

# BRIAN E. JACKSON

983 Becks Run Rd, Pittsburgh, PA  
(512) 809-5246 ◊ brianjackson@cmu.edu ◊  bjack205

## EDUCATION

---

### Ph.D. Carnegie Mellon University

*Robotics*

2020 - 2022

*Pittsburgh, PA*

- Advisor: Zachary Manchester
- Thesis Committee: Michael Kaess (Carnegie Mellon University), Lorenz Biegler (Carnegie Mellon University), Scott Kuindersma (Boston Dynamics)
- Thesis Title: Accelerating Numerical Methods for Optimal Control

### M.S. Stanford University

*Mechanical Engineering*

2017 - 2020

*Palo Alto, CA*

- GPA: 3.98 / 4.00
- NSF Graduate Fellowship
- Stanford Engineering Fellowship
- Took PhD Qualifying Exams in robotics and automatic controls

### B.S. Brigham Young University

*Mechanical Engineering*

2013 - 2017

*Provo, UT*

- GPA: 3.98 / 4.00
- Capstone Project: BYU Mars Rover
- Manga Cum Laude
- Graduated with University Honors
- Honors Thesis: “Resolving Pseudosymmetry in  $\gamma$ -TiAl using Cross-Correlation Electron Backscatter Diffraction with Dynamically Simulated Reference Patterns”

## PROFESSIONAL POSITIONS

---

### PhD Intern

*Optimus Ride, Inc.*

June 2021-Sep 2021

*Boston, MA*

- Wrote an open-source C++ implementation of ALTRO, a state-of-the-art method for nonlinear trajectory optimization I developed as part of my PhD research, from scratch.
- Advised the motion planning and controls team on integrating both nonlinear and convex trajectory optimization into their autonomy stack.
- Worked with the motion planning team to tightly integrate the developed C++ ALTRO implementation into their autonomy stack
- Successfully tested the code on-vehicle by the end of the internship, demonstrating improved ride quality and robustness.

### Engineering Intern

*Raytheon Missile Systems*

June 2017-Sep 2017

*Tucson, AZ*

- Developed full 6 degree of freedom simulations for analysis and development of guided bullets
- Used NASA's OTIS trajectory optimization tool to generate first order fin load approximations

### Research Assistant

*Brigham Young University*

Sep 2014-May 2017

*Provo, UT*

- Advisor: Dr. David Fullwood

- BYU Microstructure of Materials Laboratory
- Developed software in MATLAB for cross-correlation analysis of electron backscatter diffraction (EBSD) patterns

### Teaching Assistant

Sep 2016-Apr 2017

Brigham Young University

Provo, UT

- Great Questions Essay class: capstone experience of the BYU Honors Program
- Coached students from all majors and disciplines in writing 15-25 page multidisciplinary essays

### Engineering Co-op

May 2015-Aug 2015

Dana Cedar Park Technology Center

Cedar Park, TX

- Analyzed test data and standardized data analysis formats using Matlab and Excel
- Implemented a workflow management system to improve inter-departmental communication, data storage, data analysis, and process control

### Engineering Inter / Metrology Apprentice

Dec 2019-Mar 2011, Apr 2013-Dec 2014

Fallbrook Technologies

Cedar Park, TX

- Created project forecasting tool to improve project communication and resource efficiency
- Developed tools that reduced metrology reporting time by 50%
- Received training and certification on a Carl Zeiss CMM and GD&T ASME Y14.5-2009
- Managed the implementation of 5S, increasing professionalism, efficiency, and reducing waste

### Support Intern

Jun 2019-Aug 2010

RailPros. Inc.

Irvine, CA

- Complied documentation and manuals to standardize expectations for company technicians
- Researched buying options for various products to save the company money

### Engineering Intern

LifeModeler Inc

Summers 2008-2009

San Clemente, CA

- Researched the effects of various baseball pitches on ligaments in adolescent pitchers using biomechanical computer simulation
- Beta-tested new engineering software and wrote training documentation

## AWARDS AND HONORS

---

Best Student Paper Finalist - IROS 2020

NSF Graduate Research Fellowship (2018)

Stanford Graduate Fellowship (2017)

Tau Beta Pi Engineering Honors Society Academic Scholarship (2015)

Tau Beta Pi Engineering Honors Society Member

Brigham Young University Academic Scholarship (2013-2017)

## PUBLICATIONS

---

### Journal Articles

- [3] T. Propson, B. E. Jackson, J. Koch, Z. Manchester, and D. I. Schuster, "Robust Quantum Optimal Control with Trajectory Optimization," *Physical Review Applied*, vol. 17, no. 1, Jan. 2022.
- [5] B. E. Jackson, K. Tracy, and Z. Manchester, "Planning With Attitude," *IEEE Robotics and Automation Letters*, pp. 1-1, 2021.

- [7] B. E. Jackson, T. A. Howell, K. Shah, M. Schwager, and Z. Manchester, "Scalable Cooperative Transport of Cable-Suspended Loads With UAVs Using Distributed Trajectory Optimization," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 3368–3374, Apr. 2020.
- [13] B. E. Dunlap, T. J. Ruggles, D. T. Fullwood, B. Jackson, and M. A. Crimp, "Comparison of dislocation characterization by electron channeling contrast imaging and cross-correlation electron backscattered diffraction," *Ultramicroscopy*, vol. 184, pp. 125–133, Jan. 2018.
- [14] B. Jackson, D. Fullwood, J. Christensen, and S. Wright, "Resolving pseudosymmetry in  $\gamma$ -TiAl using cross-correlation electron backscatter diffraction with dynamically simulated reference patterns," *Journal of Applied Crystallography*, vol. 51, no. 3, pp. 655–669, Jun. 2018.
- [15] L. T. Hansen, B. E. Jackson, D. T. Fullwood, S. I. Wright, M. De Graef, E. R. Homer, and R. H. Wagoner, "Influence of Noise-Generating Factors on Cross-Correlation Electron Backscatter Diffraction (EBSD) Measurement of Geometrically Necessary Dislocations (GNDs)," *Microscopy and Microanalysis*, vol. 23, no. 3, pp. 460–471, Jun. 2017.
- [16] B. E. Jackson, J. J. Christensen, S. Singh, M. D. Graef, D. T. Fullwood, E. R. Homer, and R. H. Wagoner, "Performance of Dynamically Simulated Reference Patterns for Cross-Correlation Electron Backscatter Diffraction," *Microscopy and Microanalysis*, vol. 22, no. 4, pp. 789–802, Aug. 2016.

## Conference Proceedings

- [2] B. E. Jackson and Z. Manchester, "A Parallel Linear System Solver for Optimal Control," in *IEEE International Conference on Intelligent Robots and Systems*, In Review, Nov. 2022.
- [4] B. E. Jackson, T. Punnoose, D. Neamati, K. Tracy, and R. Jitsho, "ALTRO-C: A Fast Solver for Conic Model-Predictive Control," in *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, Jun. 2021, p. 8.
- [8] T. A. Howell, B. E. Jackson, and Z. Manchester, "ALTRO: A Fast Solver for Constrained Trajectory Optimization," in *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Macau, China, Nov. 2019.

## Talks and Presentations

- [1] *TrajectoryOptimization.jl Tutorial*, RSS 2021 Workshop on Software Tools for Real-Time Optimal Control, Virtual.
- [6] B. E. Jackson, *Adventures in Avoiding Allocations*, JuliaCon 2020, Virtual, Jul. 2020.
- [10] B. E. Jackson, *Fast Trajectory Optimization: A Step towards Online Motion Planning for Underactuated Robots*, The Industrial Affiliates of Stanford University in Aeronautics and Astronautics, Stanford University, Apr. 2019.
- [12] B. E. Jackson, *TrajectoryOptimization.jl: A Testbed for Optimization-Based Robotic Motion Planning*, JuliaCon 2019, Baltimore, MD, Jul. 2019.

## ACADEMIC EXPERIENCE

- |  |                       |
|--|-----------------------|
| <b>RSS 2021 Workshop on Software Tools for Real-Time Optimal Control</b>   | Jul 2022              |
| <i>Workshop Organizer</i>  | <i>Virtual</i>        |
| <ul style="list-style-type: none"> <li>• Initiated and lead the workshop organization. Brought in keynote leaders from industry and academia.</li> <li>• Workshop emphasis on highlighting current tooling available in the field of real-time optimal control, and how these algorithms have been successfully deployed in research and commercial applications.</li> </ul> |                       |
| <b>Carnegie Mellon University</b>  | 2021-2022             |
| <i>Teaching Assistant</i>  | <i>Pittsburgh, PA</i> |
| <ul style="list-style-type: none"> <li>• Course: 16-745 Optimal Control and Reinforcement Learning. Spring 2021 and Spring 2022.</li> </ul>  |                       |

- Worked as head TA for two semesters, including the first time the new version of the course was taught, which included writing homework problem from scratch, setting up tooling for automatic grading, and handling course logistics.

## SERVICE

---

### **American Red Cross**

Jun 2016-Apr 2017

*Curriculum Intern*

*Provo, UT*

- Member of the leadership for Latino Outreach
- Managed the curriculum for classes in disaster preparedness, first aid, and CPR and Spanish
- Taught weekly classes to groups of volunteers in Spanish

### **Utah Underwater Robotics**

Aug 2015-Apr 2016

*Volunteer*

*Salem, UT*

- Coached middle-school children in applying engineering design process to build an underwater ROV

### **The Church of Jesus Christ of Latter-day Saints**

Mar 2011-Apr 2013

*Volunteer Representative*

*Puebla, Mexico*

- Mission Executive Secretary: Coordinated visas, bilingual communication, and travel
- Branch President: Provided leadership and training to a church congregation of 80 members