Antareep Dey

Final Year Undergraduate
Computer Science & Engineering

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Education

- **Vellore Institute of Technology, Bhopal Campus** — Bhopal, India
  Bachelor of Technology - Computer Science and Engineering — *2022 - 2026*

  Relevant Coursework: Data Structures & Algorithms, Calculus & Laplace Transforms, Differential & Difference Equations, Applied Linear Algebra,Probability & Statistics,Discrete Mathematics & Graph Theory,Machine Learning

Experience

- **Indian Institute of Technology, Kharagpur** — October 2024 - Present
  Research Intern, Advisor: Dr.Abir Das
  - Created an **Image-to-Image synthesis pipeline** integrating **BLIP-2** captioning and **Stable Diffusion** for controlled synthetic data generation, **producing 650K augmented synethetic images** through **distributed inference on GPU cluster**.
  - Examined the sample-complexity–accuracy Pareto frontier of **ResNet and Vision Transformer (ViT)** models by varying synthetic to real mixing ratios to evaluate augmentation efficacy and generalisation behavior
  - Applied **layer-wise representation probing** to explain synthetic-natural feature learning disparities, revealing non-trivial **dissociations** between **inter-class separability and clustering** quality that constrain discriminative performance.
  - Currently working on **test-time adaptation** research for video domain adaptation for **action recognition tasks**.
- **Vellore Institute of Technology, Bhopal Campus** — August 2024- March 2025
  Undergraduate Researcher, Advisor: Dr.Preetam Suman
  - Created a **medical dialogue corpus** through multi-source data aggregation and preprocessing of **379K patient-physician interactions**, enabling domain-agnostic medical natural language understanding capabilities across heterogeneous clinical contexts.
  - Fine-tuned a **3B parameter language** model using parameter-efficient methods such as **LoRA** achieving **59.05% accuracy** on medical benchmarks while **outperforming similar 7B parameter models** in resource-constrained environments.The Model and Dataset Opensource
  - Work accepted for **oral presentation at ICAIET 2025**
- **Code In Place, Stanford University** — April 2023 - June 2023
  Student Instructor — *Remote*
  - **Taught a group of 15 students** from around the world through a 7-week course covering Python, console programming, and graphics programming
  - Prepared and **delivered 50-minute lessons** on a weekly basis based on **Stanford's CS106A** course

Publications

- **Fine-Tuned Language Models in Healthcare: Empowering Affordable Medical Consultations**: Conference Paper with Oral Presentation at International Conference on Artificial Intelligence And Emerging Technologies, 2025

Projects

- **Explainable Musculoskeletal Fracture Analysis**(Work in progress) Researching a dual-pipeline framework for skeletal fracture detection, with a primary focus on **explainability in clinical settings**. Currently evaluating the efficacy of various **Class Activation Mapping (CAM)** techniques in producing interpretative heatmaps that align with radiographic gold standards. The ongoing work aims to bridge the gap between deep learning outputs and clinical decision-making through rigorous interpretability studies.
- **CineGAN: High-Fidelity Cinematic Style Transfer using GAN's** Developed a **Pix2Pix-based Generative Adverserial Network** (GAN) for cinematic style transfer, featuring a **ResNet generator** with S**queeze-and-Excitation (SE) attention skip connections** and a **Multi-Scale Spectral PatchGAN discriminator**. Optimized **training on TPUs** using mixed precision and a composite loss function including **VGG19 Perceptual**, **Feature Matching**, and **Total Variation losses** to eliminate artifacts.
- **SeeCurity: Survellience Footage Optimization** Engineered an intelligent surveillance system utilizing **MobileNetV2-SSD** architecture pre-trained on the COCO dataset for high-speed object detection. **Optimized for edge inference** to enable real-time inference on mobile devices, implementing a triggered-recording logic that captured video only upon detecting relevant entities to minimize storage overhead. Developed a cross-platform applications consisting of a **Flutter** mobile application and a Web-based monitoring dashboard.

Skills

- **Languages**: Python, C++, SQL, TypeScript, Bash
- **Frameworks and Libraries:** PyTorch, Tensorflow, Scikit-Learn, Pandas, Numpy, Seaborn, OpenCV,Flask, Astro, Bun, AWS, Weights and Biases, Transformers, Diffusers
- **Soft Skills:** Leadership, Event Management, Writing

Honors and Awards

- **Raman Research Award-2026**, Vellore Institute of Technology, Bhopal Campus
- **High Distinction Excellence-2020**, International Chemistry Quiz (Formerly ANCQ)