

# Conaire Deagan

conaire.deagan@gmail.com

0478 686 014

[conaired.github.io](https://conaired.github.io)

## Education

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### University of New South Wales - Doctor of Philosophy in Physics

*Thesis: The impact of stellar activity on the habitability of exoplanets*

Feb 2023 – June 2026

Advisor: Dr Ben Montet

### University of Sydney – Bachelor of Advanced Studies (Honours)

*Thesis: Advanced Astrometry: Modelling the TOLIMAN space telescope*

July 2021 – July 2022

Advisor: Prof. Peter Tuthill, Dr Ben Pope

### University of Sydney – Bachelor of Science

*Majors: Physics, Mathematics*

Feb 2018 – June 2021

## Research Experience

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### Research Interests

1. Stellar activity, particularly of Sun-like stars, with a focus on star-spot detection and mapping
2. The detection, and characterization of, exoplanets – primarily rocky planets with atmospheres.
3. The design and optimization of (optical) astrophotonic systems.
4. Multi-band observation of Wolf-Rayet stars.

### PhD Research

UNSW

Current Research Projects:

1. Mapping stellar surfaces with high precision astrometry
  - a. Comparing stellar surfaces recovery between light curves and astrometric signals from an information theory perspective
  - b. Bayesian statistical analysis of self-written computational simulations
2. Astrometric monitoring of the Sun as a star (*In prep. to be submitted 10/24*)
  - a. Analysis of a decade long dataset of high precision photometric images of the Sun across multiple wavelengths
  - b. Comparison & analysis of existing literature

Additionally, I have taken data using the VELOCE high-resolution spectrograph on the Anglo-Australian Telescope for a colleague.

## Research Assistant at the Sydney Astrophotonic Instrumentation Laboratory

USYD

Supervisor: Prof. Peter Tuthill

Projects:

1. Modelling optical aberrations of the TOLIMAN space telescope given measured imperfections of manufactured optics and determining impact on signal recovery.
2. Continued and expanded on my honours research (detailed below).

## Honours Research

USYD

*Project details:*

1. Forwards modelling the TOLIMAN space telescope and demonstrating the limits of signal recovery given optical aberrations.
2. Calibration and recovery of the detector plate scale via an on-detector, low resolution spectra. Investigated if this recovery changes in the presence of high levels of stellar activity.
3. The impacts of detector noise processes on astrometric signal recovery.

## Publications

Currently, I do not have any publications. However, I expect both my current research projects to have papers submitted to a journal by the end of the year.

## Posters and Presentations

*Presentations:*

- Star-Planet Interactions: How tracking star-spots can give insights into planetary architecture, atmospheric composition, and habitability  
**Australian Centre for Astrobiology Seminar - 2024**
- The place of Astrometry in SETI / High Precision Astrometry: Not just for exoplanets  
**Interstellar Frontiers: Bridging SETI, Astrobiology, and the SKA - 2024**
- Star-spots, stellar dynamos and habitable exoplanet astrometry  
**Australian Exoplanet Workshop 9 - 2023**

*Posters:*

- Towards Stellar Obliquities: Recovering Stellar Inclinations via High Precision Astrometric Monitoring  
**Cool Stars 22 - 2024**
- Recovering Stellar Inclination with High Precision Astrometry  
**Extreme Solar Systems V – 2024**
- Inferring properties of stellar systems via astrometric monitoring  
**Astronomical Society of Australia AGM – 2023**

## Work Experience

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### Head Tutor of QBUS3600 – Business Analytics in Practice

USYD

June 2024 – Ongoing

*This course is a capstone unit where students work on a semester long project with a partner company. Students are taught machine learning and statistical techniques to take advantage of the large and rich datasets provided by the partner companies.*

- Took the initiative to update and create tutorial materials for this course to ensure students can go beyond simple machine learning and create complex models that are appropriate for their projects.
  - Additions include, multi-stage modelling, multi-class/label/output classification models, and practice problems using real world datasets.
  - Updated tutorials on gradient descent, EDA, clustering, random forests, model selection, and gradient descent to go into greater detail and improve students understanding of said topics.
- Liaised with corporate partners to ensure a smooth transfer of confidential data, a unified project vision, and clear project requirements for students.
- Dealt with the admin side of the class, including managing other tutors, organizing marking, and dealing with some student issues.

### Tutor of QBUS3600 and BUSS6002 – Data Science in Business

USYD

July 2022 – June 2024

*BUSS6002 is a first-year master's level course that serves as an introduction to both programming and data analysis. My teaching scores in this course, and QBUS3600, are consistently above 90% positive rate in all areas.*

### Research Assistant at the Sydney Astrophotonic Instrumentation Laboratory

USYD

July 2022 – June 2024

In addition to the research I conducted in this role, I also:

- Created solutions to, and marked, assignments for PHYS4016 – Bayesian Data Inference and Machine Learning
- Translated code from IDL to Python to reduce technical debt

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## Programming

- Proficiency in Python and LaTeX
- Competency in Fortran and IDL

## References

Dr Ben Montet (PhD supervisor)

[b.montet@unsw.edu.au](mailto:b.montet@unsw.edu.au)

Ali Yaseen (QBUS3600 Course Coordinator)

[ali.yaseen@sydney.edu.au](mailto:ali.yaseen@sydney.edu.au)

+61 498 999 035