ologandavid@gmail.com
(917) 635-2734

David Ologan

ologandavid.github.io
linkedin.com/in/dologan

Education

Carnegie Mellon University — Pittsburgh, PA

Ph.D in Mechanical Engineering - Robotics — *May 2024 – May 2028*

M.S. in Mechanical Engineering (Research) - Robotics and Control Systems — *Aug 2022 – May 2024*

- **Research**: Reliable State Estimation for Walking Among Entanglements
- **Coursework**: Planning & Decision Making in Robotics, Modern Control Theory, Robot Dynamics & Analysis, Computer Vision for Engineers, Optimal Control & Reinforcement Learning, Intro to Deep Learning

Massachusetts Institute of Technology — Cambridge, MA

B.S. in Mechanical Engineering, Electrical Engineering and Computer Science — *Sept 2018 – May 2022*

- **Coursework**: Intro to Robotics, Design & Analysis of Algorithms, Power Electronics Lab, Dynamics & Controls II, Product Engineering Processes, Thermo-Fluids Engineering I, Nanoelectronics & Computing Systems, Microcomputer Project Lab

Skills

Languages: Python, C++, C, MATLAB, Julia, Assembly, HTML, CSS, Mathmatica, Bash, CMake

Software: ROS1, Gazebo, RViz, Docker, Git, Webots, CAD (SolidWorks, AutoCAD, Autodesk Fusion, Creo), Eagle, LabView, Simulink, AWS, GCP, OpenCV, Tensorflow, Pytorch, Optitrack, Linux

Hardware: Machining/ Fabrication (Mill, Lathe, 3D-Printer, Waterjet, CNC), Circuit Construction and Design

Experience

CMU Robomechanics Lab — Pittsburgh, PA

Graduate Research Assistant — *Sept 2022 – Present*

- Maintainer of Quad-SDK, an open source ROS based full-stack software framework for quadrupedal locomotion.
- Currently developing strategies for proprioceptive foot contact detection using a generalized momentum observer.
- Implemented an Extended Kalman Filter (EKF) in C++ for reliable on-board state estimation of a quadruped.
- Contributed to the development and hardware testing of a novel momentum observer and controller designed to enable quadrupedal robots to detect unexpected external forces and disentangle while walking through dense underbrush and other compliant obstacles.

MIT ELO/ MIT Sandbox/ Volunteers for Medical Engineering (VME) — Cambridge, MA

Undergraduate Research Assistant — *Oct 2020 – Mar 2022*

- Developed and manufactured a portable sit-to-stand apparatus tailored for an elderly individual with restricted mobility, enhancing their daily life, particularly their needs in handicapped bathrooms.
- Investigated and formulated various methods of actuation using Solid Works to achieve secure and dependable patient lifting during transfers, while adhering to specified space and design parameters.
- Partnered with MIT Sandbox to bring the product to market, with the intention of distributing it to assistive care facilities.

Shark/Ninja — Needham, MA

Robotics Development Intern — *Jun 2021 – Mar 2021*

- Drafted and manufactured unique brush-roll geometries and testing apparatus in Creo to optimize pet hair pickup on Shark Robotic Vacuum by 58%.
- Fabricated and designed Floor Powered Side Brushes to minimize costs and size without sacrificing edge cleaning performance.

Projects

Multi-Robot Motion Planning for Quadruped Robots Pittsburgh, PA
Course Project - Carnegie Mellon - 16.782 *Sept 2023 – Dec 2023*

- Developed and implemented three algorithms to facilitate multi-robot motion planning of quadruped robots in C++; namely a Sequential RRT-Connect, Joint Space RRT-Connect and Conflict Based Search.
- Integrated each planner within Quad-SDK, adding substantial functionality to the open-source ROS framework.
- Performed comprehensive simulation testing within Gazebo to assess planner performance in generating collision-free and kinodynamically feasible paths over a variety of uneven terrain.
- Conducted a performance evaluation study, revealing that the Conflict Based Search exhibited better scalability beyond 4 robots, demonstrating the fastest planning time, and achieving an average path length 17.5% and 10.3% shorter than those of the Sequential and Joint methods respectively.

Hybrid Trajectory Optimization for a Monkey Bar Robot using DIRCOL Pittsburgh, PA
Course Project - Carnegie Mellon - 16.745 *Jan 2023 – May 2023*

- Created a hybrid-system direct collocation (DIRCOL) trajectory optimization-based controller of a two-link Monkey-Bar robot in Julia. Utilized IPOPT solver and MeshCat libraries for visualization.
- Performed testing on a variety of link mass distributions and bar distances, while maintaining the ability to swing up from a dead-hang and between subsequent bars.

Dense Video Captioning with Semantic Alignment Pittsburgh, PA
Course Project - Carnegie Mellon - 11.785 *Jan 2023 – May 2023*

- Enhanced Parallel Decoding for Dense Video Captioning (PDVC) framework with the addition of a trained tuner network to semantically align visual and caption features.
- Implemented and trained four different network architectures and tuned hyper-parameters of each to induce the highest quality video captions and alignment on the YouCook2 dataset.
- Performed an ablation study that determined a single layered convolutional tuner network outperforms the baseline PDVC in all four metrics BLEU4, METEOR, CIDEr, and SODA_c by 18.4%, 3.2% , 8% and 0.6% respectively.

Construction Site Hazard Detection Pittsburgh, PA
Course Project - Carnegie Mellon - 24.678 *Sept 2022 – Dec 2022*

- Designed and programmed a construction site worker detection model using YoloV7 and transfer learning, while leveraging traditional CV techniques to compute global worker positions using transformation matrices and real site footage.
- Conducted tests on varied pre-recorded site footage, while successfully classifying workers who enter high-risk areas. Demonstrated a mAP0.5 of 92% with a precision of 90% and recall of 93%.

Path Planning and Control Strategies for an Autonomous Buggy Pittsburgh, PA
Course Project - Carnegie Mellon - 24.677 *Sept 2022 – Dec 2022*

- Implemented and tuned PID, LQR, and MPC controllers for the lateral and longitudinal control of an autonomous buggy in Python and Webots. Vehicle dynamics were approximated using a bicycle model.
- Incorporated EKF SLAM for localization to successfully navigate CMU's buggy course in under 120 seconds and an average deviation of <3m from the optimal tracked path.

Publications & Abstracts

Proprioception and Reaction for Walking Among Entanglements
Justin K. Yim, Jiming Ren, **David Ologan**, Selvin Garcia Gonzalez, and Aaron M. Johnson
In IEEE/RSJ International Conference on Intelligent Robots and Systems, October 2023

Quad-SDK Update: Estimation, Underbrush, and Other Improvements
David Ologan, Ardalan Tajbakhsh, Justin K. Yim, Yanhao Yang, Joseph Norby, Jiming Ren, Selvin Orlando Garcia Gonzalez, and Aaron M. Johnson
In IROS Late Breaking Results, October 2023

Academic Memberships

CMU Mechanical Graduate Student Ambassador *Sept 2023 - Present*
MIT Electronics Research Society (MITERS) *Oct 2018 - Aug 2020*
MIT Maker-Works *Oct 2018 - Jun 2021*