# ALEX STEPHENS

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## Education

### UNIVERSITY OF SYDNEY

2015 — 2019

Bachelor of Engineering Honours (Mechatronics (Space)) &
Bachelor of Science Adv. (Computer Science & Physics)

**Honours Class I and the University Medal**
Dissertation: "Towards Robust Multi-Robot SLAM in Perceptually Challenging Subterranean Environments".

**Highest mark in course**
Advanced Control & Optimisation (Masters level course) • Intro to Artificial Intelligence (Adv.) • System Dynamics & Control • Algorithm Design (Adv.) • Data Structure & Algorithms (Adv.) • Intro to Programming (C & MATLAB) • Physics 2A

**Major Projects**

- **AERO4701 Space Engineering 3**: design and construction of a 2U CubeSat housing electrodynamic tether for LEO experiments. Final system included reaction wheel ADCS, GPS, radio comms, remotely controlled operation modes and tether deployment.
- **MTRX2700 Mechatronics 2:** software design and implementation of a laser-based object detection and area evaluation system.
- **MTRX3700 Mechatronics 3**: design and construction microprocessor-controlled interactive smart scales, including interactive audio prompts, multiple operation modes, and measurement precision ±1 g for up to 1 kg.

## Research Experience

### VISITING ROBOTICS RESEARCHER

**NASA Jet Propulsion Laboratory** Jul-Dec 2019

Member of the JPL/Caltech/MIT team (CoSTAR) for the DARPA Subterranean Challenge, in which the aim is to develop a team of robots to autonomously explore, navigate and map unknown subterranean environments. Worked on perception and SLAM with a focus on centralised fusion of data from multiple robots. All work was done in ROS C++.

- Implemented software on a base station for receiving incrementally published pose graphs and lidar scans from multiple robots and fusing them into a single pose graph and point cloud map.
- Contributed to a major SLAM architecture redesign and implementation of software for robots and base station, resulting in improved modularity and extensibility to different sensor modalities, robot configurations and loop closure mechanisms.
- Developed software for evaluation of robot trajectories against an approximate ground truth based on known locations of artifacts observed by the robot.

### PHYSICS RESEARCH INTERN

**Quantum Control Laboratory (QCL)** Aug-Nov 2017

Investigated learning- and PID-based approaches into dynamic voltage stabilisation for quantum control experiments. Developed a prototype controller using a Raspberry Pi to demonstrate preliminary results in noise reduction on a bench-top DC power supply. Supervised by Professor Michael Biercuk of QCL.

**Sydney Institute for Astronomy (SIfA)** Summer 2016-17

Developed and implemented MATLAB simulations for research into photoionisation of the outer reaches of spiral galaxies by radiation from the galactic centre, accounting for warping in the galactic plane. Supervised by Professor Joss Bland-Hawthorn of SIfA.

**Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS)** Summer 2015-16

Investigated through simulation the viability of diffraction gratings as ultra-thin solar cells. Simulations were performed using EMUstack, an open-source Python package for optics simulation. Supervised by Professor Martijn de Sterke of CUDOS.

# Publications

K. Ebadi, Y. Chang, M. Palieri, **A. Stephens**, A. Hatteland, E. Heiden, A. Thakur, N. Funabiki, B. Morrell, S. Wood, L. Carlone, A. Aghamohammadi. *LAMP: Large-Scale Autonomous Mapping and Positioning for Exploration of Perceptually-Degraded Subterranean Environments.* IEEE International Conference on Robotics and Automation (ICRA), 2020.

J. Bland-Hawthorn, P. R. Maloney, **A. Stephens**, A. Zovaro, A. Popping. *In search of cool flow accretion onto galaxies: where does the disk gas end?* The Astrophysical Journal, 849(1):51, 2017.

# Work Experience

### SOFTWARE DEVELOPMENT INTERN

**Atlassian** Summer 2018-19

Worked with the Confluence Server Platform team to optimise the development loop for Confluence Server, one of Atlassian's most popular products:

- Upgraded front-end unit and integration testing in Selenium WebDriver and JUnit.
- Migrated Confluence plugin tests to upgraded Docker build agents.

### ACADEMIC TUTOR

**University of Sydney, Faculty of Engineering & IT** 2016 – 2019

Provided demonstrations and guidance to classes of 20-40 students for courses in programming, digital logic and algorithm design. Taught over 250 students across 4 years, and received consistently positive feedback on teaching style and communication.

### SOFTWARE ENGINEERING INTERN

**Australian Centre for Field Robotics (ACFR)** Jan-Feb 2018

Contributed to ROS driver upgrades and integration of optical and LIDAR sensors to an autonomous vehicle platform, as part of ACFR's "smart cities" initiative.

# Technical Skills

### Proficient with

- **Programming languages:** C++, Python, C, MATLAB
- **Operating systems:** Linux (Ubuntu), macOS, Windows
- **Tools/software**: ROS, Git, LaTeX, Jira, Confluence

### Familiar with

- Java, Assembly, LabVIEW, Simulink

# Academic Awards & Honours

- Engineering Sydney Industry Placement Scholar: competitively selected for 6 month placement as a robotics researcher at NASA Jet Propulsion Laboratory for undergraduate thesis
- Engineering Dean's List (2015-18)
- Engineering Merit Prize (2015-16)
- Sydney Scholars Award (2015-19)
- Denison Physics Research Scholarship (2015-16)
- Physics Foundation Scholarship (2016)
- Mechanical Engineering Minor Prize & Mechanical Engineering Association Intermediate Prize (2016)
- Physics J.S.M. Scholarship (2015)

# Programming Contests & Hackathons

- AWS Amazalgo 2018: 2nd place
- ACM-ICPC 2017: South Pacific regional finalist & highest-ranked University of Sydney team
- Microsoft Coding Competition Sydney 2018: 5th place
- UNIHACK Sydney 2018: developed a Facebook Messenger chatbot to interactively recommend food venues using Instagram and Google Maps APIs