Stephen Ferro

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EDUCATION

Northwestern University, Evanston, IL   Expected Graduation: December 2024
Master of Science in Robotics   GPA: 3.6/4.0
Purdue University, West Lafayette, IN   Graduated: May 2018
Bachelor of Science in Mechanical Engineering; Minor in Economics, Certificate in Entrepreneurship and Innovation

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RELEVANT SKILLS

Software Development: Python, C++, C, Git, Linux, Unit Testing, Docker, Matlab, JAX, CMake, PyTorch
Robotics: Robot Operating System (ROS/ROS 2), Kalman Filter, Particle Filter, RRT, A-Star, Simultaneous Localization and Mapping, Navigation 2, Isaac Sim, Nvidia Jetson, MoveIt, Visual Odometry, CAN Bus, Sensor Fusion, Path Planning
Computer Vision: OpenCV, Stereo Vision, Visual SLAM, Image Processing, Feature Detection, Semantic Segmentation
Machine Learning: Vision-Language-Action Models, Reinforcement Learning, Deep Learning, Convolutional Neural Networks
Design: CAD (SolidWorks/Creo/ProE/Fusion360/Inventor), CAM (Fusion360), FEA (SolidWorks, Creo), PCB Design (KiCAD)

WORK EXPERIENCE

SmoothAg
Lead Robotics Software Engineer   **September 2024 – Present; Chicago, IL**
- Engineered algorithms to merge point cloud and odometry from four Zed cameras for use in navigation and obstacle avoidance
- Led development of firmware for robot power distribution module using C++ to control feeder, lights, and more over CAN bus
- Developed GUI tools for creating and executing waypoint paths in simulation and on the real robot

Robotics Software Engineering Intern   **June 2024 – August 2024; Chicago, IL**
- Architected navigation stack for the RanchRover using ROS 2 Navigation 2, incorporating custom behavior trees and planner
- Created solution for fusing local odometry data from Zed camera with GNSS feedback using an EKF for precise robot navigation
- Developed efficient ROS 2 drivers for communicating between Jetson Orin AGX, engine ECU, and other hardware over CAN bus

SKF USA
Product Design 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
- Served as subject matter expert for design and application of wind turbine pitch and yaw bearings
- Conducted raceway and bolting analyses to optimize bearing designs, ensuring compliance with customer specifications

Application Engineer for Industrial Market   **June 2018 – July 2022; Elgin, IL and Lansdale, PA**
- Provided comprehensive support to agriculture, robotics, and other industrial customers in all aspects of bearing system design
- Worked closely with customer engineering teams to design optimal thin section bearings for high-precision robotics applications

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PROJECT WORK

Human-Robot Interaction with ECG Sensors and Vision Language Model (C++, ROS 2, Python)   **Sept 2024 – Present**
- Developed system for teaching a Franka Panda to execute unseen multistep manipulation tasks using Octo vision-language-action model with custom fine tuning, guided by demonstration images and language prompts
- Integrated live data from ECG sensor with the action model, allowing the robot to complete tasks collaboratively with a human

Real-Time Stereo Visual Odometry from Scratch (Python, OpenCV)   **April 2024 – June 2024**
- Engineered and tested a real-time visual odometry algorithm for accurate 3D position tracking using a RealSense stereo camera
- Performed in-depth comparison of different feature detection methods including SIFT, ORB, and SuperPoint

Reinforcement Learning for Quadruped Locomotion (Python, PyTorch)   **May 2024 – June 2024**
- Trained a quadruped robot using Soft Actor-Critic (SAC) to achieve stable locomotion in a MuJoCo simulation via OpenAI Gym
- Fine-tuned SAC hyperparameters to optimize gait and stability, resulting in smooth movement through the environment

Robot Arm Block Sorting with Active Human Feedback (C++, ROS 2, PyTorch, OpenCV)   **March 2024 – June 2024**
- Created ROS 2 packages to control a Franka Panda arm for adaptive sorting using any sorting method (color, shape, etc.)
- Created and implemented a dynamic PyTorch neural network capable of real-time learning from user feedback
- Utilized MoveIt for advanced robot control, incorporating a depth camera near the gripper for accurate block manipulation

Autonomous Race Car Robot Build (C++, ROS 2)   **January 2024 – March 2024**
- Created ROS 2 packages using C++ to map and plan racetracks through hallways using SLAM Toolbox with 2D lidar technology
- Developed a high-fidelity robot simulation in Isaac Sim to facilitate rapid testing and iteration of new functionalities

Simultaneous Localization and Mapping Algorithm (SLAM) from Scratch (C++, ROS 2)   **January 2024 – March 2024**
- Engineered an EKF SLAM algorithm from the ground up using C++ and ROS 2 for both a real and simulated Turtlebot3 robot
- Implemented a landmark detection algorithm using supervised learning and data association