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)

RC Autonomous Drag Racing Car Using SLAM and Reinforcement Learning (in progress) — **January 2024 – Present**
- Creating ROS 2 packages using C++ and Python to train an autonomous RC car to drag race using reinforcement learning.
- The robot is trained in a simulated environment in Nvidia Isaac Sim and in the real world with an autonomous RC car robot.

Simultaneous Localization and Mapping (EKF SLAM) from Scratch (in progress) — **January 2024 – Present**
- Currently programming an EKF SLAM algorithm using C++ and ROS 2 for both a real and simulated Turtlebot3 robot.
- Incorporating differential drive control of the robot, odometry, and feature classification of 2D LiDAR data.

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.
- Successfully performed precise actions such as grasping the coffee ground scoop and pouring hot coffee into a cup.

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.

Localization of a Robot Using a Particle Filter — **September 2023**
- Used a particle filter and measurement data to improve the dead-reckoning position estimate of a robot test dataset.
- Created a motion model and PID controller to simulate the motion of the robot following the planned paths.

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.
- With the particle filter, the robot's position error was improved to <0.25m, compared to >2m using pure dead reckoning.

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 link loads, resulting in a 15% reduction in the weight of the suspension system.
- 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
Robotics: Robot Operating System (ROS/ROS 2), Computer Vision (OpenCV), Reinforcement Learning, Genetic Algorithms, Kalman and Particle Filters, Simultaneous Localization and Mapping (SLAM), MoveIt, Single Board Computers, Intel RealSense Camera, LiDAR
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