

# Justin Kruger

## Aerospace Engineer

Phone: +1 971-273-8878

Email: [justin@justin.zone](mailto:justin@justin.zone)

Website: <https://justin.zone>

## Skills

### Expertise Areas

Distributed space systems; navigation and state estimation; absolute and relative orbit determination and control; attitude determination and control; spacecraft dynamics and modelling; vision-based sensing; spacecraft autonomy; target tracking; optimisation algorithms

### Computer Skills

MATLAB, Simulink, C++, Python, Git, CAD, LaTeX, Office, Windows

### General Skills

System integration, verification, and validation; interface control; technical writing and presenting; mission operations; experimental analysis

## Awards and Honours

International **Parkinson Award** for the most outstanding graduate student, from the Institute of Navigation (2024)

**Ballhaus Prize** for best Ph.D. thesis in the Stanford University Aeronautics and Astronautics department (2024)

**NASA Ames Honor Award** for work on the NASA Starling mission (2024)

**Outstanding Reviewer** for the Journal of Guidance, Control & Dynamics (2022-24)

M Charles Fogg **Best Paper Award** at the IEEE Aerospace Conference (2021)

**1st Place** in the NASA/BOEM Animal Tracking Ideation Challenge (2018)

**Robert H. Cannon Fellowship** for outstanding graduate students at Stanford University (2017-19)

**Fogarty Foundation Scholarship** for outstanding students at the University of Western Australia (2010-15)

## Overview

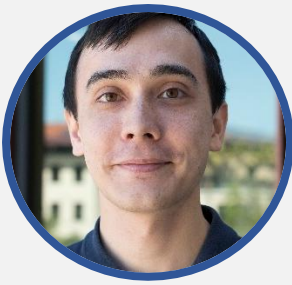
I've always been inspired by the promise of space and the countless ways in which it can move humanity forward. My work leverages distributed systems and autonomy for meaningful, equitable, sustainable utilisation of our space environment and the exploration of new frontiers.

## Education

- 04/2024** **Ph.D. (Aeronautics and Astronautics, Best Thesis Prize)**  
Stanford University, Stanford, California
- 01/2020** **Master of Science (Aeronautics and Astronautics)**  
Stanford University, Stanford, California
- 03/2016** **Bachelor of Science (Physics, 1st Class Hons.)**  
University of Western Australia, Perth, Australia
- 03/2015** **Bachelor of Engineering (Mechatronics, 1st Class Hons.)**  
University of Western Australia, Perth, Australia

## Work & Research Experience

- 06/2025 (upcoming)** **Chief Technical Officer | EraDrive**
  - Oversight & technical development of EraDrive Autonomy, a distributed hardware/software module that enables full autonomy for spacecraft. EraDrive Autonomy integrates advanced vision-based navigation, real-time collision avoidance, and intelligent decision-making to ensure safe and efficient space operations.
- 04/2024 - 06/2025** **Postdoctoral Scholar | Stanford Space Rendezvous Laboratory**
  - Lead developer for the Absolute and Relative Trajectory Measurement System (ARTMS), an autonomous angles-only navigation architecture for distributed space systems. Work includes development of image processing, target tracking, and batch & sequential estimation algorithms.
  - Experiment lead for the Starling Formation-Flying Optical Experiment (StarFOX), a core payload of the [NASA Starling mission](#). Work includes integration of flight software and ongoing flight experiment operations. All objectives were achieved, leading to a StarFOX+ extended mission in 2025.
  - Developer of the Fast Autonomous Lost-in-space Catalog-based Optical Navigation (FALCON) system, a new AI-assisted framework for resilient optical positioning and space situational awareness.
  - Project manager for the Rendezvous and Proximity Operations (RPO) kit, a modular GNC software architecture enabling autonomous, flexible, safe satellite inspection and servicing.
  - Development of software- and hardware-in-the-loop simulations for multi-spacecraft GNC in LEO, GEO, cislunar and Martian scenarios.
  - Research collaborations with Blue Origin, Ten One Aerospace, Scout Space, NASA Ames, NASA JPL, and the United States AFOSR.
  - Mentor for undergraduate and graduate students.
- 2020, 2025** **Teaching Assistant | Stanford University**  
AA131: Introduction to Spaceflight & AA297D: Distributed Space Systems.
- 07/2019 - 04/2024** **Research Assistant | Stanford Space Rendezvous Laboratory**  
Ph.D. Dissertation: '[Flight Algorithms for Autonomous Tracking and Navigation of Distributed Space Systems using Bearing Angles](#)'
- 06/2018 - 08/2018** **International Internship | NASA Ames Research Center**  
Implemented machine learning for planetary rover wheel slip estimation.
- 2016** **Physics Thesis | University of Western Australia**  
Title: 'Direct Detection of High-Frequency Dark Matter Axions'
- 2015** **Engineering Thesis | University of Western Australia**  
Title: 'Fleet Robotics for Site-Specific Weed Management'
- 12/2014 - 02/2015** **Externship | Northrop Grumman**  
Delivered design recommendations for a nanosatellite testbed.



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## Volunteering

Contributor to the **AYAA Astra Program**, delivering a white paper to the Australian Space Agency for development of the Australian space industry (2022-23).

Teacher for **Stanford Young Astronauts**, an elementary school education program for aerospace topics (2022-23)

Mentor for the **Stanford Undergraduate Research Association**, a mentorship program for undergraduates interested in academic research (2022)

Volunteer for **Stanford Science Penpals**, a program matching school students with university penpals in STEM (2018-20)

Volunteer for **Stanford Splash!**, a program in which Stanford students teach classes to high school students (2018-19)

Mentor for **CoderDojo**, a program which runs regular coding workshops for school students in Western Australia (2013-16)

Academic tutor and head coordinator of the **St George's College** tutorial program (2013-2016)

Tutor for **Teach Learn Grow**, a program which provides tutoring for disadvantaged, rural schools in Western Australia (2013)

## Interests

Playing tennis

Playing the piano

Publication of an [original sci-fi novel](#) and other online stories

Board games, video games, tabletop games

Thai language

STEM outreach, primarily in the areas of space exploration, physics, and robotics

## Publications

**J. Kruger** and S. D'Amico, "Autonomous Vision-Based Navigation using Bearing-Angles to Catalogued Resident Space Objects", *International Astronautical Congress*, Sydney, Australia (2025, submitted).

**J. Kruger** and S. D'Amico, "[On-Orbit Performance and Lesson Learned for Autonomous Angles-Only Navigation of a Satellite Swarm](#)", *IEEE AeroConf*, Big Sky, MT (2025).

M. Foutter, **J. Kruger** et. al., "[Space-LLaVA: a Vision-Language Model Adapted to Extraterrestrial Applications](#)", *IEEE Aerospace Conference*, Big Sky, MT (2025).

**J. Kruger** and S. D'Amico, "[Observability Analysis and Optimization for Angles-Only Navigation of Distributed Space Systems](#)", *Advances in Space Research*, Vol. 73, No. 11, pp. 5464-5483 (2024).

**J. Kruger**, S. Hwang and S. D'Amico, "[Starling Formation-Flying Optical Experiment: Initial Operations and Flight Results](#)", *38<sup>th</sup> Small Satellite Conference*, Logan, UT (2024).

**J. Kruger** et al., "[Adaptive End-to-End Architecture for Autonomous Spacecraft Navigation and Control During Rendezvous and Proximity Operations](#)", *2024 AIAA SciTech Forum and Exposition*, Orlando, FL (2024).

**J. Kruger**, A. W. Koenig, and S. D'Amico, "[Starling Formation-Flying Optical Experiment: System Design, Experiment Design and Pre-Flight Verification](#)", *Journal of Spacecraft and Rockets*, Vol. 60, No. 6, pp. 1755-1777 (2023).

A. Schildkraut, **J. Kruger** et. al., "[From Down Under to the Moon: launching Australia's contribution to a sustainable lunar ecosystem](#)", *AYAA Astra White Paper* (2023).

**J. Kruger** and S. D'Amico, "[Angles-Only Tracking and Navigation for Approach and Rendezvous in Geosynchronous Orbits](#)", *AIAA Spaceflight Mechanics Meeting*, Austin, TX (2023).

K. Iiyama, **J. Kruger** and S. D'Amico, "[Autonomous Distributed Angles-Only Navigation and Timekeeping in Lunar Orbit](#)", *ION ITM*, Long Beach, CA (2022).

**J. Kruger** and S. D'Amico, "[Autonomous Angles-Only Multi-Target Tracking for Spacecraft Swarms](#)", *Acta Astronautica*, Vol. 189, pp. 514-429 (2021).

J. Sullivan, A. W. Koenig, **J. Kruger**, and S. D'Amico, "[Generalized Angles-Only Navigation Architecture for Autonomous Distributed Space Systems](#)", *Journal of Guidance, Control, and Dynamics*, Vol. 44, No. 6, pp. 1087-1105 (2021).

A. W. Koenig, **J. Kruger**, J. Sullivan, and S. D'Amico, "[ARTMS: Enabling Autonomous Distributed Angles-Only Estimation for Spacecraft Swarms](#)", *American Control Conference*, New Orleans, LA (2021).

**J. Kruger**, K. Wallace, A. W. Koenig, and S. D'Amico, "[Autonomous Angles-Only Navigation for Spacecraft Swarms around Planetary Bodies](#)", *IEEE Aerospace Conference*, Big Sky, MT (2021).

**J. Kruger**, A. Rogg, and R. Gonzales, "[Estimating Wheel Slip of a Planetary Rover via Unsupervised Machine Learning](#)", *IEEE Aerospace Conference*, Big Sky, MT (2018).

## Media

"[Alumni Stories Navigating the Stars: An Interview with UWA Fogarty Alumni Justin Kruger](#)", *The Fogarty Foundation* (2024).

"[StarFOX autonomous satellite tech could level up space exploration](#)", *Space.com* (2024).

"[Navigating by sight](#)", *SpaceNews* (2024).

"[Former Harvey resident Dr Justin Kruger gives space talk as part of National Science Week celebrations](#)", *The West Australian* (2023).

"[Justin on USA space mission](#)", *South Western Times* (2019).

"[Space dreams become reality with NASA internship](#)", *Bunbury Mail* (2018).