Vaishanth Ramaraj

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EDUCATION

University of Maryland	**College Park, MD, USA**
Master's in Robotics Engineering	*Aug 2021 - May 2023*
Kongu Engineering College	**Chennai, TN, India**
Bachelor's in Mechatronics Engineering	*May 2016 - May 2020*

TECHNICAL SKILLS

Programming Languages: Python, C++
Libraries and Tools: ROS, PyTorch, Sklearn, Pandas, Numpy, OpenCV, Git, Docker, Tensorflow, SolidWorks, Linux
ML Architectures: KNN, SVM, Softmax, MLP, CNN, YOLO, Transformers(BERT, LSTM), RAFT

WORK EXPERIENCE

Research Assistant

Children's National Research Center, DC, USA   *Jun 2022 - Apr 2023*

- Led a team to develop a modular autonomous navigation system for a powered wheelchair.
- Designed and developed end-to-end pipelines for mapping and localization using ROS, PyTorch, RTabmap and OpenCV with real-time performance of 35 FPS.
- Tested the software system in the Gazebo simulation with a dense environment to validate the system's integrity.
- Deployed the system using ARM-based docker container on Jetson Nano with Intel RealSense stereo camera and ESP32, resulting in 52% cost savings and less than 10W power consumption.
- Developed a real-time object detection system for smart wheelchair using YOLOv5 and Point Cloud algorithms for obstacle avoidance.
- A lightweight KIVY framework GUI for touch navigation was implemented, for a user-friendly and intuitive control interface.

Software Developer

Bariflo Labs, TN, India   *Mar 2021 - Jun 2021*

- Worked with a team of engineers to build a robust software system to remotely control Water Aeration device.
- Integrated algorithms for environmental data capture using sensors to collect water quality data every 10 seconds and perform regression algorithm analysis on the cloud with a latency of 160ms.
- Deployed the system on Raspberry Pi with remote operation implementation using onboard WiFi.

Intern - Robotics Developer

National Institute of Ocean Technology, Chennai, India   *Dec 2019 - April 2020*

- Led a team to design and fabricate a soft-gripper robotic manipulator prototype using flexible material 3D prints.
- Designed mechanical linkages for underwater manipulation using SolidWorks. Utilized micro-controllers to create a compact gripper mechanism with a max payload of 500g.

PROJECTS

- **Monocular depth estimation and Path planning in partially known environments**, implemented MiDaS using PyTorch for 3D environment construction and performed path planning using D* lite and OpenCV. Achieved 30FPS in simulation and 22FPS in Real-time using Jetson Nano. GitHub
- **Path planning algorithms** implementation for robots in simulation using Python, including BFS, DFS, Dijkstra, A*, RRT, RRT*, and bi-RRT, showcasing the ability to optimize paths for efficient navigation. GitHub
- **Image Classification** on 60,000 CIFAR-10 image dataset from scratch using KNN, SVM, Softmax, MLP, and CNN (PyTorch and Tensorflow). Achieved maximum accuracy of 78% using CNN. GitHub
- **Automation solution for industrial warehouse** using C++, ROS melodic and Gazebo simulation as part of ARIAC challenge to perform pick, place, and transport operations with an optimized control system. GitHub
- **SLAM navigation system** using ROS for a real-time search and rescue on Turtlebot3 in Gazebo simulation, using C++ to locate missing persons represented by Aruco markers and map the environment for improved search efficiency. GitHub

PUBLICATIONS

- Ramaraj, V., Paralikar, A., Lee, E. et al. Development of a Modular Real-time Shared-control System for a Smart Wheelchair. J Sign Process Syst (2023).   Link
- Krishnamurthy, K., Meenakshipriya, B., Shree, K.I., Vaishanth, R., Sandeep, V. and Vijay, V.P., "Design and Development of Spherical Robot Using Pendulum Mechanism", 2020.   Link