Vaibhav Rathore

M.S by Research
Center For Machine Intelligence and Data Science(C-MInDS)
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Degree	Discipline	Institute	Year	CPI/%
MS by Research	Artificial Intelligence & Data Science	IIT Bombay	2023-26	9.31
B.Tech	Mechanical Engineering	MNNIT Allahabad	2018-22	9.10
Intermediate/+2	Science(PCM) & Languages	De Paul School (ISC)	2015-17	98.00
Matriculation	Science(PCM) & Languages	De Paul School (ICSE)	2013-15	93.80

PUBLICATIONS

- **Vaibhav Rathore**, Shubhranil B, Saikat Dutta, Sarthak Mehrotra, Zsolt Kira , Biplab Banerjee. ***When Domain Generalization meets Generalized Category Discovery***. Accepted in **CVPR 2025**, Main A* Conference.
    - **Train** in **Delhi's summer**, **sort** known and new things in **snowy Manali — without seeing snow till test time**. Our **DG^{2}CD-Net** adapts on the fly using **episodic training** and **synthetic domains** to handle this.
- **Vaibhav Rathore**, Divyam Gupta , Biplab Banerjee. **HIDISC***: A Hyperbolic Framework for Domain Generalization with Generalized Category Discovery*. Accepted in **NeurIPS 2025**, Main A* Conference.
    - Developed HIDISC, a hyperbolic DG-GCD framework outperforming DG^{2}CD-Net by removing costly episodic simulation with geometry-aware learning for superior domain & category generalization.
- **Vaibhav Rathore**, Divyam Gupta , Biplab Banerjee. **FOCUS*: Bridging Fine-Grained Recognition and Open-World Discovery across Domains***. Under Review in **CVPR 2026**, Main A* Conference.
- Anisha Saha , **Vaibhav Rathore**, Abhisek Tiwari , Akash Ghosh , Sai Ruthvik Edara , Sriparna Saha. ***M3 Questioning: Multi-modal, Multi-span Medical Question Answering***. Under Review in **ACM Health**.

WORK EXPERIENCE & INTERNSHIPS

- **Research Intern** | ***Motilal Oswal Financial Services Limited (MOFSL)*** *(Sep'25 - Oct'25)*
  Technologies: *Latent Sync, Gaussian Splatting, Wav2Lip, OmniSync, 3D Avatar Generation*
    - Implemented and evaluated **Latent Sync** for high-fidelity lip-synchronization, conducting **cross-character experiments** to assess generalization capabilities.
    - Investigated **Gaussian Splatting** for **3D Avatar Generation**, focusing on real-time rendering and integration with dynamic lip-sync pipelines.
    - Benchmarked **SOTA methods** (OmniSync, Key Sync) to analyze trade-offs in data efficiency and visual fidelity.
- **Research Intern (Vehant Fellow Track)** | ***Pedestrian Attribute Recognition (PAR)*** *(Sep'25-Nov'25)*
  Focus Areas: *PAR, Hyperbolic Geometry, Graph Neural Networks, Vision–Language Models*
    - Conducted research on **Pedestrian Attribute Recognition (PAR)** using hyperbolic embeddings, attribute graphs, and correlation-aware models (GCN, RNN, attention-based) for improved contextual attribute prediction.
    - Explored **Vision–Language (CLIP-based) PAR models**, robustness to occlusion/domain shift, and fairness mitigation across benchmark datasets (PETA, RAP, PA-100K, UPAR, MSP60K).
- **Research Intern** | ***Sony Research India***, Bengaluru , India *(May'25 - July'25)*
  Technologies: *PyTorch, Tensorflow, Python, Avatar , 3D Computer Vision , Gaussian Splatting*
    - Built an **automatic 3D lip-syncing** pipeline using 3D GS, benchmarked against leading models.
    - Delivered **seamless visual-audio synchronization**, enhancing realism and overall user experience.
- **Research & Development Intern** | ***Clinical AI Assistance*** *(May'24 - Jul'24)*
  Technologies: *LoRA, Large Language Models (LLMs), Hugging Face Transformers, Streamlit*
    - Fine-tuned **LLMs** with **LoRA**, creating system predicting diseases from 10,000 patient-doctor dialogues
    - Developed **multimodal medical QA model** combining imaging data with text analysis for higher precision
    - Deployed the solution via **Streamlit** for an interactive and efficient diagnostic environment.
- **Graduate Engineer Trainee** | ***Reliance Industries Limited*** *(Aug'22 - Jul'23)*
  Technologies: *SAP , Excel , Data Visualization (Matplotlib/Seaborn)*

- Built ML models for predictive maintenance and managed shutdown logistics using SAP, reducing downtime and ensuring on-time completion

COURSE PROJECTS : COMPUTER VISION AND IMAGE ANALYSIS

- **Calorie Estimation of Food Items from Images using Deep Learning**, GitHub Link *(Sep'23 - Nov'23)*
  - Developed a ML system to estimate **calorie content** from food images for **dietary tracking**.
  - Built a multi-stage pipeline with **YOLO** for food detection & **GrabCut** for precise foreground segmentation.
  - **Ensured accurate analysis and calorie prediction** by isolating food items from complex backgrounds.
- **Medical Image Deblurring**, GitHub Link *(Jan'24 - May'24)*
  - **Mitigated motion blur** in multi-modal medical images (**30% of scans affected**) to improve diagnostics.
  - **Built a scale-recurrent network** with **spatial-asymmetric attention** for focus on critical regions.
  - **Improved clarity by 24% (PSNR)**, providing higher-quality inputs for reliable medical analysis.

GENERATIVE AI & REPRESENTATIONAL LEARNING

- **Learning with Noisy Labels using Vision Transformer (ViT)**, GitHub Link *(Oct'24 - Dec'24)*
  - **Classified images** with **40% label noise** on CIFAR-100, boosting robustness to data corruption.
  - Applied the **state-of-the-art Turtle method** to mitigate mislabeled training data.
  - **Achieved 83% accuracy** with a Vision Transformer, maintaining strong performance despite noise.
- **Fine-Grained Classification on CUB Dataset**, GitHub Link *(Mar'24 - May'24)*
  - **Solved fine-grained visual classification** on the CUB-200 dataset (**200 bird species**), accurately distinguishing sub-categories with high visual similarity.
  - Designed a **CNN with <10M parameters**, achieving **35% lower model size** with competitive accuracy.
  - **Attained 87.14% top-1 accuracy**, demonstrating an optimal **trade-off between efficiency and performance**.
- **Autoencoding Beyond Pixels (Million AID Dataset)**, GitHub Link *(Aug'24 - Nov'24)*
  - Implemented **VAE/GAN** to generate high-fidelity images, improving perceptual score by **18%** over SOTA.
  - Applied a **feature-wise similarity metric** from the GAN discriminator, boosting realism in outputs.
  - Achieved **superior fidelity** and controlled attribute edits via **latent space arithmetic** on **10K+ images**.

SELF PROJECTS

- **AI Support Assistant**
  - Built a **Streamlit-based chatbot** for Samsung S25 Ultra support, integrating **RAG** with PDF manuals for accurate responses.
  - Fine-tuned **Qwen3-4B-Instruct** using **QLoRA** to adopt a patient and professional support persona.
  - Delivered **real-time, factual assistance** with reduced hallucinations and improved user satisfaction.
- **Kinector: A Text-Conditioned 2D Gesture Generator** GitHub Link
  - **Generated 2D stick-figure animations** from text using **less than 100-sample** short-video dataset.
  - Built pipeline with **MediaPipe** keypoint extraction, **GRU** pose prediction, and text-to-motion animation.
  - Used **PyTorch** and Bag-of-Words in an interactive Jupyter notebook for end-to-end workflow.

TECHNICAL SKILLS

- **Programming Languages:** Python, Shell, Bash,C, C++, Java
- **Tools and Libraries:** PyTorch, TensorFlow, OpenCV, Numpy, Pandas, YOLO, scikit-learn, Hugging Face for LLMs

MACHINE LEARNING / DEEP LEARNING COURSES

- **CS 725: Foundations of Machine Learning**
- **GNR 650: Advanced Topics in Deep Learning**
- **CS 736: Medical Image Computing**
- **CS 601: Algorithms and Complexity**
- **GNR638: Machine Learning for Remote Sensing - II**
- **EE 601: Statistical Signal Analysis**
- **EE 610: Image Processing**
- **SC 607: Optimisation**

POSITIONS OF RESPONSIBILITY & EXTRACURRICULAR ACTIVITIES

- **Teaching Assistant , IIT Bombay**
  - e-PGD: Introduction to Python Programming (Prof.Abir De) *(Jan'25 - Present)*
  - DS 303: Intro to Machine Learning (Prof.Prashanth L.A.) *(Jul'24 - Present)*
- **Student Mentor, MNNIT Allahabad** *(Jul'21 - May'22)*
  - Mentoring group of **20+ freshmen**, providing academic and social support for successful transition into university life.
  - Acted as a key liaison between students and faculty, organizing academic resources for common first-year challenges.

ACHIEVEMENTS

- Achieved a **top 1 percentile** rank in the **JEE Main 2018**, securing a position among 1.2 million candidates nationwide.
- Attained a **top 1 percentile** rank in the **GATE 2022** examination in both **Mechanical Engineering (ME)** and **Engineering Sciences (XE)**, competing against over 100,000 candidates.