Sumukha Manjunath

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Machine Learning Engineer with over 5 years of experience designing and deploying production-grade ML algorithms for Advanced Driver Assistance Systems, Autonomous Navigation, and Patient Diagnosis.

Technical Skills

Programming Languages & Data Analysis: Python, C++, MATLAB, SQL, Pandas, Numpy
Machine Learning & AI Frameworks: Keras, TensorFlow, PyTorch, Lightning, NLTK, Huggingface, Scikit-learn, LangChain, Mlflow
Cloud Services, Platforms & DevOps: AWS, Azure, Airflow, Kubernetes, Terraform, Apache Spark, Databricks, Git, Docker
Web Development & Libraries: OpenCV, FastAPI, Streamlit, Matplotlib, Plotly, Pillow, Flask

Experience

Machine Learning Engineer (Internship and Co-op)**, Raven Industries** May 2023 – April 2024

- Improved person detection accuracy for autonomous navigation by 18% through fine-tuning a YoloNAS model with generative AI-based data augmentation.
- Developed an image prompt-based data augmentation method by training an image2image diffusion model with video data to generate images depicting people in novel backgrounds.
- Led the development of an AI-based image search tool achieving 90% higher accuracy and 100x faster retrieval than the existing SSIM method, utilizing Transformer model representations and FAISS for image database retrieval.
- Created a database of 60M image representations by automating the extraction of global and local image feature representations using AWS S3, Athena, Lambda, and DynamoDB.
- Engineered a method for generating compact image representations by training a Vision Transformer with ~1M images in a self-supervised setting using self-distillation, view invariance, and masked-image-modelling.
- Developed a method for fine-grained image search with multi-image queries, leveraging attention mechanism. (Patent Pending)

Senior Data Scientist (Consultant), **Carl Zeiss** May 2021 – June 2022

- Developed diagnostic pipelines for retinal pathology detection using Kubernetes and Azure services for pre-clinical testing.
- Achieved an AUC of 0.82 in detecting Age related Macular Degeneration and Diabetic Macular Edema by training a Multimodal Convolutional Neural Network (CNN) with 3D OCT images and patient metadata.
- Enhanced accuracy of diabetic retinopathy stage classification by 16% compared to existing models through synthetic data generation and advanced data augmentation techniques.

Senior Software Engineer-Computer Vision, Robert Bosch August 2018 – May 2021

- Enabled real-time road safety assistance by improving road sign detection speed by 20% through multistage training of a Faster R-CNN model with a MobileNet backbone.
- Achieved a 12% increase in IoU metric for free space segmentation by training a Fully Convolutional Network to penalize boundary error, facilitating camera-based automated lane changing.
- Integrated deep learning algorithms into Advanced Driver Assistance System (ADAS) software leveraging TensorRT quantization techniques and implementing C++ based inference pipelines.
- Led a cross-functional team in developing an AI-driven Azure application for generating harvest estimation reports and berry heatmaps to improve the planning of produce sales.
- Accomplished 50% improvement in blueberry count estimation accuracy by developing a multi-head Unet algorithm with a custom objective function designed to handle occlusion among berries.
- Achieved a 26% reduction in customer acquisition costs for an agribusiness supplier by developing an application for land segmentation and ARIMA time series analysis on Sentinel satellite images.

Projects

ResearchSurveyLLM (Project repository link)**:**

- Developed an application to summarize multiple research papers into a single document using the RAG framework with LlamaIndex, LLama for Natural Language Generation, and Mistral for vector embedding.
- Engineered an ETL pipeline to scrape and filter academic papers from arXiv, storing their embeddings in Weaviate DB.

FashionXChange (Project repository link)**:**

- Developed a Streamlit application for text-based outfit modification in images using Grounding DINO, Segment Anything Model and Stable Diffusion.
- Achieved superior pose preservation and minimized distortion in results by fine-tuning the Stable Diffusion inpainting model with the DeepFashion dataset leveraging Low Rank Adaptation (LoRA) and custom data masking methods.

Education

Master of Science, Electrical Engineering August 2022 – May 2024
North Carolina State University, Raleigh, NC GPA: 4.0/4.0
Relevant Courses: Computer Vision, Pattern Recognition, Neural Networks, Design and Analysis of Algorithms, Cloud Computing Technology, Design of a Robotic Computer Vision System for Autonomous Inspection