

Varshini Prakash

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SUMMARY

Machine Learning Engineer with a strong foundation in deep learning, transformer models, and applied AI systems. Experienced in building ML pipelines, experimentation workflows, and deploying production-ready models using Python, PyTorch, and TensorFlow.

EDUCATION

MSc Computing Science University of Alberta, Canada
GPA 3.9, Thesis Advisor: Osmar Zaiane 2024

Bachelor of Technology in Computer Science VIT University, Vellore, India
GPA: 9.26 / 10.0 2020

EXPERIENCE

Mood Disorders Society of Canada 2024 – 2026
Machine Learning Engineer Edmonton, Canada

- Designed and deployed **MIRA**, a mental health assistant combining Retrieval-Augmented Generation (**RAG**) with transformer embeddings and scalable inference to deliver context-aware resource recommendations.
- Shipped **layered safety guardrails**: toxic-content detection, structured refusal paths, fallbacks, and conversational constraints for sensitive-domain use.
- Built **data ingestion and serving workflows** for retrieval, embedding generation, and production inference; standardized release practices for model and index updates.
- Ran an **offline evaluation harness** using curated query sets and systematic sweeps over similarity thresholds, retrieval parameters, and prompt templates, to iteratively refine response quality.
- Maintained legacy **Rasa**-based MIRA; integrated **DIET** (Dual Intent and Entity Transformer) to strengthen intent recognition and entity extraction in rule-driven flows.
- Extended the domain **knowledge graph** with representation learning and link prediction, improving coverage for semantic retrieval and downstream recommendations.

University of Alberta 2021 – 2024
Graduate Research Assistant Fellow Edmonton, Canada

- With Dr. Osmar Zaiane, built a **no-code chatbot builder** enabling configurable dialogue workflows; implemented graph-based flow visualization and dynamic routing for scalable, deployable conversational systems.
- With Dr. Alona Fyshe, developed a **neural decoding pipeline** using transformer embeddings (BERT, RoBERTa) to study metaphor processing in fMRI data; evaluated alignment between brain activation patterns and contextualized semantic embeddings using similarity and correlation metrics.

Cognitive Systems Lab 2019
Summer Research Intern Bremen, Germany

- Collaborated with Prof. Tanja Schultz to train an EMG-Speech system for Silent Speech, to align lip-reading data from images with phonemes of corresponding EMG signals using 3D Convolutional Neural Networks (CNNs).

One Fourth Labs, IIT Madras 2018
Content Development Intern Chennai, India

- Authored hands-on Deep Learning coursework and programming assignments aligned to industry practices, with Dr. Mitesh Khapra and Dr. Pratyush Kumar.

Siam Computing 2018
Chatbot Developer Chennai, India

- Designed a conversational chatbot using Google Dialogflow for a retail enterprise, enabling context-aware responses and handling multi-turn dialogues to enhance customer interaction efficiency.

PUBLICATIONS AND POSTERS

- **Prakash, V.**, Ali Gharaat, M., Lambe Foster, A., Merrick, D., Desnoyers, E., Noble, J. M., & Zaiane, O. R. (2025). *Mental Health Resource Retrieval Using Semantic Similarity and Knowledge Graphs*. International Conference on Digital Economy (pp. 89–98). **Outstanding Paper Award**.
- **Prakash, V.**, Foster, A. L., Noble, J., & Zaiane, O. (2024). *Integrating Conversational Pathways with a Chatbot Builder Platform*. Information Integration and Web Intelligence: 26th International Conference.
- **Prakash, V.**, Chouinard, B., & Fyshe, A. (2023). *Decoding Neural Representations of Sentences in Individuals with Autism*. Poster presented at the Reverse Expo, University of Alberta.
- **Prakash, V.**, & Tripathy, B. K. (2020). *Recent Advancements in Automatic Sign Language Recognition (SLR)*. In *Computational Intelligence for Human Action Recognition* (pp. 1–24).

AWARDS

- Outstanding Paper Award at International Conference on Digital Economy (ICDEc) 2025.
- Certificate of Accomplishment for 16th Annual Student Unmanned Air Systems Competition.
- Certificate of Appreciation for oral presentation on Data Security for IoT-Based Healthcare System - A cryptographic approach, ICWRS & ICAFEE 2018.
- Recipient of the Special Student Achiever Award from VIT University Vellore (2018-2020).
- Finalist in HSBC Artificial Intelligence Hackathon conducted by HSBC and IIT Madras.

SKILLS

Programming: Python, C++, SQL

ML/DL: PyTorch, TensorFlow, HuggingFace Transformers, Scikit-learn, NLP

LLM Systems: RAG pipelines, Vector Search, Model Context Protocol (MCP), Prompt Engineering

Data & Scientific Tools: NumPy, Pandas, Jupyter Notebooks, Conda

Systems & Deployment: GPU/CUDA environments, Docker, Git, REST APIs, Linux

Graph ML: Knowledge Graphs, GNNs, Representation Learning, Semantic Search

SELECTED PROJECTS

Multimodal Speech Recognition System

2025

- Built an end-to-end audio-visual speech recognition system in PyTorch on GRID using a ResNet-18 lip encoder, mel-spectrogram CNN, gated multimodal fusion (temporal alignment + learned gates), and a CTC-trained BiGRU decoder.
- Evaluated WER/CER on speaker-held-out splits with audio/video ablations and noisy-audio stress tests; shipped a reproducible training/eval pipeline with checkpointing, TensorBoard logging, and CTC beam search.

Noise Eliminator for Active Learning

2021

- An interactive machine learning-based algorithm that helps produce automated systems that provide highly accurate predictions, with a low number of training instances.

Stock Forecasting

2021

- Developed a stock forecasting model framed as a binary classification task to identify profitable stocks. Trained several classifiers on historical data and leveraged their predictions to build portfolios that surpass benchmark performance.

Unmanned Aerial System

2019

- Competed in AUVSI SUAS 2018 (Maryland, USA) as team Ardra; integrated and field-demonstrated a full unmanned aerial system (UAS) for autonomous mission execution.
- Developed interoperability modules and real-time obstacle visualization to support navigation, system coordination, and mission awareness.