

# Bharath Sivaram

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## Education

University of Minnesota - Twin Cities

*M.S. Robotics*

2023

*B.S. Mechanical Engineering*

2021

## Experience

Research Engineer II, *Bush Combat Development Complex*

Oct 2023-Present

- Enhanced multi-object tracking performance by **20%** by extracting object semantics from sensor data and integrating it into a multi-hypothesis tracking framework
- Deployed observation sharing software across multiple ground vehicles, optimizing for latency, and successfully demonstrated its capabilities to Army stakeholders
- Accelerated object localization by **10x** through efficient integration of camera and LiDAR data, utilizing **C++** and **ROS**
- Utilized **PyTorch** to test a Transformer based approach for tracking, validating performance through dynamic scenario creation in **Unity** simulations, resulting in more robust tracking capabilities.
- Upgraded the vehicle perception pipeline to **ROS2**, integrating updated sensor drivers for improved performance
- Integrated the object-tracking stack with the Army's software stack, enhancing mission planning
- Streamlined code deployment by organizing git repositories for real-time updates on both ground vehicles and simulation environments
- Mentored an intern, setting project goals and providing technical guidance to ensure successful project completion

Graduate RA, *University of Minnesota*

Mar 2022-May 2023

- Conducted extensive research on fault diagnosis of electro-hydraulic actuators, specifically focusing on utilizing control signal harmonics for fault detection
- Developed a streamlined workflow from **Simulink** model simulation to training data generation, reducing data generation time to **30 minutes** for efficient testing of various ML models
- Leveraged **MATLAB** to optimize data processing and neural network, resulting in **80%** accuracy in experimental fault detection
- Presented to industry and academia, incorporating their feedback to develop a draft application which allows for real-time fault detection on hardware
- "A Fault Diagnosis Tool for Electro-Hydraulic Actuators", accepted in *ASME Letters in Dyn. Sys. Control*

## Projects

Category-Level 6D Pose/Size Estimation

- Transferred the main components of NOCS for **category-level pose/size estimation** from TensorFlow to **PyTorch**, enhancing compatibility and flexibility
- Utilized a **high-performance computing (HPC)** cluster for efficient data storage and model training
- Achieved results within **15%** accuracy of the original work and open-sourced the code and weights
- Led project planning, assigning tasks based on team members' strengths to ensure timely project completion
- Project Site: <https://sites.google.com/view/nocs-pytorch>

WeBots Maze Runner

- Created an EKF **SLAM** algorithm using **sensor fusion** of LiDAR, camera, and noisy odometer data for maze navigation without global position knowledge
- Implemented the Hough transform to process **LiDAR** data for effective navigation through walled environments

Two-Stage Object Detector

- Implemented an object detector based on **Faster R-CNN** using **PyTorch** and trained it on the PROPS dataset
- Developed a Region Proposal Network (RPN) to generate objectness scores and box-regression deltas relative to ground truth

## Skills

**Languages:** C++, Python, MATLAB, CUDA C/C++

**Frameworks:** ROS, OpenCV, PyTorch, Numpy, Tensorflow, , Pandas, Scikit-learn, Spark

**Other Softwares:** Linux, Git, Docker, SolidWorks

**Relevant Coursework:** DL for Perception/Manipulation, Spatial AI, Deep Learning, Computer Vision, ML