AKSHAY BADAGABETTU

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EDUCATION

Carnegie Mellon University, Pittsburgh, PA **Dec 2024**
Master of Science in Artificial Intelligence Engineering – Mechanical Engineering (conc. In Robotics) *CGPA: 4.0/4.0*
Courses: *Advanced NLP, Intro to Deep Learning, Trustworthy AI, Intro to Machine Learning, Robot Localization and Mapping, Computer Vision, Systems and Tool Chains for AI Engineers*

Vellore Institute of Technology, Vellore, India **Jul 2023**
Bachelor of Technology in Mechanical Engineering *CGPA: 9.64/10.0 (3.975/4.0)*

PROFESSIONAL EXPERIENCE

Mechanical and Artificial Intelligence Lab
Machine Learning Graduate Research Assistant **Mar 2024 - Present**
- Designed a novel architecture that uses natural language prompts to generate Python code to create a 3D model.
- Providing feedback to the LLM (GPT-4) by generating captions from the isometric CAD image using the BLIP-2 model, facilitating self-refining iterative learning. Finetuned BLIP-2 on a custom CAD image-description pair dataset.
- Establishing the state-of-the-art performance for this task and creating a benchmark dataset to propel further research.

Sandvik Mining and Rock Technology, Bengaluru, India
Mechanical and Machine Learning Intern **Oct 2022 - Apr 2023**
- Engineered an ML pipeline to predict stress and deflection in blasthole drill rig masts, reducing design time from 12 months to 7 months (40% reduction). Gathered data by performing FEA of 6 different mast configurations on critical load cases.
- Employed upsampling techniques (CTGAN and SMOTE) to augment dataset size and developed a combination of strong models such as XGB and Random Forest for developing the prediction model with an error rate of less than 7%.
- Created a responsive website with Streamlit for user-friendly input of mast and load parameters, displaying stress and deflection predictions for all critical load cases. Deployed it to production on Azure.

Data Science Intern **May 2022 - Jul 2022**
- Developed a DCNN model with 84% accuracy using Keras to perform multiclass classification of drill bit failures.
- Devised an algorithm employing feature extraction to detect and eliminate flawed images in real time swiftly.
- Formulated Python code capable of extracting tables with non-static structures from images using OCR.

SKILLS

Technical: Python, C++, PostgreSQL, Kafka, NoSQL, Google Cloud Platform, Amazon AWS, Docker, Linux, ROS2
Libraries: PyTorch, TensorFlow, Langchain, Hugging face, SkLearn, NumPy, Open-CV, PySpark, OCR, Pandas

PROJECTS

Retrieval Augmented Generation system capable of answering questions related to CMU **Feb 2024 - Mar 2024**
- Spearheaded a team of 3 to develop an end-to-end NLP system to answer CMU and LTI-related questions.
- Performed system-based annotations (using Flan-T5) and manual annotations to generate a test set that can effectively assess the performance of our system.
- Developed a retriever method that is a combination of dense retriever, reranker, and multi-query retriever.
- Used Llama2 as the reader model and got an F1 score of 0.41, which was 3x better than the closed-book use of LLM.

Implementation of core components of Llama2 from scratch **Feb 2024**
- Implemented the transformer block (attention modules and feed-forward), RoPE, a modified version of AdamW optimizer, and inference with temperature sampling. Finetuned the model on a '42M stories' dataset.
- Evaluated the model on SST and CFIMDB datasets and improved the test accuracy from .224 to .418 after finetuning.

End-to-End Data Engineering and Model Building Process on FIFA Dataset **Sep 2023 - Nov 2023**
- Performed extensive data cleaning and engineering processes such as imputation, string indexing, and vector assembling on a very large FIFA dataset of 150k rows and 110 columns by leveraging tools such as Spark and reading and writing data using Postgres.
- Trained multiple ML models using the Google Cloud Platform to predict the overall potential of each player.

Building a stereo visual odometry SLAM system from scratch **Oct 2023 - Dec 2023**
- Led a team of 3 people to build our own SLAM pipeline from scratch and evaluated it on the KITTI odometry dataset.
- Developed the frontend, backend using GTSAM, and loop closure using visual bag of words and integrated all of them.