

# Bharath Sivaram

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## Education

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University of Minnesota - Twin Cities

M.S. Robotics

2023

B.S. Mechanical Engineering

2021

## Experience

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Research Engineer II, Texas A&M: Bush Combat Development Complex

Oct 2023-Present

- Enhanced object tracking by extracting semantic features from sensor data and utilizing a multi-hypothesis approach, improving tracking accuracy by **20%** for autonomous perception systems
- Developed and deployed cross-platform observation sharing software for ground and air vehicles, demonstrating system capabilities to key Army stakeholders
- Accelerated object localization by **10x** through efficient sensor fusion of camera and LiDAR data using **C++**, **PCL**, & **OpenCV**
- Modernized perception pipeline by upgrading to **ROS2**, integrating latest sensor drivers to improve system performance
- Streamlined development by restructuring git repos, enabling real-time updates across vehicle and simulation environments
- Mentored research intern, providing technical guidance and project management to ensure successful project completion

Graduate RA, University of Minnesota

Mar 2022-May 2023

- Conducted research on fault diagnosis of electro-hydraulic actuators, developing novel machine learning approaches for fault detection
- Engineered an optimized workflow from **Simulink** model simulation to ML training data generation, reducing data preparation time to **30 min**
- Leveraged **MATLAB** for advanced data processing and neural network development, achieving **80%** accuracy in experimental fault detection
- Published research paper “A Fault Diagnosis Tool for Electro-Hydraulic Actuators” in *ASME Letters in Dyn. Sys. Control*

## Projects

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Computer Vision from Scratch

- Developed Vision-Language Model (**VLM**) using contrastive learning, generating high-quality captions for COCO dataset
- Implemented Vision Transformer (**ViT**) achieving **80% accuracy on MNIST** through strategic parameter optimization
- Engineered Neural Radiance Fields (**NeRF**) model to enhance 3D scene reconstruction techniques, and released tutorial video

Category-Level Pose & Size Estimation

- Re-implemented NOCS (Normalized Object Coordinate Space) for category-level pose and size estimation, translating the core framework from TensorFlow to **PyTorch**
- Utilized high-performance computing (**HPC**) cluster for efficient model training and data management
- Achieved **85%** performance parity with the original implementation, and open-sourced comprehensive implementation with full model weights and documentation
- Project Showcase: <https://sites.google.com/view/nocs-pytorch>

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 GT
- Trained a classifier head on proposed regions to generate object classes for each bounding box

## Skills

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Languages: C++, Python, MATLAB

Frameworks: ROS2, OpenCV, PyTorch, Numpy, PCL, Scikit-learn

Other Softwares: Linux, Git, Docker

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