



# James Scott Jackson

## Contact





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 superjax  
 superjax08

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## Programming Languages

 C++  
 Python  
 Julia  
 MATLAB

## Software Tools

 ROS  
 OpenCV  
 Tensorflow  
 Eigen  
 Numpy  
 Ceres  
 Pybind11  
 Qt  
 Linux  
 GCC  
 CMake  
 GTSAM  
 IPOPT  
 PSOPT

## Algorithms

SLAM  
RTK GPS  
EKF  
LQR  
MPC  
MHE  
RANSAC  
ICP  
BoW

## Hardware

STM, Atmel, TIVA  
TX1/TX2  
Realsense  
XTION

## Clearance

DOE Q (Inactive)

## Education


2008–2015 **B.S.** in Mechanical Engineering (3.84 GPA)

Brigham Young University


2015–2019 **Ph.D.** in Mechanical Engineering



Brigham Young University

## Graduate Research Work

- |      |   |                 |
|------|---|-----------------|
| 2019 | <b>G-VINS</b><br>Tightly-coupled GNSS-Visual-Inertial state estimation<br>Improve estimator performance in GNSS-degraded zones by fusing raw pseudorange and carrier phase measurements   | MAGICC Lab, BYU |
| 2018 | <b>Relative Edge Optimization</b><br>Improved Robustness of Pose Graph optimization over state-of-the-art with relative formulation<br>Demonstrated on Hardware Dataset   | MAGICC Lab, BYU |
| 2018 | <b>Visual-Inertial EKF</b><br>Tightly-Coupled Visual-Inertial EKF-based state estimation<br>Improved robustness over state-of-the-art methods<br>Demonstrated in Hardware   | MAGICC Lab, BYU |
| 2016 | <b>ROSflight</b>  <a href="http://www.rosflight.org">www.rosflight.org</a><br>Developed full custom autopilot firmware for STM32 flight controller<br>Prioritized sensor streaming, safety pilot integration, onboard computer control and clean ROS API<br>Achieved nearly 20x improvement over PixHawk sensor and command streaming capabilities<br>Demonstrated on fixed wing and multirotor SUAS | MAGICC Lab, BYU |
| 2016 | <b>Relative Navigation Framework</b><br>Observable, consistent visual-inertial estimation framework for SUAS<br>Performed indoor-outdoor autonomous experiments, online loop closure and optimization without state/control jumps<br>Lots of work in hardware implementation, ROS, simulation in Gazebo and in home-built simulation environments.  | MAGICC Lab, BYU |

## Employment

- |              |  |                   |
|--------------|--|-------------------|
| 2016-Present |  <b>InertialSense Micro Navigation Systems</b><br><i>Autonomy Engineer</i><br>Implemented, tested and fielded RTK and Dual GNSS (Compassing) algorithms<br>Developed hardware continuous integration tools<br>Developed data analysis and post-processing tools<br>Built ROS tools for interfacing with embedded hardware<br>Developed SLAM stack for autonomous lawnmower  | Lindon, UT        |
| 2016         | <b>KH KittyHawk Aero</b><br><i>Intern - Flight Controls and Estimation</i><br>Built custom autopilot for gigantic 500lb multirotor<br>Developed SIL simulation environment<br>Prototyped full-state MUKF<br>Developed and tested altitude hold algorithm around PixHawk autopilot<br>Prototyped and tested new multirotor configuration with custom autopilot<br>Prototyped and patented multi-autopilot redundancy technique<br>Developed auto-calibration routine for user control inputs<br>Developed log management tools for post-processing flight test data | Mountain View, CA |

- 2013-2014  **Los Alamos National Laboratory** Los Alamos, NM  
*Intern - Weapons R&D*  
 Performed structural analyses to determine cause of failures and proposed design changes to ensure safety.  
 Designed and programmed a completely automated testing station for hazardous dynamic testing  
 Designed control, data acquisition, and analysis programs to aid in testing and optimization.
- 2012  **Autoliv ASP** Ogden UT  
*Intern -Side pyrotechnic and curtain stored gas/hybrid inflator group*  
 Designed and conducted a “modified IZOD impact test” on substandard material specimen to identify supplier inconsistencies  
 Worked closely with international engineers in the design and standardization of testing.  
 Presented testing methods and results to call attention to problems with supplier processing.  
 Experimented with original concepts to improve inflator performance.

## Notable Side Projects

- 2013-2014 **HustleMeter** BYU Provo, UT  
 Developed proprietary algorithms and devices to measure the “hustle” of basketball players  
 Developed financial models, business plans and pitched idea before investors  
 Developed concept, hardware and software with the help of basketball coaches from all over the world
- 2013-2014 **MealPlannr** BYU Provo, UT  
 Mobile App to help suggest and plan meals  
 Designed algorithm to suggest meals based on previous meal choices  
 Interviewed several dozen participants who used the app to improve the interface and meal suggestion algorithm  
 Pitched idea to investors in student competition
- 2012-2013 **Hiven** BYU Provo, UT  
 IoT sensor to detect and warn homeowners of frozen pipes  
 Developed mobile app to interface with the sensor  
 Demonstrated device at student competition
- 2012-2013 **Intellibeat** BYU Provo, UT  
 Pacemaker Thermoelectric battery replacement module  
 Invented idea to replace pacemaker batteries with thermoelectric modules  
 Led multidisciplinary student team in experimenting and validating design and application.  
 Built and programmed feedback controller for testing apparatus and data acquisition.

## Publications

- [1] Improving the Robustness of Visual-Inertial Extended Kalman Filtering  
 James Jackson, Jerel Nielsen, Randal Beard, Tim McLain  
 2019 IEEE International Conference on Robotics and Automation (ICRA) (May 2019).
- [2] Direct Relative Edge Optimization, a Robust Alternative for Pose Graph Optimization  
 James Jackson, Kevin Brink, Brendon Forsgren, David Wheeler, T.W. McLain

IEEE Robotics and Automation Letters PP (Jan. 2019) pp. 1–1. doi: *10.1109/LRA.2019.2896478*.

- [3] **Relative Navigation: A Keyframe-Based Approach for Observable GPS-Degraded Navigation**  
David Wheeler, Daniel Koch, James Jackson, Tim McLain, Randal Beard  
IEEE Control Systems Magazine 38.4 (Aug. 2018) pp. 30–48. doi: *10.1109/MCS.2018.2830079*.
- [4] **Relative Navigation of Autonomous GPS-Degraded Micro Air Vehicles**  
David Wheeler, Daniel Koch, James Jackson, Gary Ellingson, Paul Nyholm, Tim McLain, Randal Beard  
BYU Scholars Archive, All Faculty Publications. 1962 PP (Aug. 2017) pp. 1–1.
- [5] **Cushioned extended-periphery avoidance: A reactive obstacle avoidance plugin**  
James Jackson, David Wheeler, Tim McLain  
2016 International Conference on Unmanned Aircraft Systems (ICUAS) (June 2016) pp. 399–405. doi: *10.1109/ICUAS.2016.7502597*.
- [6] **ROSflight: A lightweight, inexpensive MAV research and development tool**  
James Jackson, Gary Ellingson, Tim McLain  
2016 International Conference on Unmanned Aircraft Systems (ICUAS) (June 2016) pp. 758–762. doi: *10.1109/ICUAS.2016.7502584*.

## References

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