Raghuraman Venkatesh

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WORK EXPERIENCE

Abbott Neuromodulation   *Dec 2024 – Present*
Software Engineer II – AI R&D   *Dallas, Texas*

- Engineered **deep learning vision algorithms** to compute 3D Human Pose Estimation of people using monocular monitored videos over time of 6 months
- Collaborated with physicians to translate clinical observations of pain-induced movement into structured 3D data frameworks for quantitative biomarker development
- Conducted comprehensive statistical analysis of pain therapy effectiveness using t-tests, correlation coefficients, and longitudinal analysis methods to identify significant patterns in patient outcomes over time
- Utilized 3D motion capture technology to map human movement and performed advanced statistical analysis (amplitude, frequency, symmetry, consistency) to characterize movement dynamics
- Deployed and managed AI models on **Google Cloud Platform (GCP)**, utilizing **Cloud Storage** for data handling and **AI Platform / Cloud Run** for on-demand and scheduled inference pipelines.

CHIMA   *June 2024 – Nov 2024*
AI Engineer   *San Francisco, California*

- Engineered a Retrieval-Augmented Generation (RAG) System using **LangChain** and **Pinecone** to process diverse file types (CSV, Excel), enabling semantic understanding and segmentation for enhanced summaries across internal, hybrid, and external queries
- Optimized an Intelligent News Retrieval System by integrating Pinecone for semantic search and **LangChain** for orchestration, reducing runtime from 4 minutes to under 2 minutes and delivering four distinct news content types to boost engagement
- Developed an AI-powered market research system by integrating Exa Search with a LangChain-driven **RAG pipeline** and Pinecone for semantic retrieval, generating insights and visual reports from external market and internal company data

UIC   *Jan 2024 – May 2024*
Teaching Assistant for Machine Learning   *Chicago, Illinois*

- Synchronized course content with common queries, enhancing graduate students' comprehension of intricate machine learning topics, resulting in a 17.5% increase in assignment performance

Motorola Mobility   *Jan 2023 – June 2024*
Computer Research Assistant   *Chicago, Illinois*

- Optimized the memory footprint of the exposure fusion and low light enhancement machine learning **TFLite** model, reducing it from 2.5 GB to 1.4 GB (44% decrease)
- Innovated on the existing data-augmentation methods by creating state-of-the-art 64 augmentation blurs to mimic human hand-held blurs
- Augmentation using 24 blurs based on direction of the blurs on different exposure levels helped in reducing noise, figments and artifacts on the fused image.
- Conducted large-scale ablation study on loss functions (SSIM, GAN, MS-SSIM, Fourier, Perceptual) for image enhancement
- Engineered 34% improvement on BRISQUE and 18% on NIQE, significantly enhancing image quality obtaining state-of-the-art results

EDUCATION

University of Illinois (GPA 3.9/4.0)   **Chicago, Illinois**
Master of Science, Computer Science   *Aug 2022 – May 2024*
SSN College of Engineering   **Chennai, India**
Bachelor of Engineering – Computer Science and Engineering (GPA 8.434 / 10.0)   *Aug 2018 – June 2022*

SKILLS

Programming: Python, Java, C++, SQL, Scala

ML & Data Science: TensorFlow, PyTorch, OpenCV, Keras, NumPy, Pandas, Scikit-learn, TFLite

Web Development: React, Spring Boot, Flutter, Bootstrap, Tailwind, Ant-Design

Tools & Cloud: Docker, Kubernetes, Git, AWS, Hadoop, Django, GCP, Azure

Generative AI & RAG: RAG pipelines, multi-agent systems, vector databases (Pinecone, Weaviate, Chroma), prompt engineering, OpenAI API, Anthropic API, Azure OpenAI, AWS Bedrock, Exa

Cloud & DevOps: AWS (SageMaker, EC2, S3), Azure ,GCP (Cloud Run, Vertex AI), Docker, Kubernetes, Terraform, CI/CD

PROJECTS

3D - Human Pose Estimation Dataset and comparison (OpenCV, TensorFlow, PyTorch, Python, MATLAB)

- Bridged the gap in the existing datasets by creating a new one that had more than 2 person occlusions and 10 different lighting conditions
- Increased the MPJPE score by 7.3 % to obtain better representation in both 2-D and 3-D pose estimation

Solid Waste Classification using Deep Learning (Python, OpenCV, TensorFlow-GPU, Label-Img, Keras)

- Engineered double-stage, single-stage detectors for multi-object recognition, improving mAP and testing speed (+2 frames/sec)
- Solved the issue of lack of dataset by creating a dataset with 3200 images along with 22,500 manually annotated objects
- Exceeded benchmarks with 84/88 mAP (Faster RCNN) and 85/98 mAP (YOLOv5) using advanced Transfer Learning strategies
- Evaluated on 500 images with testing times of 0.424s (Faster RCNN) and 0.236s (YOLOv5)

PUBLICATION

Multi Object Detection and Classification in Solid Waste Management using Region Proposal Network and YOLO model - Gnest_04501