



# MATT BRYMER

AUTONOMY ENGINEER

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Mountain View, CA



## EDUCATION

Master of Engineering  
Aerospace Engineering  
University of Toronto  
2021-2022

Bachelor of Applied Science  
Mechanical Engineering  
University of Waterloo  
2009-2014

## SKILLS

Control Theory  
State Estimation  
Sensor Fusion  
Motion Planning  
C++, Python  
MATLAB, Simulink  
ROS  
Simulation  
Optimization  
  
Initiative  
Communication  
Teamwork  
Problem Solving  
Time Management

## PROFESSIONAL PROFILE

I'm a highly motivated engineer who's passionate about enabling agile motion in vehicles and robotics. Flight vehicles, ground vehicles or dynamic systems in general, I like seeing things go. My technical interests span the full software stack including control systems, state estimation, motion planning, perception and optimization.

My past experience in fast paced environments demonstrates my ability to take ownership, communicate effectively and drive design decision making. My background in the areas of simulation and vehicle dynamics has given me a strong ability to analyze data and identify underlying system dynamics.

## PROFESSIONAL EXPERIENCE

### Software Engineer, Controls

Kodiak | Mountain View, CA | Dec. 2022 - Present

Designed control system and estimation algorithms for autonomous Class 8 semi-trucks, implemented in C++ and validated through on-road and track testing

- Led creation of a common controller software architecture to support code reuse across vehicle platforms that enabled the company to operate two new vehicles on public roads within 5 months of development
- Applied this architecture to implement lateral and longitudinal controllers for an entirely new truck platform, leading to delivery of customer freight within 90 days of first receiving the vehicle
- Developed an Extended Kalman Filter for vehicle mass estimation capable of detecting a mass mismatch within 1 minute of merging onto a highway
- Created MATLAB tools and test procedures for identifying dynamic bicycle model parameters from steady state and frequency response data

### Algorithm Design and Development Engineer

General Motors Canada | Markham, ON | Feb. 2020 - June 2021

Developed embedded control algorithms for all wheel drive systems for application across the GM fleet and implemented in Simulink to autogenerate C code

- Designed an electric all wheel drive controller for fault scenarios. Deployed within an entirely new software component bundling speed control and actuator constraints and brought to production release in 9 months
- Developed algorithms for active clutch torque control and managing engage state for a single clutch electromechanical all wheel drive system
- Verified performance and robustness of both software components using CarSim vehicle handling simulations

## SELECTED COURSEWORK

### AER 1517 – Control for Robotics

Optimal control, dynamic programming, MPC, reinforcement learning

### AER 1513 – State Estimation for Robotics

Recursive linear and nonlinear Gaussian estimation, batch estimation, sigma point transform, rotation formalisms for probability, optimization and estimation

### ROB 501 – Computer Vision for Robotics

Camera models and calibration, pose estimation, feature detection, stereo vision, visual odometry, deep learning

### CSC 2506 – Probabilistic Learning and Reasoning

Probabilistic models, variational inference, Bayesian regression, kernel methods, Gaussian processes, variational autoencoders

## AWARDS

Canadian Society for Mechanical Engineering Gold Medal  
University of Waterloo, 2014

In recognition of outstanding academic achievement

## HOBBIES

Climbing  
Traveling  
Hiking  
Running  
Quadcopters  
Reading  
Board games

## PROFESSIONAL EXPERIENCE CONTINUED

### Structures Engineer

Multimatic Technical Centre | Markham, ON | Mar. 2016 – Jan. 2020

Performed a wide variety of finite element simulations ranging from linear statics to nonlinear explicit dynamics using LS-DYNA, ABAQUS and OptiStruct in support of various automotive OEM programs

- Modelled an array of phenomena including carbon fibre composites, crash simulations and hot blow forming of boron steel structures
- Effectively communicated simulation results and recommendations to design engineers and program managers through reports and in person to drive design decision making

### Dragon Structures Engineer

Space Exploration Technologies | Hawthorne, CA | Feb. 2015 – Feb. 2016

Structures engineer responsible for all structure directly interfacing with the Super Draco abort engines on Dragon 2

- Developed the design of forged metallic structures to mount the SuperDraco engines, react their thrust and protect the vehicle from reentry heating
- Collaborated with Propulsion, Thermal Protection and Avionics Engineers to resolve interfaces and ensure system level requirements were met

## PROJECT EXPERIENCE

### Visual-Inertial Relative Pose Estimation for Quadrotor Landing

University of Toronto | AER 1810 - MEng Project | May-Aug. 2022

Summer project developing a quadrotor capable of autonomously flying to a target location and landing based on visual-inertial navigation

- Developed a Multiplicative Extended Kalman Filter for fusing IMU data with AprilTag pose measurements to estimate relative pose over the landing pad
- Implemented filter in a C++ ROS node and deployed on a custom quadrotor platform powered by an NVIDIA Jetson Nano and industrial vision camera
- Evaluated in RotorS simulations and achieved estimation error below 50 mm at a height of 2 m
- Validated in manual flight tests including sweeping flights and simulated landings after 3 months of development

### Hierarchical Trajectory Planning for Quadrotor Flight in Unknown Environments

University of Toronto | AER 1516 – Motion Planning for Robotics | Jan.-Apr. 2022

Course project where teams were tasked with researching and implementing an advanced motion planning algorithm

- Led group of 4 team members in writing a simplified version of the FASTER trajectory planner in Python ROS nodes
- Implemented the local planner to determine the final trajectory by solving a MIQP using MOSEK while respecting vehicle dynamic limits, continuity and collision constraints
- Validated in Gazebo simulations achieving flight speeds of up to 4.2 m/s at replanning rates of 10 Hz