Ananya Vivek Kulkarni

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Work Experience

- **AI/ML Intern, iHub-Data, IIIT Hyderabad** **Jun 2025 – Present**
  Supervisor: Mr. Govind Krishnan
  - Enhancing an existing **deep learning model using knowledge distillation** for **Adverse Weather Removal**.
  - Curated datasets and generated **synthetic rain data** to improve model robustness.
  - Fine-tuned and modified the model specifically for **rain removal**.
  - Deployed the optimized model on **Jetson Nano** using **INT8 quantization** for real-time edge inference.
- **Research Intern, Space Applications Centre (SAC), ISRO** **Dec 2024 – Apr 2025**
  Supervisor: Dr. Bipasha Paul Shukla
  - Developed a **radiative transfer emulator** using ML models to simulate **greenhouse gas behavior** (CO_2, CH_4) for climate studies.
  - Reduced inference time from over 15 minutes to **0.02 minutes per scenario** while preserving spectral accuracy.
  - Created and processed a large-scale dataset of **9TB** for ML applications.
- **Research Intern, Defence Institute of Advanced Technology (DIAT), DRDO** **May 2024 – Jul 2024**
  Supervisor: Dr. Amrita Nighojkar
  - Developed and evaluated **LSTM and RNN models**, achieving over **92% accuracy** in detecting leaks in simulated maritime pipeline data.
  - Enhanced **leak detection in underground pipes**, contributing to improved reliability and maintenance strategies.

Publications

1. **A. Kulkarni**, M. Shah, N. Thakur, S. Pednekar, and V. H. Shah, "*Raspberry Pi-Driven Affordable Image-to-Braille Converter for Visually Impaired Users*," in *Advancements in Smart Computing and Information Security*, S. Rajagopal, K. Popat, D. Meva, and S. Bajeja (Eds.), Springer Nature Switzerland, Cham, 2024, pp. 225–242. ISBN: 978-3-031-59107-5. DOI: https://doi.org/10.1007/978-3-031-59107-5_15
2. **A. Kulkarni**, Z. Barad, and H. B. Prajapati, "*Improving Vehicle Visibility in Fog Environment*," in *Proc. of 2025 4th OPJU Int'l Tech. Conf. (OTCON) on Smart Computing for Innovation and Advancement in Industry 5.0*, IEEE, Apr. 2025, pp. 1–8. DOI: https://doi.org/10.1109/OTCON65728.2025.11070636

Upcoming Publications

- **A. Kulkarni**, S. Pednekar, and D. Vegda. "*Gender Agreement in Indo-Aryan Languages Using Rule-Based Parsing and Finite Automata*," Accepted at *ERCICAM 2025*, presented on March 8, 2025, To be published. Preprint: https://shorturl.at/V3Vdq
- H. S. Mukkamala, S. Gangisetty, **A. Kulkarni**, V. G. Yalla, and C. V. Jawahar. "*Enhancing Driving Visibility via Semantic-Guided Knowledge Distillation Framework for Adverse Weather Removal*," Accepted at *ICVGIP 2025* (Indian Conference on Computer Vision, Graphics and Image Processing), to be presented on December 17, 2025, To be published.

Research Experience

- **SMART NOTE:::BOOK – Raspberry Pi-Driven Affordable Image-to-Braille Converter for Visually Impaired Users**
  Feb '23 – Nov '23 — IoT-based OCR Project — Funded under SSIP, Govt. of Gujarat
  - Designed a real-time, low-cost Braille converter to address the scarcity of accessible learning resources in developing nations.
  - Mentored by **Asst. Prof. Viral H. Shah**; secured funding under the Student Startup Innovation Policy (SSIP).
  - First author of the paper *"Raspberry Pi-Driven Affordable Image-to-Braille Converter for Visually Impaired Users"*.
  - Received the **Best Paper Award** at *ASCIS 2023*; published in the **Springer CCIS Series** (May 2024).
- **Development of Marathi Language Parser**
  Oct '23 – Sep '24 — Paper Accepted at ERCICAM 2025 (Upcoming Publication)
  - Built a rule-based syntactic parser for the Marathi language using concepts from the Theory of Computation and Linguistics.

- Guided by **Asst. Prof. Deepak Vegda**; first author of the accepted paper *"Gender Agreement in Indo-Aryan Languages Using Rule-Based Parsing and Finite Automata"*.
- Presented at *ERCICAM 2025* on 8th March 2025.

- **Car Detection in Low Visibility**
  Jul '24 – Oct '24 — Published in OTCON 4.0 — Presented on 10th April 2025
  - Developed a vehicle detection pipeline combining DCP and CLAHE-based contrast enhancement with YOLOv8 and DeepSORT tracking.
  - Enabled real-time tracking of vehicles in foggy environments with improved visibility and temporal stability.

Patents

- **A System and Method for Real-Time Text-to-Braille Converter**
  Patent Filing Number: 202421066714, Published: Dec 6, 2024
  Developed a real-time, cost-effective text-to-Braille converter designed for visually impaired students. The system features adjustable Braille output speed, voice activation, AI-powered image captioning, and a teacher monitoring tool for tracking student progress and storing data.

Skills Summary

Programming Languages:	Python, C++, Java, C, SQL, R, JavaScript, HTML/CSS, LaTeX
Machine Learning & Computer Vision:	PyTorch, TensorFlow, OpenCV, Scikit-learn, NumPy, Pandas, Matplotlib, NLTK
3D Vision & Geometry:	COLMAP, Monocular Depth Estimation, Camera Poses, Point Clouds
Web & App Development:	Django, React, Spring Boot, Flutter, Android
DevOps & Deployment:	Docker, Kubernetes, Jenkins, MLFlow, DVC, Git, GitHub, CI/CD Pipelines
Databases:	PostgreSQL, MySQL, MongoDB
Core Competencies:	Problem Solving, Research Communication, Collaboration, Time Management, Initiative

Selected Technical Projects

- **Open Source Contribution — Graph Weather (OpenClimateFix)** *Jul '25 – Present*
  - Implemented **Angular MSE loss using Spherical Harmonics** to mitigate spectral double penalty in weather forecasting.
  - Added unit tests and contributed to the model evaluation pipeline.
  - *GitHub: graph_weather*
- **DashIndo3D: Monocular 3D Local Mapping from Dashcam Videos** *Jul '25 – Present*
  - Built **sparse 3D point clouds** from dashcam footage using **COLMAP**.
  - Fine-tuning **3D Gaussian Splatting (3DGS)** for improved scene consistency and depth accuracy.
  - Targeting unstructured Indian roads with challenges like **occlusion** and **dense traffic**.
- **Jigsaw Puzzle Solver via Self-Supervised Learning** *May '25 – Present*
  - Training a self-supervised model to solve **jigsaw image puzzles** via contrastive patch embeddings.
  - Generated a **custom dataset** from Pascal VOC; UI under development for demonstration.
- **Car Detection in Low Visibility** *Jul '24 – Oct '24*
  - Built a real-time system for **vehicle detection in fog** using enhancement and tracking techniques.
  - Combined **DCP**, **CLAHE**, **YOLOv8**, and **DeepSORT** to achieve **85% visibility improvement** with low latency.

Honors, Awards, and Extracurriculars

- **Student Startup Innovation Policy (SSIP)** *(Government of Gujarat, Feb '23)*: Proposed the SMART NOTE:::BOOK project to address the scarcity of Braille books for visually impaired students.
- **Best Paper Award** at *ASCIS 2023 Conference (Dec '23)*.
- **Devheat Beta Hackathon**: Achieved Top 10 Finalist *(Jun '22)*.
- **Classical Dance (Bharatnatyam)**: Completed 3 years with Distinction.

Education

2021 - 2025 **B.Tech in Information Technology**, Dharmsinh Desai University, India *CGPA: 8.68/10.0*
Relevant Coursework: Linear Algebra, Calculus, Probability and Statistics, Data Analysis using Python, Machine Learning, Deep Learning

2021 **Class 12th**, Amity School, CBSE Board *91.2%*
2019 **Class 10th**, Amity School, CBSE Board *92.8%*