COLIN BALFOUR

BS/MS ROBOTICS ENGINEERING – WPI CLASS OF 2027

Portfolio – colinbalfour.github.io

CONTACT

(978) 831-3142

colinbalfour@gmail.com

EDUCATION

WORCESTER POLYTECHNIC INSTITUTE, WORCESTER, MA

Master of Science in Robotics Engineering (Jan 2025 – May 2027)
Bachelor of Science in Robotics Engineering, Minor in Mathematics (Aug 2024 – Dec 2026)
Courses|RBE 549: **Computer Vision**, RBE 590: **Deep Learning for Perception**, MA 590: **Stochastic Control & Optimization**

SKILLS/TECHNOLOGIES

Languages: Python (5+ years), C/C++ (1yr), MATLAB (1yr), Java/TypeScript (2yr), Java (2yr)
Tools: ROS1/2, PyTorch, TensorFlow, OpenCV, Git/Hub, Docker, Ardupilot, Jetson/Coral/Arduino, Simulink, Blender

EXPERIENCE

PeAR GROUP (WPI), WORCESTER, MA

The Perception and Autonomous Robotics (PeAR) group at WPI, run by Professor Nitin Sanket, pushes the boundaries of autonomy with extreme resource constrained tiny aerial robots using only on-board computation and sensing.

Student Researcher May 2024 – Present

- Working on **Echolocation based quadrotor navigation** in visually challenging scenes (fog, low light, etc)
  - Submitting to *IROS* February 2025
- Built custom **140g drone** demo (Ardupilot firmware) using ultrasound, **able to avoid obstacles in smoke**, darkness, transparency, and other environments **where traditional vision fails** with **only a Teensy4.0**
- Used signal processing techniques to **reduce propeller noise by over 50%** from ultrasound measurements
- Researching novel uses of sensors using **AI models for small, resource constrained drones**
- CADed and built data collection rig for depth cameras, LiDAR, and various novel sensors with ROS2 **at 10GB/min**
- **Calibrated extrinsics of multi-cam setup** using traditional methods + Iterative-Closest-Point, **sub-mm precision**
- **Stitched pointclouds of 3 RealSense depth cameras** to create a combined depth image with **170-degree FOV**
- Used Solidworks with Topology Optimization to create low-weight drone attachments and mounts

FIRST ROBOTICS TEAM, CONCORD, MA

The FIRST Robotics Competition (FRC) is an international high school robotics competition. Robots up to 125lbs complete tasks such as scoring balls into goals, placing inner tubes onto racks, and hanging on bars.

Team Captain & Software Lead October 2021 – May 2024

- **Responsible for managing a team of 40+ students** and training 10+ students in robotics software
- Created an NVIDIA gstreamer pipeline for **AprilTag detection** on multiple **time-synchronized** global shutter CSI cameras on an **NVIDIA Jetson** platform, fused with **ZED** stereo depth camera VSLAM for **pose estimation with a Kalman filter**, and real-time object detection with **MobileNet-v2**
- **Followed kinodynamic time-optimal trajectories with error under 5cm** at rest (< 1sec) and 20cm while moving
- Wrote a PID + FF controller for two jointed arm using IK with dynamic path generation
- Developed and tested a robust autonomous routine to perform many picking-up and shooting tasks; written to be highly adaptable so **a brand-new auto routine could be created with just a few lines of code in ~10 minutes**

SAKON, CONCORD, MA

Sakon provides a leading connectivity spend management and mobile operations platform (software).

Implementation and Data Analytics Intern, Client Services Team Summers 2021, 2022

- Supported team **to onboard new Fortune 500 client** and provided QA for Salesforce processes