

Gaurav Kumar Nayak

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WORK EXPERIENCE (ACADEMIC)

Indian Institute of Technology Roorkee

Assistant Professor

Mehta Family School of Data Science and Artificial Intelligence

Roorkee, India

Apr 2024 – Present

University of Central Florida (UCF)

Post-Doctoral Scholar, Center for Research in Computer Vision

Supervisor: *Dr. Mubarak Shah*

Florida, USA

Jan 2023 – Mar 2024

EDUCATION

Indian Institute of Science (IISc)

Ph.D., Computational and Data Sciences

Thesis title: *Data-efficient Deep Learning Algorithms for Computer Vision Applications*

Supervisor: *Dr. Anirban Chakraborty*

Bangalore, India

2017 – 2022

Jawaharlal Nehru University (JNU)

M.Tech, Computer Science and Technology

Supervisor: *Dr. R. K. Agrawal*

New Delhi, India

2015 – 2017

Vellore Institute of Technology (VIT)

B.Tech, Computer Science and Engineering

Supervisor: *Dr. Swathi J. N.*

Tamil Nadu, India

2009 – 2013

PUBLICATIONS

- Gustavo García, Alejandro Aparcedo, **Gaurav Kumar Nayak**, Tanvir Ahmed, Mubarak Shah, and Mengjie Li, *Generalized deep learning model for photovoltaic module segmentation from satellite and aerial imagery*, in Elsevier Journal of Solar Energy, 2024.
- **Gaurav Kumar Nayak**, Inder Khatri, Ruchit Rawal, and Anirban Chakraborty, *Data-free Defense of Black Box Models against Adversarial Attacks*, Accepted in IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshop (CVPRW) on Fair, Data-efficient, and Trusted Computer Vision (TCV), 2024
- **Gaurav Kumar Nayak**, Ruchit Rawal, Inder Khatri, and Anirban Chakraborty, *Robust Few-Shot Learning without using any Adversarial Sample*, in IEEE Transactions on Neural Networks and Learning Systems (TNNLS) 2023. [Core A*]
- M Yashwanth, **Gaurav Kumar Nayak**, Harsh Rangwani, Arya Singh, R. Venkatesh Babu, and Anirban Chakraborty, *Minimizing Layerwise Activation Norm Improves Generalization in Federated Learning*, in IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2024. [Core A]
- Vicente Vivanco Cepeda, **Gaurav Kumar Nayak**, Mubarak Shah, *GeoCLIP: Clip-Inspired Alignment between Locations and Images for Effective Worldwide Geo-localization*, in Neural Information Processing Systems (NeurIPS) 2023. [Core A*]
- **Gaurav Kumar Nayak**, Ruchit Rawal, and Anirban Chakraborty, *DE-CROP: Data-efficient Certified Robustness for Pretrained Classifiers*, in IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2023. [Core A]
- Indu Joshi, Priyank Upadhyay, **Gaurav Kumar Nayak**, Peter Schüffler, and Nassir Navab, *DISBELIEVE: Distance Between Client Models is Very Essential for Effective Local Model Poisoning Attacks*, in MICCAI Workshop on Distributed, Collaborative and Federated Learning (DeCaF), 2023.

- **Gaurav Kumar Nayak**, Ruchit Rawal, Rohit Lal, Himanshu Patil, and Anirban Chakraborty, *Holistic Approach to Measure Sample-level Adversarial Vulnerability and its Utility in Building Trustworthy Systems*, in IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshop (CVPRW) on Human-centered Intelligent Services Safety and Trustworthy (HCIS), 2022.
- **Gaurav Kumar Nayak**, Ruchit Rawal, and Anirban Chakraborty, *DAD: Data-free Adversarial Defense at Test Time*, in IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2022. [Core A]
- **Gaurav Kumar Nayak**, Konda Reddy Mopuri, Saksham Jain, and Anirban Chakraborty, *Mining Data Impressions from Deep Models as Substitute for the Unavailable Training Data*, in IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2021. [Core A*]
- **Gaurav Kumar Nayak**, Konda Reddy Mopuri, and Anirban Chakraborty, *Effectiveness of Arbitrary Transfer Sets for Data-free Knowledge Distillation*, in IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2021. [Core A]
- **Gaurav Kumar Nayak**, Monish Keswani, Sharan Seshadri, and Anirban Chakraborty, *Beyond Classification: Knowledge Distillation using Multi-Object Impressions*, in British Machine Vision Conference (BMVC), 2021. [Core A]
- **Gaurav Kumar Nayak**, Het Shah, and Anirban Chakraborty, *Incremental Learning for Animal Pose Estimation using RBF k-DPP*, in British Machine Vision Conference (BMVC), 2021. [Core A]
- Sravanti Addepalli, **Gaurav Kumar Nayak**, Anirban Chakraborty, and R. Venkatesh Babu, *DeGAN: Data-enriching GAN for retrieving representative samples from a trained classifier*, in AAAI Conference on Artificial Intelligence, 2020. [Core A*]
- **Gaurav Kumar Nayak**, Saksham Jain, R. Venkatesh Babu, and Anirban Chakraborty, *Fusion of Deep and Non-Deep Methods for Fast Super-Resolution of Satellite Images*, in IEEE International Conference on Multimedia Big Data (BigMM), 2020.
- **Gaurav Kumar Nayak**, Konda Reddy Mopuri, Vaisakh Shaj, R. Venkatesh Babu, and Anirban Chakraborty, *Zero-Shot Knowledge Distillation in Deep Networks*, in International Conference on Machine Learning (ICML), 2019. [Core A*].
- **Gaurav Kumar Nayak**, Utkarsh Shreemali, R Venkatesh Babu, and Anirban Chakraborty, *Efficient Person Re-identification in videos using Sequence Lazy Greedy Determinantal Point Process (SLGDPP)*, in IEEE International Conference on Image Processing (ICIP), 2019. [Core B]

PAPERS UNDER REVIEW

- Jiaqi Xue, **Gaurav Kumar Nayak**, Mengxin Zheng, Lei Yang, Mubarak Shah, and Qian Lou, *TrojSSL: Accurate and Stable Trojan Attacks in Self-Supervised Learning*, Under review in *TMI Journal*.
- **Gaurav Kumar Nayak**, Inder Khatri, Shubham Randive, Ruchit Rawal, and Anirban Chakraborty, *DAD++: Improved Data-free Test Time Adversarial Defense*, Under review in *IJCV Journal*.
- M Yashwanth, **Gaurav Kumar Nayak**, Arya Singh, Yogesh Simmhan, and Anirban Chakraborty, *Adaptive Self-Distillation for Minimizing Client Drift in Heterogeneous Federated Learning*, Under review in *TMLR Journal*.
- Rohit Gupta, Naveed Akhtar, **Gaurav Kumar Nayak**, Ajmal Mian, Mubarak Shah, *Query Efficient Cross-Dataset Transferable Black-Box Attack on Action Recognition*, Under review in *Neural Networks Journal*.

BOOK CHAPTER

- Atmika Honnalgere, and Gaurav Kumar Nayak. *Classification of Normal Versus Malignant Cells in B-ALL White Blood Cancer Microscopic Images*, in **ISBI** C-NMC Challenge: Classification in Cancer Cell Imaging, 2019.

GRANT PROPOSALS

- **Cisco Research (#89189875):** Dataset Distillation in Videos, PI: Mubarak Shah, Co-PI: **Gaurav Kumar Nayak**, [Grant Awarded \(100,000 USD\)](#)
- **National Science Foundation (NSF, USA):** Physics-informed machine learning for laser-assisted manufacturing of electronic microlayers using semiconductor nanomaterials, PI: Aravinda Kar, Co-PIs: Ranganathan Kumar, Kristopher Davis, Mubarak Shah, and **Gaurav Kumar Nayak** (Under Review)

ONGOING PROJECTS

- **ChatGPT for Geo-localization:** Large Language Models (LLMs) are providing a new way to interact with visual data. While there have been initial attempts for image-based conversation models, this work aims to build image conversation models that can answer to geographical queries such as image location, nearby information (tourist spots, hospitals, restaurants, etc.), population, climate, and many more. We are planning to build an image-caption dataset and use it for visual instruction tuning to build geo-aware ChatGPT by aligning the image features with pretrained LLM word embeddings.
- **Dataset Distillation:** Training of state-of-the-art sophisticated deep models is becoming computationally expensive due to the large-scale datasets. To overcome this issue, recent works reduce the training time by distilling the knowledge from a larger training set into a small number of synthetic samples ('dataset distillation'), which are then used for training. However, existing works have primarily focused on distilling image data. Our objective is to develop a dataset distillation method for the video modality (especially for video classification tasks such as action recognition). We plan to model the spatio-temporal relationships by utilizing 3d backbone networks and perform feature distribution matching between original and synthetic videos using maximum mean discrepancy. Another goal is to demonstrate the utility of distilled videos on the incremental learning task in the video classification framework.

WORK EXPERIENCE (INDUSTRY)

MyGuestHouse Accommodations Pvt. Ltd
Software Engineer, Developer

Noida, UP, India
Jun 2013 - Oct 2014

- Worked on Channel Manager Integration with major online travel tickets booking sites.
- Worked on Property Management System (PMS); Zend Framework, API development; Web Services based on OTA Manual

ACHIEVEMENTS

- Awarded Cisco Grant of 100,000 USD **2023**
- Received Preminent Postdoctoral Program (P3) award with amount of 5,000 USD [[award letter](#)] **2023**
- Shortlisted to participate in [Research Week with Google](#) [[Certificate](#)] **2022**
- Selected for [Doctoral Consortium](#) at WACV 2022 **2021**
- Qualcomm Innovation Fellowship (QIF) India 2020 Finalist [[Certificate](#)] **2020**
- Received GARP Funding for attending ICIP 2019 Conference in Taipei, Taiwan **2019**
- Selected for ICML 2019 travel grant for attending the conference at Long Beach, CA, USA **2019**
- Senior Research Fellowship for Ph.D. research at Indian Institute of Science. **2019-2022**
- Junior Research Fellowship for Ph.D. research at Indian Institute of Science. **2017-2018**
- Qualified UGC NET-JRF [[Net Certificate](#)] [[JRF Certificate](#)] **2016**
- Qualified GATE and among top 2 percent. **2015**
- Qualified NTSE Stage 1 **2007**

TECHNICAL SKILLS

- **Programming Languages:** • C • C++ • Python • R • Java
- **Deep Learning Frameworks:** • Tensorflow • Pytorch • Keras • Caffe
- **Scripting Languages:** • PHP (Zend Framework)
- **Database:** • MYSQL and Oracle

RELEVANT COURSES

- Deep Learning for Computer Vision • Machine Learning for Signal Processing • Pattern Recognition • Practical Data Science • Linear and Non Linear Optimization • Stochastic models and Applications

TEACHING RESPONSIBILITY

- Course Instructor, Statistical Learning Theory at IIT Roorkee July 2024
- Course Instructor with Prof. Mubarak Shah, Advanced Computer Vision (Topics: Visual-Language Models) Jan 2024-Mar 2024
- Course Observer, Advanced Computer Vision (Topics: Diffusion Models) Jan 2023-Apr 2023
- Teaching Assistant, Data Analytics and Visualization Jan 2019-Apr 2019
- Teaching Assistant, Video Analytics course Aug 2019-Dec 2019
Duties: Assisting the instructor in preparing course materials including course content, assignments, projects and grading.

MENTORING EXPERIENCE

Guided several students from different colleges which lead to several publications

- Vicente Vivanco Cepeda (B.Tech) University of Central Florida, USA
- Ruchit Rawal (B.Tech) Netaji Subhas University of Technology, Delhi
- Inder Khatri (B.Tech) Delhi Technological University, Delhi
- Shubham Randive (M.Tech) IIT Madras
- Monish Keswani (M.Tech) Indian Institute of Science, Bangalore
- Het Shah (B.Tech) Birla Institute of Technology and Science, Goa
- Saksham Jain (B.Tech) Netaji Subhas University of Technology, Delhi
- Sharan Seshadri (B.Tech) Manipal Institute of Technology, Manipal
- Rohit Lal (B.Tech) Visvesvaraya National Institute of Technology, Nagpur
- Himanshu Patil (B.Tech) Visvesvaraya National Institute of Technology, Nagpur

PROFESSIONAL SERVICES

- Reviewed four papers in CVPR 2024 Dec 2023
- Presented Start-up Proposal in UCF Technology Ventures Symposium 2023 [[Weblink](#)] Oct 2023
- Reviewer three papers in AAAI and five papers in WACV 2024 Sept 2023
- Presented recent work of NeurIPS 2023 to National Geospatial-Intelligence Agency (NGA) [[Slides](#)] Aug 2023
- Reviewed six papers in NeurIPS 2023 Jun-Jul 2023
- Reviewed two papers in WACV 2023 Jul-Aug 2022

- CVPR Workshop 2022 - Presented *“Holistic Approach to Measure Sample-level Adversarial Vulnerability and its Utility in Building Trustworthy Systems”* paper [Slides] June 2022
- Delivered a Guest Lecture in Data Analysis and Visualization course (at IISc, Bangalore) on *“Principle Component Analysis”* [Slides] March 2022
- Delivered a Guest Lecture in Deep Learning for Computer Vision course (at IISc, Bangalore) on *“Deep Learning in the absence of Training Data”* [Slides] March 2022
- Reviewed six papers in BMVC 2021 and two papers in WACV 2022 Jul-Sept 2021
- Delivered a keynote talk on *“Data-Free Knowledge Distillation in Deep Networks”* in Manav Rachna University [Memento] [Certificate] July 2021
- Reviewed a paper for Pattern Recognition Journal Feb 2021
- WACV 2021 - Presented *“Effectiveness of Arbitrary Transfer Sets for Data-free Knowledge Distillation”* paper [Slides] Jan 2021
- Reviewed two papers for WACV 2021 Oct 2020
- IEEE BigMM 2020 - Presented *“Fusion of Deep and Non-Deep Methods for Fast Super-Resolution of Satellite Images”* paper [Slides] Sept 2020
- Reviewer for Elsevier Pattern Recognition Journal [Certificate] May 2020
- Reviewed Research Papers for BMVC 2020 May 2020
- NCVPRIPG 2019 (Conference on Computer Vision) - Presented *“Zero-Shot Knowledge Distillation”* paper in session on *“VISION INDIA”* [Slides] Dec 2019
- ICIP 2019 - Presented *“Efficient Person Re-Identification in Videos Using Sequence Lazy Greedy Determinantal Point Process (SLGDPP)”* paper [Poster] Sep 2019
- Chair IEEE-IISc joint student chapter, Computational Intelligence and Computer Society. 2019-2021
- Coordinated IISc Open Day 2018-2019
- Coordinated International Conference (VLDB), held on 5-9 September, 2016. 2016