

Nirat Saini

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RESEARCH INTERESTS

I am a passionate problem solver, dedicated to working on challenging and impactful problems in Computer Science. My research focuses on Computer Vision, such as Video understanding, Compositional Zero-shot learning, and Generative AI for fine-grained concept generation and editing in image and video.

EDUCATION

University of Maryland, College Park August 2017 – Present
Doctor of Philosophy (PhD) in Computer Science GPA: 3.94/4
Advisor: Prof. Abhinav Shrivastava

Dayalbagh Educational Institute, India July 2012 – July 2017
B.Sc.–M.Sc.–M.Tech. Computer Science (5 year Integrated Program) CGPA: 9.52/10

PUBLICATIONS

- **InVi: Object Insertion in Videos Using Off-the-Shelf Diffusion Models** *Under Review.*
Nirat Saini, Navaneeth Bodla, Ashish Shrivastava, Avinash Ravichandran, Xiao Zhang, Abhinav Shrivastava, Bharat Singh.
- **Beyond Seen Primitive Concepts and Attribute-Object Compositional Learning** *CVPR 2024* [[web](#)]
Nirat Saini, Khoi Pham, Abhinav Shrivastava.
- **WAYEX: Waypoint Exploration for Single Demonstration Learning** *ICRA 2024* [[web](#)]
Mara Levy, Nirat Saini, Abhinav Shrivastava.
- **Chop & Learn: Recognizing and Generating Object-State Compositions** *ICCV 2023* [[web](#)]
Nirat Saini, Hanyu Wang*, Kamal Gupta, Archana Swaminathan, Vinoj Jayasundara, Bo He, Abhinav Shrivastava.* [[Media Coverage](#)]
- **Disentangling Visual Embeddings for Attributes and Objects** *CVPR 2022* [[web](#)]
Nirat Saini, Khoi Pham, Abhinav Shrivastava. (Oral: Top 4.2% of submitted papers)
- **Recognizing Transforming Actions via Object State Transformations** *ICLRw 2022* [[web](#)]
Nirat Saini, Gaurav Shrivastava, Sai Saketh Rambhatla and Abhinav Shrivastava.
- **Learning Graphs for Knowledge Transfer with Limited Labels** *CVPR 2021* [[web](#)]
Pallabi Ghosh, Nirat Saini, Larry Davis and Abhinav Shrivastava.
- **All About Knowledge Graphs for Actions** *ArXiv 2020* [[web](#)]
Pallabi Ghosh, Nirat Saini, Larry Davis and Abhinav Shrivastava.
- **Explicit Bias Discovery in Visual Question Answering Models** *CVPR 2019* [[web](#)]
Varun Manjunatha, Nirat Saini and Larry Davis.
- **Multi-bid Spectrum Auctions in DSA Networks with Spatial Reuse** *COMSNETS 2017* [[web](#)]
Nirat Saini, Mainak Chatterjee.

RESEARCH EXPERIENCE

Cruise LLC. November 2023 – January 2024
Research Intern *San Francisco, CA*

- Mentors: Dr. Xiao Zhang, Dr. Navaneeth Bodla, Dr. Bharat Singh
- Worked on training-free algorithm for extending pre-trained Text-to-Image models for Video editing and in-painting.
- The proposed method is relevant for sim-to-real generation, as it uses single in-painted image, along with conditional control to insert a new object in a video.

Comcast AI Labs June – August 2021
Research Intern *Washington D.C.*

- Mentors: Dr. Hongchang Wang and Dr. Zhe Wu

- Developed an end-to-end solution for package delivery detection with multi-view cameras.
- This work was integrated into the proprietary security camera system for Amazon and UPS delivery detection.

Affectiva

June – August 2019

Research Intern

Boston, MA

- Mentors: Dr. Taniya Misra and Dr. Mohammad Mavadati
- Developed multi-modal system to capture affect from text, audio and video.
- This method improves over the baseline with 5% accuracy by including multi-level fusion for LSTMs.

University of Central Florida

June – August 2016

Research Intern

Orlando, FL

- Mentor: Prof. Mainak Chatterjee
- Worked on a Multi-Bid Auction design for Dynamic Spectrum Access Networks, which was accepted at IEEE conference as my first published work.

Indian Institute of Technology, Delhi (IITD)

May – July 2015

Research Intern

New Delhi, India

- Mentor: Prof. Huzur Saran
- Analyzed the Wi-fi signal Modeling and Estimation using Rayleigh and Rician Signal Models, for understanding performance and connectivity bottlenecks of wireless systems.

OTHER RELEVANT PROJECTS

Generating Intermediate States of object Transformation

October 2023

For generating images to learn cutting of fruits and vegetables, this project focuses on using Diffusion models for granular intermediate state generation, such as apple cut in five slices or one slice.

Sentiment analysis on Customer support voice calls

January 2019

This project utilizes audio and textual data from recorded customer support calls to evaluate the customer engagement and service quality provided by Hughes Communications' support staff and identify areas for enhancement.

Interpretability of models: Measures of Influence

August 2018

This analysis explores the effect of removing or perturbing a training sample, in order to understand it's effect on the test sample, to estimate the Influence Functions tied to training samples.

Neural Dialogue Systems

August 2017

We develop a sequence-to-sequence model for open-ended dialogue generation and conversation, with contextualizing affect and domain specific understanding.

AWARDS AND SERVICES

Reviewer: CVPR: 2020 – 2023, ICCV: 2023, 2021, ECCV: 2024, 2022, TPAMI: 2023, WiCV-CVPR: 2023, 2024

Organizer: Women in Computer Vision Workshop at ECCV 2024

Graduate Mentor: Senior Graduate mentor for new admit PhDs (UMD) 2021

Mentor: Tech + Research Undergraduate Projects at Technica (UMD) 2019

Dean's Fellowship, University of Maryland, College Park 2017, 2018

Director's Medal, Rank 1 in MSc, Dayalbagh Educational Institute, India 2016

Undergraduate Research Award, Cash Prize INR 10,000 2014–2015

TEACHING ASSISTANT-SHIP EXPERIENCE

CMSC 472: Introduction to Deep Learning Spring 2024

CMSC 414: Computer and Network Security Spring 2018 - Spring 2020

CMSC 216: Introduction to Computer Systems Fall 2017

TECHNICAL SKILLS

Languages: Python, C/C++, MATLAB.

Frameworks: PyTorch, Keras, TensorFlow, OpenCV.

Deep Learning Architectures: CNNs, RNNs, LSTMs, Transformers, VAE, Diffusion Models (DDPM).

Domain Skills: Computer Vision, Machine Learning, Data collection, Multi-model Learning, Reinforcement Learning, Vision+Language Models, Natural Language Processing, Generative Pre-trained Transformers (GPT).