Varad Datta Joshi

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EDUCATION

University of Utah, *Salt Lake City, UT* — Aug. 2024 – Present
Master of Science, Computing - Artificial Intelligence — GPA: 3.90/4
Relevant Courses: Data Mining, Deep Learning, Manage Data for and with ML

University of Pune, *Pune, India* — Aug. 2017 – Jun. 2021
Bachelor of Engineering, Electronics and Telecommunication — GPA: 8.59/10
Relevant Courses: DSA, OOP, Machine Learning, Artificial Intelligence

EXPERIENCE

AI/ML Intern, *Infotrend Inc* — Jun. 2025 – Present
- Designing and deploying a Retrieval-Augmented Generation (RAG) pipeline using Ragbits, Docling, LiteLLM, and ChromaDB to enhance contextual retrieval from enterprise documents and improve response quality.
- Developing internal e-discovery tools that leverage LLMs and vector databases for semantic search, intelligent filtering, and knowledge extraction across legal and business document collections.
- Addressing challenges related to retrieval accuracy, document chunking, and vector store tuning, leading to improvements in latency and answer grounding.
- Collaborating with cross-functional teams and contributing to open-source components to align foundational infrastructure with long-term product and research goals.

Research Associate, *University of Utah* — May. 2025 – Present
Advisor: Dr. Evan Goldstein — Department of Population Health Sciences
- Conducting research as part of the Health System Innovation and Research (HSIR) program on clinical narrative data, fine-tuning BERT-based natural language processing (NLP) models for multi-label classification of suicide-related outcomes. The work focuses on addressing class imbalance and improving predictive performance on underrepresented categories.

Student Researcher, *University of Utah* — May. 2025 – Present
Advisor: Dr. Brian Codding — Department of Anthropology
- Developing and evaluating deep learning-based computer vision models to detect and localize beaver dams in NAIP satellite imagery. Conducting performance comparisons to identify the most effective approach, while processing and analyzing large-scale geospatial datasets to support automated environmental monitoring and habitat assessment.

Graduate Research Assistant, *University of Utah* — Jan. 2025 – Apr. 2025
Advisors: Dr. Brian Codding, Dr. Simon Brewer, and Dr. Kenneth Blake Vernon — Department of Anthropology
- Developed machine learning models to predict soil moisture using environmental and geospatial data, implementing robust preprocessing pipelines. Enhanced model accuracy through iterative tuning and feature engineering, while collaborating with domain experts to generate data-driven insights supporting ecological research.

Machine Learning Engineer, *Tata Consultancy Services* — Jul. 2021 – Aug. 2024
- Collaborated with startups to optimize and scale machine learning, deep learning, generative AI, and LLM workloads, achieving up to 30% improvements in training and inference performance.
- Developed and deployed a multi-class NLP model to automate chatbot query classification, reducing manual data segregation by 80% and streamlining customer support operations.
- Designed an interactive analytics dashboard using Gradio to visualize classification outputs and enhance model interpretability and user interaction.
- Built and productionized a recommendation system that drove a 15% increase in client revenue through personalized product suggestions.

TECHNICAL SKILLS

Languages: Python, C++
Frameworks: PyTorch, TensorFlow, Transformers (Hugging Face)
Libraries: Scikit-learn, Pandas, NumPy, Matplotlib, OpenCV, Spacy, NLTK, Whisper, Ragbits, Docling, LiteLLM, Accelerate, Peft, Bitsandbytes, Scipy
Databases & Vector Stores: MySQL, MongoDB, ChromaDB
Tools & Platforms: Docker, Postman, Gradio, Git, VSCode

PUBLICATIONS

Collision Warning System for Vehicles using Deep Learning [Link]
International Conference on Deep Learning, IOT, Drone Technology, Smart Cities & Application (ICDIDSA) 2023

PROJECTS

Pneumonia Detection in Chest X-rays
- Built and fine-tuned a Faster R-CNN model with ResNet-50 FPN backbone to detect and localize pneumonia-related lung opacities in chest X-rays, achieving a mAP of 0.775.
- Engineered a data pipeline for preprocessing DICOM images, including normalization and conversion to 3-channel format for compatibility with pretrained networks.
- Designed a custom Dataset class to handle complex medical imaging annotations and optimize data loading during training.
- Attained Average Precision scores of 0.990 (IoU=0.50) and 0.975 (IoU=0.75), demonstrating high sensitivity and localization accuracy.
- Evaluated performance using the COCO framework and validated model outputs with bounding box visualizations.

Retinal Vessel Segmentation
- Developed a U-Net model from scratch in PyTorch to perform semantic segmentation of blood vessels in retinal fundus images, achieving F1-scores of 0.805 (validation) and 0.770 (test).
- Enhanced model performance through geometric data augmentation and a custom weighted binary cross-entropy loss to address class imbalance.
- Conducted an ablation study demonstrating the significance of skip connections, showing a 28% improvement in segmentation accuracy.
- Performed qualitative analysis to identify failure cases such as misclassification of fine capillaries and prediction noise.

Big Data Analysis of Zomato Restaurants
- Developed a machine learning pipeline using PySpark to preprocess and analyze the Zomato Bengaluru dataset comprising over 50,000 restaurant entries.
- Trained and evaluated multiple regression models including Linear Regression, Elastic Net, Random Forest, and XGBoost, achieving the best R^2 score of 0.52 with XGBoost.
- Performed feature importance analysis, identifying 'cost for two people' and 'online order availability' as the most impactful features influencing ratings.

Mining Cancer Patterns Across the 50 Most Populated Countries
- Built a Random Forest classifier to predict cancer incidence using the Kaggle dataset of top 50 populated countries, incorporating dimensionality reduction through PCA for improved model performance.
- Applied the Apriori algorithm to mine association rules, revealing meaningful correlations among demographic and health indicators.

Collision Warning System for Vehicles using Deep Learning and Lane Detection
- Developed an object detection model utilizing SSDMobileNet_V2 with transfer learning on the Indian Driving Dataset to assess distance and issue warnings.
- Integrated a lane detection module using Canny Edge Detector and Hough Transform to notify drivers of lane drift.

ACHIEVEMENTS

- Selected for ISSS Scholarship, University of Utah (Fall 2025)
- Tuition Benefit, awarded for Research Assistantship (Spring 2025)
- On the Spot Team Award by TCS (September 2023, April 2024, July 2024)
- Special Achievement Award by TCS (June 2024)
- Best Team Award by TCS (May 2023, December 2021, May 2024)
- Academic Interface Program Anchor Award by TCS (November 2022)
- Learning Achievement Award by TCS (May 2022)
- Selected for National Service Scheme Special Camp 2020
- Member of PICT Robotics team in ABU Robocon 2019 – Secured All India Rank 14th

Volunteering

Leader and Technical Head at PICT-National Service Scheme   Aug. 2019 – Jun. 2021

Planned various activities and developed applications specifically aimed at solving real-life problems for the benefit
of society.

Member of PICT Robotics-2019 Team   Aug. 2018 – Jul. 2019

Programmed microcontrollers and designed custom PCBs to ensure seamless operation and coordination of robotic systems.