverse real-world images using diffusion-based editing techniques.
- Generated comprehensive metadata on scene attributes, perturbation magnitudes, and augmentation techniques to facilitate stress testing of AI-generated image detectors, revealing critical biases and performance gaps.

Data Science Intern , Corteva Agriscience

Johnston, IA

Manager: Dr. Jeremiah Barr

May 2023 – Aug 2023

Project: Image Super Resolution for satellite imagery

- Developed transformer-based image super-resolution algorithms for satellite imagery to enhance the downstream task of field boundary detection on agricultural land, yielding PSNR of 36dB and SSIM of 0.81.
- Built a tool using selenium for accessing soil and landmass data from longpaddock website.

Graduate Research Assistant, CQGRD, Georgia Institute of Technology

Atlanta, GA

Advisor: Dr. Arthi Rao

Aug 2022 – May 2023

Project: Henry County Smart Resilience Decision Support Tool

- Implemented a Community Decision Support tool for Henry County in the Atlanta Metro, utilizing machine learning, data visualization, and spatial multicriteria decision analysis with ArcGIS to rank locations within the county based on suitability for freight-related construction and transportation, promoting growth aligned with social, environmental, and economic resilience.
- Collaborated with stakeholders and government officials to refine the tool design and deployment strategy, ensuring seamless integration into the Henry County decision-making pipeline for driving economic development initiatives.

Machine Learning Engineer, Hyperverge Inc.

Bengaluru, INDIA

Manager: Nikhil Naphade

Dec 2019 – July 2022

Project: Passive Video Liveness

- Led the development of a custom passive video liveness solution incorporating a vision transformer-based, multi-channel architecture with optimized frame sampling techniques for detecting Face Presentation Attacks and achieving a consistent score of over 99% on research benchmarks and in production environments.
- Mentored interns for the project - machine learning-based digital forgery(deepfake, photoshopped and other synthetically generated data) detection system.

Project: Infrastructure Change Detection

- Led the AI efforts of the Geospatial team, designing a unique change detection and classification system on large-scale satellite/aerial imagery.
- Implemented a hybrid approach utilizing segmentation models, automatic imagery alignment, vectorization, and shape enhancement techniques, achieving a consistent F1 score of over 90% across various geographies and significantly improving property tax collection efficiency.
- Assisted the product team in arriving at a product-market fit by designing and conducting feasibility analysis of product features and supporting modules.

Solution Specialist Intern, Microsoft Corporation

Bengaluru, INDIA

Manager: Samhita Sharma

May 2019 – July 2019

Project: Study on Smart City Landscape in India

- Enabled the FY20 GTM (Go to Market) strategy for Microsoft Public Sector Department by conducting a comprehensive analysis of the smart city landscape in India through engagement with key stakeholders.
- Conducted market research on cloud and AI services adoption, and suggested a growth-maximizing roadmap targeting industry leaders followed by facilitating prototype design for smart city solutions.

Research Intern, Jadavpur University

Kolkata, INDIA

Advisor: Prof. Nibaran Das

May 2018 – June 2018

Project: Computationally Efficient Road Scene Segmentation for Self-Driving Cars

- Designed a computationally efficient deep learning-based semantic segmentation algorithm for self-driving cars that achieved 10x faster speed, 5x less memory consumption, and 224x fewer parameters with similar accuracy compared to the state-of-the-art segmentation algorithms.

Selected Projects

NAS Latency Predictor



Course Project: CS8803-SMR Special Topics in Systems for Machine Learning [Fall 2023]

- Developed a latency predictor that generalizes to unseen hardware and architectures
- Created the corresponding dataset by expanding NATS-Bench to encompass hardware-specific latency measurements and descriptors across diverse GPUs, CPUs, and Edge devices

Medical VQA



Course Project: CS 7650: Natural Language Processing [Spring 2023]

- Designed a lightweight model for medical visual question answering by combining an image encoder (ConvNeXt) with a text encoder (BERT), matching SOTA performance (72% acc.) on the VQA-RAD dataset.
- Conducted in-depth evaluation of image feature extractors, question encoders, and structured, free-text, and multi-choice answering frameworks to optimize system performance and clinical relevance.

Black Box Optimization

- Conducted extensive survey and experimentation on the different Hyperparameter Optimization techniques such as Turbo, Hyperopt, PySOT and Nevergrad as part of the NeurIPS 2020 Black Box Optimization Challenge.
- Identified the advantage of trust-region-based exploration-exploitation provided by Turbo and the superior candidate selection method (TPE) used by Hyperopt to design a hybrid approach that achieved a score of 85.34.

Adversarial Defense



- Trained neural networks robust to post-hoc pruning using Targeted Dropout. The idea was to cut off the snowball effect of error buildup in the network's activations by removing the impact of most weights.
- Experimented with FGSM and PGD attacks on CIFAR-10/100 datasets using ResNet models augmented with Targeted Dropout to assess its potential for improving robustness.

Talks & Presentations

- "From AI to Climate Action: Harnessing Machine Learning Background for Environmental Impact", online talk hosted by iExplore Foundation & The Institution of Green Engineers (IGEN) *Oct 2024*
- "Synthetic-to-Real Generalization for Aerial Imagery" at NASA S2A2 workshop, Georgia Tech *Jan 2024*

Features

- "A Guide to Higher Education Abroad", Bits And Bytes, Manipal Institute of Technology, MAHE *March 2023*
- "Embracing The GEO AI Revolution", R3PL1C4 *Sep 2020*

Teaching Experience

Graduate Teaching Assistant, CS 6476: Computer Vision

Fall 2023

Instructor: Prof. Irfan Essa

Worked with a team of 13 TAs in a class of 184 students to design homework and mentor students in their coursework and project work on the fundamentals of computer vision.

Volunteering & Leadership Experience

Research Volunteer, Engineers for Exploration(E4E), UCSD – Remote

Feb 2022 – Aug 2022

- Worked in collaboration with San Diego Zoo on the Aye Aye Sleep Monitoring project to develop a real-time machine learning system to monitor and analyze behavioral cues in Aye Aye for early detection of health issues.
- Analyzed sleeping and eating patterns using spatiotemporal data across multiple imaging modalities to identify abnormal behavior, and developed an optimized frame sampling technique and MegaDetector-based detection pipeline for real-time functionality.

Vice Chairperson, IEEE Student Branch Manipal – Manipal, India

Sep 2016 – Aug 2019

- Established IEEE Women in Engineering Society in Manipal to empower women in the field of technology and inculcate an atmosphere of research through talks, workshops, mentorship programs, and hackathons.
- Designed curriculum, headed projects, and mentored students in machine learning, data structures, and algorithms during the summer break mentorship and upskilling program.