Omkar Chittar

(301) 526-5726 | ochittar@umd.edu | omkarchittar.com | linkedin | github

Education

University of Maryland — College Park , MD
Master of Engineering in Robotics — 3.96 CGPA — *Aug. 2022 – May 2024*

Savitribai Phule Pune University — Pune, India
Bachelor of Engineering in Mechanical — *July 2014 – June 2018*

Work Experience

Computer Vision Engineer — June 2019 – June 2022
Sakar Robotics — *Pune, India*

- Engineered a system by integrating **U-Net** architecture for precise pixel-level semantic segmentation and employing **YOLO** for object detection, achieving segmentation training accuracy of **98.02%** & validation accuracy of **97.78%**
- Enhanced localization & navigation capabilities by integrating **Normal Distribution Transform** & fusing **GPS/IMU** data with **Kalman filters**, increasing mapping precision by **20%** and a **50%** gain in operational efficiency; conducted research to refine odometry processes for enhanced sensor-based localization
- Transitioned a PyTorch-based trained model to a **production** environment in C++, utilizing **libtorch** and CMake
- **Containerized** and deployed deep-learning models for inference on third-party operational platforms and **AWS**
- Devised localization methods for deep **few-shot** vision models, improving accuracy on densely-annotated datasets
- Implemented few-shot binary segmentation models to generate object annotations for downstream classifiers

Computer Vision Project Intern — June 2018 – June 2019
Defence Research and Development Organisation — *Pune, India*

- Innovated an *active exoskeleton* system for assisting humans while lifting heavy loads, achieving **95%** gait prediction accuracy with **PoseNet** and **LSTM** networks, enhancing load support by **30%**
- Created systems to analyze **geo-spatial** data using state-of-the-art self and semi-supervised deep learning methods
- Performed image segmentation using **superpixels** generated with **SLIC** algorithm, resulting in **95%** accuracy
- Implemented **Siamese neural network** for face recognition utilizing Tensorflow and **One-Shot Learning**

Projects

Point Cloud Classification and Segmentation | *PyTorch3D, Python* — GitHub

- Implemented PointNET architecture for classification amongst three classes and segmentation of different parts of the point clouds, achieving 97% accuracy for classification and 90% for segmentation

Single View to 3D Reconstruction | *PyTorch3D, Python* — GitHub

- Innovated a system using the Pix2Vox model for reconstructing voxel grids from 2D RGB images and the PointNetFCAE model for reconstructing 3D point clouds and meshes
- Attained an average F1 score of 54.37 for voxels, 86.92 for point clouds and 73.15 for meshes

Simultaneous Localization and Mapping | *Particle Filter, SLAM* — GitHub

- Integrated the orientation and odometry information from IMU and 2D LIDAR scans to build occupancy grid map of environment by updating the log odds while simultaneously performing particle filter based localization

Structure from Motion | *SfM* — GitHub

- Reconstructed a 3D scene and estimated poses from a given set of images and feature correspondences

Neural Radiance Fields | *NeRF* — GitHub

- Synthesized novel views of intricate 3D scenes using only a sparse set of input views

Robotic Arm Control with Reinforcement Learning | *DDPG* — GitHub

- Guided a robotic arm in a pick-and-place task using the DDPG algorithm in panda gym environment

Robot Path Planning | *Python* — GitHub

- Implemented BFS, DFS, Dijkstra, A*, RRT, RRT* and bi-RRT for holonomic and non-holonomic robots

LQG and LQR Control for a Gantry Crane with two suspended masses | *MATLAB* — GitHub

- Designed LQG and LQR control by linearizing the dynamic model of a crane carrying 2 suspended masses to minimize the oscillations & control effort. Employed Kalman filter to account for Gaussian noise in the sensor measurements

Quizzify | *Langchain, ChromaDB, VertexAI, GCP* GitHub

- Developed a dynamic quiz generation tool using the RAG framework to tailor quizzes from user documents
- Utilized Langchain's PyPDFLoader to process textual documents, employed ChromaDB's CharacterTextSplitter to divide the text into manageable chunks, stored in a Chroma collection for quick retrieval
- Integrated VertexAIEmbeddings to enhance the semantic understanding of text chunks
- Used "gemini-pro" model from GCP's Model Garden to generate quizzes informed by the retrieved text segments

SentimentScope | *Streamlit, MongoDB, BERT, FastAPI* GitHub

- Developed a real-time sentiment analysis platform that processes user-generated content from social media platforms using BERT and FastAPI
- Created an interactive dashboard using Streamlit that displays sentiment trends, emotional breakdowns, and real-time sentiment feeds, allowing users to filter results by topic, time, and source
- Used MongoDB for storing and managing historical sentiment data efficiently, allowing for trend analysis

Technical Skills

Languages: Python, C/C++, MATLAB, SQL, HTML, CSS, JavaScript, R
Tools: CUDA, TensorRT, Git, Docker, GCP, Linux, ROS, OpenVINO, ONNX, Carla, AWS, Azure, Tableau, PowerBI, Langchain, ChromaDB, VertexAI, RAG, Jupyter Notebook, RViz, MoveIt, Gazebo, Carla
Libraries: pandas, NumPy, Matplotlib, PyTorch, Tensorflow, Keras, scikit-learn, OpenCV, PCL, PIL, OpenGL
Domain Expertise: 3D reconstruction, SfM/SLAM, Gen AI, GANs, Object Detection & Tracking, NLP, LLMs, NeRF

Publications

Chittar. O. A., Dr. Barve. S. B. Waist-Supportive Exoskeletons: Systems and Materials. (Paper, MATPR 2022)
Chittar et al. Experimental investigations on waist supportive passive exoskeletons. (Paper, MATPR 2022)

Leadership Experience

Recruitment & Retention Manager at DOTS Oversaw recruitment, significantly boosting team size & diversity. Implemented retention strategies & coordinated training programs, enhaning staff satisfaction & skills.
Proprietor at SAI Classes Founded SAI Classes, growing it to serve 100 students annually. Led 10 instructors, enhancing teaching quality and initiated key partnerships for community engagement.