ARUN MADHUSUDHANAN

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Availability: Full time oppurtunities starting Jan 2025

EDUCATION

Master of Science in Robotics (Conc: Computer Science) , Northeastern University, Boston, MA Expected Dec 2024
Relevant Coursework: Computer Vision, Reinforcement Learning, AI, Robotics Sensing and Navigation
GPA: 4.0/4.0

Bachelor of Technology in Mechanical Engineering, NIT, Calicut, India. GPA: 8.89/10.0 2014 - 2018

SKILLS

Programming Skills	C++, Python
Libraries	PyTorch, Cuda, OpenCV, PCL, Open3D, TensorRT, ONNX, Scikit-learn, NumPy, Matplotlib
Software tools	MATLAB, ROS, Git, Ubuntu, OriginPro, Solidworks, Abaqus (FEA)

EXPERIENCE

Graduate Teaching Assistant, Computer Vision
Northeastern University, Boston, MA Jan 2024 - April 2024

- Reviewed code, debugged issues, and graded projects in C++, Python, OpenCV, and PyTorch for a cohort of 120+ students.
- Held weekly office hours to mentor students with topics like image retrieval, augmented reality & object recognition.

Machine Learning Research Intern
Festo, Boston, MA Jul 2023 - Dec 2023

- Developed a robust machine learning pipeline to predict the output parameters of a high-precision liquid dosing unit, achieving an error rate of less than 2.5%.
- Experimented with diverse models, including LSTMs, GRUs, TCNs, Neural Networks, and Decision Trees, to identify the most optimal models for accurate prediction.
- Executed the complete data pipeline, from data collection and feature extraction to labeling, ensuring high-quality datasets for machine learning tasks.
- Optimized software modules for sensor activation, hardware drivers, and data conversion/storage, significantly improving system efficiency and enabling seamless experiment execution during data collection.

Wells Engineer
ExxonMobil,India July 2018 – July 2022

- Led the technical aspects of testing beta versions of company-wide tubular design software applications, ensuring robustness and reliability in a dynamic development environment.
- Stewarded and improved the tubular design workflow for business divisions across the world in accordance with industry standard API 5C5, resulting in $230k immediate savings and long-term synergistic benefits.

PROJECTS

- **Time to Collision Estimation for Autonomous Vehicles:** Developed a system to detect, track, and estimate TTC for 3D objects using both camera and LiDAR data for autonomous driving. [Code]
- **3D Point Cloud Processing using Point Cloud Library (PCL):** Implemented a point cloud processing pipeline using PCL for downsampling, segmentation, clustering, and bounding box creation from 3D LiDAR point clouds. [Code]
- **3D Object Classification from Incomplete Point Clouds:** Developed a 3D object classification system using GRNet and PointNet to classify objects from incomplete point clouds. [Code] [Report]
- **Model Optimization with TensorRT:** Optimized PyTorch models (YOLO V8 and ResNet) with TensorRT for enhanced inference performance, demonstrating significant speed improvements over ONNX and PyTorch. [Code] [Report]
- **Image Generation and Captioning:** Implemented VQGAN+CLIP for text-based image generation and developed CNN-LSTM and ViT-GPT-2 models for image captioning. [VQGAN+CLIP Code] [Image Captioning Code]
- **Implementing Models from Scratch:** Tiny NeRF, PointNet, Visual Transformers, GAN & VAE. [Code]
- **Sensor Fusion for State Estimation:** Compared SLAM pipelines, including ORB-SLAM3 and RTK GPS with NTRIP Client and GVINS, to improve global state estimation accuracy across diverse environments. [Code] [Report]
- **Structure from Motion (SfM):** Implemented a SfM pipeline to reconstruct 3D structures from 2D images. [Code]

PUBLICATIONS

"*Exoskeletal Development of a Hand Complex for Rehabilitation Activities*," in IEEE CONIT 2021. [Paper]

"*Design, modelling and fabrication of railway track cleaning bot*," in International Conference on Robotics and Smart Manufacturing (RoSMa2018). [Paper]