

Stephen Ferro

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EDUCATION

Northwestern University, Evanston, IL

Expected Graduation **Fall 2024**

Master of Science in Robotics

Purdue University, West Lafayette, IN

Graduated **May 2018**

Bachelor of Science in Mechanical Engineering

Minor in Economics and Certificate in Entrepreneurship and Innovation.

ROBOTICS PROJECTS (photos and more at scferro.github.io)

Autonomous RC Racecar Build from Scratch

January 2024 – March 2024

- Built an autonomous RC-style car from scratch to drag race autonomously with traction control and do point-to-point races.
- Created ROS 2 packages using C++ to map racetracks through the hallways of Northwestern using SLAM with a 2D lidar.
- Created a simulation of the robot in Isaac Sim for testing new robot functionality before deploying it on the real robot.

Simultaneous Localization and Mapping (EKF SLAM) from Scratch

January 2024 – March 2024

- Programmed an EKF SLAM algorithm using C++ and ROS 2 for both a real and simulated Turtlebot3 robot.
- Incorporated differential drive control of the robot, odometry, and feature classification of 2D lidar data.

Neural Network for Robot Obstacle Detection from RGB Video

February 2024 – March 2024

- Created a convolutional neural network using PyTorch to detect obstacles in an RGB video stream as part of a team of three.
- Collected image data with a mobile robot and created a training dataset by labelling safe areas in the video image.
- Developed ROS 2 packages for mobile robot navigation and path planning using the trained network and onboard cameras.

Making Coffee With 7DOF Robot Arm: Botrista

November – December 2023

- Used ROS 2, Python, and MoveIt2 to control a Franka Emika robot arm to brew a cup of coffee as part of a team of five.
- Used a RealSense camera and OpenCV to detect the handles of objects before picking them up.

Robot Navigation Using A* Algorithm

October 2023

- Developed a navigation model for a robot from scratch using Python and the A* algorithm to plan paths to a goal location.
- Created a motion model and PID controller to simulate the motion of the robot following the planned paths.
- Optimized performance of the algorithm using different cell sizes, different obstacles, and different start and goal locations.

Design of Back-drivable Cycloidal Actuator for Quadruped

June 2021 – December 2022

- Designed and manufactured a 3D printed robot actuator powered by a brushless motor with output of over 10 Nm of torque.
- Built prototype leg for quadruped robot using two actuators and performed basic robot leg motions on a test stand.

Purdue FSAE Electric – Member and 2018 Vehicle Dynamics Team Lead

January 2016 - June 2018

- Led team of 8 students to design, manufacture, test, and tune the suspension system for an electric racecar.
- Created a MATLAB script to calculate suspension loads, then used the data to optimize suspension design, reducing weight by 15%.
- 2018 Results: 1st in Skidpad and 2nd in AutoX at Formula North and FSAE Lincoln, the team's best results to that point.

WORK EXPERIENCE

SKF USA

Product Engineer for Slewing Rings

July 2022 – August 2023; Chicago, IL

- Designed custom slewing bearings with PTC Creo for demanding applications in the wind energy and rail industries.
- Ensured designs met customer requirements such as stiffness and load capacity by performing raceway and bolting analysis.

Application Engineer for Industrial Market

June 2018 – July 2022; Elgin, IL and Lansdale, PA

- Ensure smooth operation of specialty thin section robotics bearings by performing load and torque analysis.
- Directly supported industrial market customers in all aspects of bearing system design, including bearing and seal selection, life calculations, shaft and housing tolerances, and lubrication.
- Reduced failures and improved bearing performance in applications such as pumps, gearboxes, and other rotating machinery.

Tenneco Automotive

Mechanical Engineering Co-Op – 5 sessions

May 2014 – August 2017; Grass Lake, MI

- Worked with four different teams at all stages of the product lifecycle: design, prototyping, testing, and warranty support.
- Designed and implemented several test procedures, including component fatigue testing, on-vehicle testing, and flowrate tests.

RELEVANT SKILLS

Programming/Software: Python, C++, C, Git, Linux, Visual Studio, MATLAB, Unit Testing, Pytorch, Docker, CMake

Robotics: Robot Operating System (ROS/ROS 2), Computer Vision (OpenCV), Deep Learning, Neural Networks, Kalman and Particle Filters, Simultaneous Localization and Mapping (SLAM), MoveIt, Single Board Computers, Intel RealSense, Lidar, Isaac Sim, Gazebo

Design: CAD (SolidWorks/Creo/ProE/Fusion360/Inventor), CAM (Fusion360), FEA (SolidWorks, Creo), PCB Design (KiCAD)

Manufacturing: Manual and CNC Machining, Injection Molding, Waterjet, Laser Cutting, 3D Printing (FDM, SLA), Soldering