

ROWAN DEMPSTER

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SKILLS AND PASSIONS

Well versed in C++, PX4 / uORB, and ROS2 at Cleo Robotics. Prior internship and research experience in PyTorch and CasADi. At home with Git, Linux, and Docker. Passionate about highly observable + replayable autonomy stacks, complete logging coverage, and fleet monitoring + continuous deployment cycles.

INDUSTRY

Cleo Robotics 🔗, *Autonomy & State Estimation Engineer* **Feb 2023 — Present**

- Learned that you cannot beat physics, and you cannot beat statistics, and to lean into both of them.
- Optimized the OctoMap library for CPU constraints via mutual information ray downsampling. Implemented a BoostRPC-based OctoMap server which integrates VIO + ToF data and responds on the ms scale to occupancy queries from a 3DVFH-style reactive planner. Shortest route-to-home using R-Trees for efficient NN queries during graph creation, and Informed RRT* which queries the OctoMap server for re-planning around dynamic obstacles.
- Introduced multi-camera loosely coupled VIO fusion in the PX4 EKF2 estimator, requiring redundant vision source agreement to guarantee quality position and velocity estimates for control. Modified the EKF2 estimator to allow for simultaneous fusion of GPS and vision sources, allowing seamless transitions between outdoor (GPS) and indoor (vision-only) navigation. Integrated dense LiDAR SLAM (FASTER-LIO) for navigation in featureless but geometry-rich environments.
- Profiled rate-control latencies and cut gyro-to-response delay from 15ms to 3ms by improving UART scheduling and PX4 work queue synchronization. Advocated for mechanical redesign to prioritize actuator response time and low moment of inertia over control tuning alone, informing next-gen airframe design (centralized mass, faster actuators).

Matic Robots 🔗, *Research Engineer* **Sep 2021 — Dec 2021**

- Researched self-supervised learning (SSL) for scene reconstruction via dense stereo matching in robotic mapping applications.
- Introduced visual odometry to the SSL pipeline, allowing for photometric loss computations across time, reducing end-point error (EPE) in the disparity maps by >10%.

Facebook 🔗, *Software Engineer* **Jan 2019 — Apr 2019**

- Implemented new features for timeseries anomaly detection algorithms and an accompanying notification system. Built a new entry point for creating anomaly detectors, introducing thousands of new users to the system.

Zynga 🔗, *Software Engineer (Analytics)* **May 2018 — Aug 2018**

RESEARCH

WATonomous 🔗 - Building an AV from the ground up, competitor in the SAE AutoDrive Challenge (ADC).

Director - Autonomy (ADC Year 4 and Onwards) **Sep 2020 — Sep 2022**

- Headed a team of undergraduate and graduate students as we overhauled the automated driving stack. The team's final design earned 2nd place in the ADC Year 4 competition, demo video available online 🔗.
- Applied optimal control principles to develop a unified trajectory planning and control scheme, and an accompanying novel real-time MPC solution. Presented at ICRA 2023 🔗.
- Designed a dynamic relation graph (DRG), building on the success of relational mapping in *Lanelet2*, for unified prior-online environment modeling and explainable decision making. Presented at ICRA 2022 🔗.
- Implemented a neural architecture for action recognition in road scenes, based on the SlowFast feature extractor and a modified ACAR-Net classification head. Demonstrated superior performance on the ICCV 2021 ROAD challenge, beating the baseline by 2.2 points on video-level mAP@0.2IOU. Published in T-Cybernetics 🔗.

Program Manager - Team Principal (ADC Year 2 & 3) **Aug 2018 — May 2020**

- Led 100+ software, electrical, and mechanical engineers as we transformed a Chevrolet Bolt into a Level 4 AV.
- Achieved 3rd place in the ADC Year 3 competition (up from 8th place in Year 2) by defining a range of organizational policies (e.g. development cycles, test plans) aimed at increasing the team's efficiency.

Tech Lead - Trajectory Generation (ADC Year 1) **Sep 2017 — May 2018**

EDUCATION

University of Waterloo, *Electrical and Computer Engineering, MAsc* **Sep 2020 — Dec 2022**

- Research in motion planning for autonomous vehicles (AVs). Thesis work on relational graph models for decision making 🔗, action classification in video streams 🔗, and unified trajectory planning & control 🔗.

University of Waterloo, *Bachelor of Computer Science* **Sep 2015 — Apr 2020**