Kshitiz

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Education

Carnegie Mellon University – School of Computer Science — Pittsburgh, PA
Master of Science in Robotics — *2025 – 2027*

Indian Institute of Technology Jodhpur, India — CGPA: 8.97/10
B.Tech. in Computer Science and Engineering (Dept. Rank – 2) — *2019 – 2023*

Publications

- Kshitiz, Shreshtha, S., Dosi, M., Dutta, B., Vatsa, M., Singh, R., Anand, S., Sarkar, S., and Parihar, S. **BirdCollect: A Comprehensive Benchmark for Analyzing Dense Bird Flock Attributes**. *AAAI Conference, 2024*
- Kshitiz, Shreshtha, S., Mounir, R., Vatsa, M., Singh, R., Anand, S., Sarkar, S., and Parihar, S. **Long-term Monitoring of Bird Flocks in the Wild**. *IJCAI Conference, 2023*
- Kshitiz, Garg, G., and Paul, A. **Few-shot Diagnosis of Chest X-Rays Using an Ensemble of Random Discriminative Subspaces**. *ICLR Workshop on Machine Learning & Global Health Network, 2023*

Industry Experience

Research Fellow — *Bangalore, India*
Intel Labs — *Aug 2024 – July 2024*

- Designed an end-to-end μ-architecture design exploration framework that encodes design knobs, learns differentiable predictors of IPC (throughput) and dynamic power, and replaces large sweeps of cycle-accurate simulation with model-guided search
- Developed a multi-objective exploration protocol that computes the empirical Pareto front, performs guided sampling, and runs NSGA II over a compressed parameterization to map the performance-power frontier
- Prototyped a Pareto-aware hypernetwork with a constraint validator, and ran SHAP and gradient saliency ablations to verify the meta parameter grouping and to guide pruning and model choice

Senior Analyst — *Bangalore, India*
Media.net (previously Directi) — *Jun 2023 – Jul 2024*

- Optimized ML deployment by transitioning to Torchserve, reducing 99th percentile latency from 70s to under 10s and stabilizing memory usage for real-time inference
- Automated profile optimization for ad-tech auctions using bidding data, increasing request blocking by 740M/day and achieving 83% cost savings

Academic Research Experience

Image Analysis and Biometrics Lab, IIT Jodhpur — *Undergraduate Researcher*
Advisors: Profs. Richa Singh, Mayank Vatsa, Sudeep Sarkar, Saket Anand — *Sep 2022 – May 2023*

- Led an NSF funded Indo-US project to develop a non-invasive, animal agnostic monitoring system. Curated the **BirdCollect** dataset (7,000+ high-res images/videos) capturing dense and occluded bird populations
- Applied counting-guided diffusion sampling for accurate density estimation and noise reduction. Enhanced flock segmentation through guided point annotations. Improved rare species detection through multi-scale feature extraction and confidence based noise suppression
- Generated 3D bird meshes and simulated high-density flocks in Blender, integrating 3D-2D data with a dual-branch geometric fusion network to handle occlusions and posture changes

Machine Intelligence Group, University of Edinburgh — *Research Intern*
Advisor: Prof. Timothy M. Hospedales — *Sep 2022 – Mar 2023*

- Developed a framework to evaluate meta-learners across tasks (classification, segmentation, keypoint localization), improving generalization via shared feature extraction

- Analyzed multi-task learning challenges due to task diversity, and compared ProtoNet and MAML, showing that ProtoNet achieves better generalization through metric-based feature embeddings without fine-tuning
- Demonstrated that random search outperforms grid search in hyperparameter optimization for high-dimensional tasks, improving scalability and robustness across datasets

University of Central Florida & Microsoft Research, Redmond *Research Internship*
Advisors: Prof. Yogesh Rawat, Dr. Vaibhav Vineet *Jun 2022 – Dec 2022*

- Developed weakly supervised human action detection models for large-scale video datasets with minimal labels, reducing annotation requirements while capturing spatial-temporal dependencies
- Created a teacher-student framework with EMA updates to refine pseudolabels. Improved accuracy by 5-7% through bipartite matching and integrated a transformer-based architecture with key frame selection and augmentations
- Used VideoCapsuleNet and key-point tracking to model dynamic spatio-temporal relations, achieving viewpoint-invariant representation and robustness under occlusions

Vision & AI Lab, Indian Institute of Science, Bangalore *Summer Research Intern*
Advisor: Prof. Venkatesh Babu *May 2022 – Aug 2022*

- Developed source-free unsupervised domain adaptation for semantic segmentation (GTA → CityScapes) using vision transformers, teacher-student framework, and pseudo-labeling, achieving 13% mIoU improvement
- Designed a multi-resolution strategy using hierarchical transformers and edge queries to enhance segmentation details and spatial context. Improved pseudo-labels with saliency refinement and contrast enhancement
- Used pretext tasks (deblurring, masked image consistency), DACS augmentation and vendor-side pretraining with client-side adaptation using a critic model to improve rare object class performance without source data

Indian Institute of Technology Jodhpur *Undergraduate Student Researcher*
Advisor: Dr. Angshuman Paul *Jun 2021 – Dec 2021*

- Developed an ensemble approach for few-shot chest X-ray diagnosis using random discriminative subspaces. Reduced feature selection complexity from $O(a)$ to $O(1)$ and achieved 1.8x faster training than t-SVD
- Introduced a class-separating loss function for well-separated clusters, reducing inference time and maximizing inter-class variance. Outperformed MAML and ProtoNets on the NIH chest X-ray dataset, particularly in classifying underrepresented abnormalities

Selected Academic Projects

Efficient Visual Attention *Collaborators: Gautam Kunapuli & Maneesh Singh*

- Developed a foveal-peripheral attention model, reducing operations by 22% and enhancing CIFAR-10 accuracy. Combined hybrid self-attention and convolutions in ResNet-18 for improved feature representation in low-resolution images
- Integrated block-wise local self-attention into CNNs, achieving ImageNet-level accuracy with 20% fewer parameters and expanded receptive fields

Automatic Number Plate Recognition *PI: Dr. Kaushal A. Desai, Prof. Santanu Chaudhury*

- Developed an end-to-end automatic number plate recognition system for Indian conditions using MTCNN and YOLOv5, addressing inconsistent formats, fonts, occlusions, and poor lighting
- Created a synthetic dataset with augmentations like CLAHE and perspective transforms to improve robustness and address data scarcity

Selected Achievements

- Selected as Research Fellow (pre-doctoral) with Microsoft Research India [*2024*]
- Serving as program committee member for the research track of CODS-COMAD'24 [*2024*]
- Featured in an AIHub interview on using computer vision for non-invasive wildlife monitoring [*2024*]
- Invited to present our wildlife monitoring computer vision research at IJCAI-SACAIR in Johannesburg [*2023*]
- Awarded fully-funded grant from **Imperial College London & MLGH group** to attend **ICLR'23** [*2023*]

- Our paper Long-term Monitoring of Bird Flocks in the Wild was selected as an IKDD premier paper [*2023*]
- Awarded travel funding from Microsoft Research to present my paper at **IJCAI'23** [*2023*]
- Selected as an in-person summer intern at Australian National University [*2022*]
- **OpenSource**: Contributed to **Hacktoberfest** 2022 and 2020 through open-source projects [*2022*]

Academic Services

- **Invited Reviewer**: NeurIPS, CVPR, ICLR Tiny Papers, CODS-COMAD, Pattern Recognition(J)
- **Teaching Assistant** : Deep Learning Course, IIT Jodhpur [*Spring 2023*]

Volunteering & Extracurricular Activities

- **Hamari Pehchan NGO**: Led research, social media campaigns, and community service initiatives to improve education for the underprivileged [*2023*]
- Represented IIT Jodhpur at the **Inter IIT Tech Meet** Chandrayaan Moon Mapping Challenge [*2023*]
- Volunteer at **Winter School'23**, IIT Jodhpur, focused on algorithms, graphs, and responsible AI [*2022*]
- Core Member of the **Robotics Society**, IIT Jodhpur [*2021*]

Technical Skills

- **Languages**: Python, C/C++, SQL, Bash
- **Tools & Technologies**: PyTorch, TensorFlow, OpenCV, Docker, Kubernetes, GCP, Streamlit, Heroku, OpenGL

Relevant Coursework

Courses: Machine Learning, Optimization in ML, Deep Learning, Computer Vision†, Computer Graphics†, Human-Computer Interaction, Probability & Statistics, Calculus, Linear Algebra, Differential Equations, Discrete Math, Data Structures and Algorithms
† Graduate level course