Paul Dreyer

Email: pdreyer@andrew.cmu.edu | Cell: (717) 793 1907 | Veteran – United States Air Force (USAF)
Portfolio: https://paul-dreyer.github.io/

EDUCATION

- **Carnegie Mellon University | Pittsburgh, PA** **2021 - 2025**
  Bachelor of Science in Mechanical Engineering, GPA: 3.3/4.0
  Master of Science in Mechanical Engineering, Robotics + Controls - Graduating May 2025

WORK EXPERIENCE

- **Path Planning Algorithms / Backend Engineer - Internship | Dirac Inc.** **Sum. 2024**
  Developed a trajectory optimization algorithm that generates minimal-collision part trajectories for autonomously assembling generalized 3D CAD assemblies. This algorithm made it to a production release for the company, directly improving the quality of the product delivered to customers.

- **ML/Computer Vision Research Engineer - Internship | Ford Motor Company** **Sum. 2023**
  Developed end-to-end synthetic image dataset generation software with auto-labeling capability that eliminated the need to hand collect + label inspection datasets. Enabled team to quickly generate new datasets to train CNNs to inspect + identify failed installation of any rigid connector within the vehicle.

- **Pipe-in-Pipe Trenchless Repair - ARPA-E Research | Carnegie Mellon Biorobotics Lab** **Sum. 2022**
  R&D of an extrusion nozzle for a mobile robot to dispense a self-healing resin creating a hardened pipe within existing natural gas pipes to extend the lifetime of piping infrastructure across the USA.

- **Soft Robotic Position Sensing - Research | University of Colorado Boulder** **Sum. 2021**
  R&D, manufactured, and parameterized a novel print-in-place integrated position sensor for a naturally compliant pneumatic robotic actuator with pneumatic PID feedback control.

- **Radio Frequency Communication Specialist - Staff Sergeant (E5) | USAF** **2014-2020**
  Communications team leader for multiple field expedition exercises enabling long-range communication methods in mountain/jungle environments. Completed 6 Mo. deployment - Lead maintainer for critical base communication suite in a multinational team (Operation Inherent Resolve) where I developed adaptive problem-solving skills under severe operational constraints.

PROJECTS

- **Suspension Actuated Robot** **Spring 2024-present**
  Design + Manufacture of an autonomous mobile robot assistant which traverses via an underactuated cable-drive parallel mechanism. Developed deep RL based controller, graphical UI, and animatronics for robot arms.

- **Autonomous Quadrotor Exploration** **Fall 2023**
  Developed mutual information-based motion planner for 3D occupancy grid exploration and mapping for quadrotor robot simulation.

- **LQR Stability and Optimal 'Swing-up' Trajectories** **Spring 2022**
  Implemented LQR feedback controller for balance at unstable equilibrium positions of flywheel driven "Cubli" robot and inverted pendulum "cart-pole" robot simulation. Solved for optimal "Flip-up" trajectory to allow Cubli to self-right from flat face position to balancing on a single edge using impulse braking of high rpm mechanical flywheel.

- **Vehicle Panel Gap Inspection Software** **Fall 2022**
  Developed a computer vision tool to inspect panel gaps on vehicles, allowing users to see visual feedback on panel gap uniformity across the car body. Developed for graduate-level computer vision class.

SKILLS & HONORS

Software: Python, C++, MATLAB, OnShape CAD, PyBullet physics simulation, Automatic differentiation
Fabrication: Mechatronics, FDM 3DP, Laser cutting, Water jet, Milling/Lathe, MIG/Arc weld, Soldering
Honor: Engineering Student of the Year – Engineering Dept. | Pierce College | Spring 2020