

PROFESSIONAL SUMMARY

Graduate student in MSc Computing (AI & ML) at Imperial College London, with a B.Tech in Computer Science and Engineering from IIT Jodhpur. Research focuses on robust multimodal representations, generative modeling, and AI fairness. Former AI Research Engineer at MetaFusion, where I built and deployed large-scale VLM- and LLM-driven systems for surveillance, traffic automation, and scene-captioning across Indian cities. Published at top conferences like WACV and EMNLP, with ongoing work on generative debiasing and lip-sync video personalization.

EDUCATION

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| Imperial College London | United Kingdom |
| • <i>MSc Computing (Artificial Intelligence and Machine Learning)</i> | <i>2025 - 2026</i> |
| Indian Institute of Technology Jodhpur | India |
| • <i>Bachelor of Technology in Computer Science and Engineering; CGPA: 8.88/10</i> | <i>2020 - 2024</i> |
- All India Rank **3316 (IIT-JEE 2020)** among 1.3 million applicants.
 - Secured 2nd position in Computer Vision Hackathon conducted by [algo8.ai](#).
 - Selected for the prestigious **Mitacs Globalink Research Internship** and completed a funded summer research internship.
 - Capstone Project: *Hybrid Sample Synthesis-Based Debiasing in Limited Data Settings* published at **WACV 2024**.
 - Ranked among the top 5 students in the cohort.
 - Coursework: Deep Learning, Advanced Machine Learning, Natural Language Understanding, Data Structures and Algorithms, Operating Systems, Computer Networks, Probability, Statistics, Stochastic Processes, Linear Algebra.

PUBLICATIONS

- **P. Arora***, N. Singh*, V. Diwan*, P. Mazumder, *BLADE: Bias-Linked Adaptive DEbiasing*: Under Review
- A. Subramanyam*, N. Singh*, **P. Arora***, and A. Mishra, *When Big Models Train Small Ones: Label-Free Model Parity Alignment for Efficient Visual Question Answering with Small VLMs*: **EMNLP 2025**
- **P. Arora***, and P. Mazumder*, *Hybrid Sample Synthesis-Based Debiasing Of Classifier In Limited Data Setting*: **WACV 2024**

* denotes equal contribution

RESEARCH EXPERIENCE

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| Diffusion-Based Personalization for Audio-Driven Lip-Sync | Imperial College London |
| • Supervisors: Dr. Antoni Bigata , Dr. Stavros Petridis (iBUG Lab) | <i>Sep 2024 – Present</i> |
| ◦ Investigating personalization techniques for the KeySync model to capture speaker-specific micro-expressions and articulation patterns with minimal reference samples. | |
| ◦ Analyzing audio cross-attention layers to identify bottlenecks in capturing individual traits; applying layer-specific LoRA fine-tuning with targeted inpainting masks to prevent identity leakage. | |
| ◦ Exploring cross-lingual transfer: training on one language and evaluating articulation pattern preservation when generating lip-sync for different languages and identities. | |
| ◦ Skills: Python, PyTorch, Diffusers | |
| When Big Models Train Small Ones | IIT Jodhpur |
| • Supervisor: Dr. Anand Mishra (VL2G Lab) <i>Technical Report</i> | <i>Dec 2024 – Mar 2025</i> |
| ◦ Designed Model Parity Alignment (MPA) to train small VLMs (SmolVLM-500M, TinyLLaVA-2B, InternVL2-2B/4B) from large VLMs (Qwen2VL-7B, InternVL2-8B, GPT-4o) using unlabeled data. | |
| ◦ Developed disparity-aware training to close reasoning gaps between VLM and its larger counterpart via automated QA pair generation and filtering of disparity samples to guide fine-tuning across OCR, commonsense, and factual tasks. | |
| ◦ Achieved consistent accuracy gains up to 6% on VQA benchmarks like TextVQA, ST-VQA, OKVQA, MedicalVQA, and ChartQA. | |
| ◦ Skills: PyTorch, HuggingFace, Docker, Git | |
| BLADE: Bias-Linked Adaptive DEbiasing | IIT Jodhpur |
| • Supervisor: Dr. Pratik Mazumder <i>Technical Report</i> | <i>May 2024 – Mar 2025</i> |
| ◦ Proposed a generative debiasing framework using adapted StarGAN to create bias-translated image pairs, eliminating the need for conflicting supervision. | |
| ◦ Trained ResNet classifiers with an instance-specific refinement strategy to align task-relevant features across domains. | |
| ◦ Improved worst-group accuracy on corrupted CIFAR-10 by up to 15% absolute over prior methods. | |
| ◦ Skills: Python, PyTorch, Matplotlib, Plotly, ResNet, Docker, Git | |

• Hybrid Sample Synthesis-Based Debiasing in Limited Data Settings

IIT Jodhpur

Supervisor: Dr. Pratik Mazumder | Technical Report

Dec 2022 – Mar 2023

- Designed a hybrid sample synthesis method for low-data regimes, enabling ResNet classifiers to generalize under unknown biases and promoting AI fairness.
- Built a dual-model framework to create bias-conflicting samples without relying on explicit bias annotations.
- Achieved up to **+10%** accuracy improvement over prior methods on benchmarks such as corrupted CIFAR-10, Colored MNIST, and BFFHQ.
- Skills: Python, PyTorch, Matplotlib, Plotly, ResNet, OpenCV, Docker, Kubernetes, Git

INDUSTRY RESEARCH

• MetaFusion

Noida, India

AI Research Engineer

May 2024 - Aug 2025

- Developed agentic AI frameworks with VLMs and LLMs for surveillance captioning and fine-grained attribute prediction, training Microsoft Florence-2 and increasing F1 score from **84% to 91%**.
- Built an intelligent traffic management system integrating multi-violation, vehicle detection, license plate recognition, OCR, and OpenAI CLIP-based vehicle attribute predictor.
- Created interactive interfaces for the AI systems using Gradio for real-time monitoring and visualization.
- Increased system throughput by over **50%** and deployed large-scale solutions across Gandhinagar, Vizag, and Maharashtra with cloud monitoring and automated logging.
- Skills: Python, C++, PyTorch, RAG, HuggingFace Transformers, YOLO, Kubernetes

RESEARCH INTERNSHIPS

• Exploring Imbalanced Problems Through Data Transformation

Ottawa, Canada

Supervisor: Dr. Paula Branco (Mitacs GRI 2023, uOttawa)

May 2023 – Aug 2023

- Evaluated SMOTE, reweighting, and feature engineering methods for their impact on boosting performance in imbalanced datasets.
- Automated large-scale benchmarking on 30+ datasets with reproducible Python pipelines.
- Identified insightful transformation patterns across continuous, discrete, and categorical features.
- Skills: Python, PyTorch, NumPy, Scikit-learn, OpenCV

• Unsupervised Learning for Bleed-Through Removal in Historical Documents

Remote

Supervisors: Florian Kordon, Dr.-Ing. Vincent Christlein (FAU)

Jun 2022 – Sep 2022

- Designed an encoder-decoder to separate bleed-through artifacts from text in degraded documents using unsupervised learning.
- Generated synthetic training data via image processing (thresholding, erosion, dilation) to replicate real-world degradation.
- Demonstrated artifact removal without clean ground truth, enabling scalable archival restoration.
- Skills: Python, PyTorch, OpenCV

• Mitigating Spurious Correlations via Memory-Guided Triplet Loss

Remote

Supervisor: Dr. Roberto Capobianco (Sapienza University of Rome)

May 2022 – Sep 2022

- Enhanced classifiers with a memory bank and cosine-similarity retrieval to detect shortcut learning.
- Used nearest-neighbor retrieval to visualize bias-driven decisions and expose spurious correlations.
- Applied memory-guided triplet loss to separate embeddings sharing bias features, improving generalization.
- Skills: Python, PyTorch, Git

TEACHING, CO-CURRICULAR AND ACADEMIC SERVICE

• Reviewer — CVPR 2026:

- Serving as reviewer for the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2026.

• Student Ambassador — AE Global Summit on Open Problems for AI:

- Represented students at a global forum featuring researchers from DeepMind, NVIDIA, and others.

• Teaching Assistant — Dr. Angshuman Paul:

- Assisted in teaching "Principles of Computer Systems" (CPU design, memory hierarchy, MIPS).
- Conducted labs, prepared assignments, and graded exams for 75+ students.

• Teaching Assistant — Dr. Mayank Vatsa:

- Supported "Introduction to Computer Science" (C++, Python, DSA).
- Designed tutorials and evaluated coursework for 200+ first-year students.

• Exhibition Team Head — Prometeo 2023:

- Led a 10-member team to organize North-Western India's largest student-run tech exhibition.
- Coordinated with 15+ companies/startups to showcase emerging technologies.