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MRIDUL KHURANA

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EDUCATION

Virginia Tech **Aug 2022 – May 2027**
PhD. in Computer Science, *Advisor: Dr. Anuj Karpatne* GPA 4.0/4.0 *Blacksburg, Virginia*
Courses: Computer Vision (CV), Natural Language Processing (NLP), Deep Reinforcement Learning (RL), Adv Machine Learning

Delhi Technological University **Aug 2015 - May 2019**
Bachelor of Technology (B.Tech.), Electrical Engineering *New Delhi, India*

PROFESSIONAL EXPERIENCE

AMD Inc. **San Jose, CA**
Research Intern *Jan 2025 – Present*
- **Model optimization** using sparsity-aware **quantization** of LLMs like **Llama-3**, Falcon for near-lossless inference.
- Developing Post Training Quantization (**PTQ**) for **Diffusion Transformers** using **KV cache** quantization.

Knowledge-guided ML Lab, Virginia Tech (Advisor: Dr. Anuj Karpatne) **Blacksburg, VA**
Graduate Research Assistant *Sep 2022 – Dec 2024*
- **Hierarchical** conditioning of **Stable Diffusion,** for studying species evolution and accelerating scientific discoveries (**ECCV'24**)
- Progressive training of **Diffusion Models** for **Fine-Grained Generation** and Trait Discovery (in review **ICCV'25**)
- **Multimodal scientific benchmark dataset** for Vision Language Models (**VLMs**) including **GPT-4o**, LLaVa, BLIP (**NeurIPS'24**)

Theremin.ai (Quant startup) **Mumbai, India**
Software Engineer *May 2020 -July 2022*
- Designed and built a **Trading Platform (OMS)** handling over **$10 Million** in Indian stock markets. Mentoring **2 interns**.
- Achieved a **15x increase** in volume to support **1,500 securities** by implementing **Kafka** for real-time stock data streaming.
- Deployed **event-driven architecture** framework on **AWS**, and integrated **ETL** pipelines with SQL database using custom **APIs**

Fractal Analytics **Mumbai, India**
Software Engineer *June 2019 – Apr 2020*
- Built ML models with **10,000+ variables** reducing dimensionality by **97%** using **PCA**, variable binning & **clustering**.
- Used **Random Forest** and **XGBoost**, achieving **10% increase** on an F1 score from previous models.

Vision and AI Lab, IISc Bangalore (Advisor: Dr. R. Venkatesh Babu) **Bangalore, India**
Research Intern *May 2018 – July 2018*
- Developed **monocular depth estimation** models using **CNNs** (ResNet-50) & fovea transformations for outdoor scenes.
- The absolute & squared relative errors were reduced by 0.7% and 2% resp. on the KITTI stereo dataset (at par with SOTA).
- Employed Fully Convolutional Residual Networks (**FCRN**) using **unsupervised learning** for indoor scenes in Tensorflow.

PROJECTS

Mitigating Simple and Adversarial Attacks on Vision Language Models (VLMs) GitHub Feb 2024 - May 2024
- Jailbreaking and mitigating positional biases & adversarial vulnerabilities in VLMs on MCQA tasks.
- Proposed **Visual Latent Smoothing** enhancing robustness of LLaVa & BLIP VLMs against adversarial attacks by **9% & 4%** resp

Numeral-Aware Large Language Models (LLMs) GitHub Sep 2023 – Dec 2023
- **Prompt tuning** and Instruction fine-tuning **Llama-2** using **LoRA** for accurately generating numeral-aware news headlines.

INVITED TALKS AND AWARDS

- **Tree-of-Life Meets AI:** Knowledge-guided Generative Models, hosted by Voxel51, Nov. 2024
- Received **Travel Award** from CS Department, Virginia Tech for attending ECCV 2024.
- **Taekwondo:** State level **Gold medalist**, India. **Music:** Certified **Grade 2** drummer, Rockschool, **Trinity College of London**.

PROFESSIONAL SERVICE

- Reviewer for **ICLR 2024, NeurIPS 2023-2024** Workshops and **AAAI 2024-2025** Workshops.

TECHNICAL SKILLS

- **Programming Languages:** Python, C++, Shell Scripting, SQL, no-SQL, Git, MATLAB
- **Technologies:** PyTorch, HuggingFace, Tensorflow, AWS, Docker, OpenCV, Scikit-learn, WandB, Kafka, MongoDB

SELECTED PUBLICATIONS & PREPRINTS

7. **Mridul Khurana,** Arka Daw, M. Maruf, …, Anuj Karpatne. "*Hierarchical Conditioning of Diffusion Models Using Tree-of-Life for Studying Species Evolution*". ***ECCV 2024*** *(Paper)*
6. Mohannad Elhamod, **Mridul Khurana**, Harish Babu Manogaran, …, Anuj Karpatne. *"Discovering Novel Biological Traits from Images using Phylogeny-guided Neural Networks". **KDD 2023 (Oral)** (Paper)*
5. Kazi S. Mehrab, M. Maruf, Arka Daw, Harish. B. Manogaran, Abhilash Neog, **Mridul Khurana**, …, Anuj Karpatne *"Fish-Vista: A Multi-Purpose Dataset for Understanding & Identification of Traits from Images". **CVPR 2025** (Paper*)
4. M. Maruf, Arka Daw, Kazi S. Mehrab, Harish. B. Manogaran, Abhilash Neog, Medha Sawhney, **Mridul Khurana**, …, Anuj Karpatne. "*VLM4Bio: A Benchmark Dataset to Evaluate Pretrained Vision-Language Models for Trait Discovery from Biological Images*". ***NeurIPS 2024*** *(Paper)*
3. **Mridul Khurana**, Arka Daw, M. Maruf, …, Anuj Karpatne. *"Conditioning Diffusion Models Using the Knowledge of Phylogeny for Understanding Species Evolution". **AAAI 2024 Workshop (Oral)** on Imageomics (Poster)*
2. Mohannad Elhamod, **Mridul Khurana**, Harish Babu Manogaran, …, Anuj Karpatne. *"Discovering Novel Biological Traits from Images using Phylogeny-guided Neural Networks". **CVPR 2023 Workshop (Oral)** on CV4Animals (Poster)*
1. Amin Karimi Monsefi, **Mridul Khurana**, Rajiv Ramnath, Anuj Karpatne, Wei-Lun Chao, Cheng Zhang. "*TaxaDiffusion: Progressively Trained Diffusion Model for Fine-Grained Generation and Trait Discovery*" (*in review **ICCV 2025***)