# Hello. I'm Robert Finnegan.


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I am a postdoctoral researcher specialising in advanced image software technologies for radiotherapy. I am currently a cancer researcher (South Western Sydney LHD, University of Sydney, and the Ingham Institute). I have experience with large-scale data analysis, developing novel algorithms, and translating research into the clinical radiotherapy workflow.

I have a diverse academic background, studying maths, astrophysics, and medical physics. I aim to use my broad knowledge base, strong communication skills, dynamic technical expertise, and range of practical competencies to drive progress in cancer research.

## Research Experience.

**2021 - Current.**
**Postdoctoral Cancer Research Fellow**
South Western Sydney LHD, University of Sydney, Ingham Institute

- Develop, validate, and deploy image segmentation algorithms for radiotherapy data analysis. This technology will be integrated into the AusCAT network (a distributed machine learning framework). Initially this work is focussed on cardiotoxicity following thoracic radiotherapy (for breast and lung cancer patients).
- Design and conduct scientific studies to evaluate the performance of medical imaging software, and assess the suitability to use in research studies and clinical radiotherapy practice.
- Support ongoing and future research projects through technical assistance, grant writing, publication of research, teaching, regular attendance at scientific conferences, participation in multidisciplinary radiation oncology meetings, and supervision of students.

**2020 - 2021**
**Translational Cancer Research Fellow**
Sydney West TCRC, University of Sydney, Ingham Institute

- Led the development of a statistical atlas of prostate cancer using MRI and high-resolution histological imaging. This project aims to improve the accuracy of characterising underlying tumour characteristics using non-invasive imaging, a key step for focal, biologically-adapted radiotherapy.
- Provided technical assistance for several multidisciplinary research projects at the Institute of Medical Physics (University of Sydney) and Westmead Hospital. A common focus is increasing the usefulness of MRI in radiotherapy.

**2018**
**Endeavour Research Fellow**
Syddansk Universitet, Odense Universitetshospital (Denmark)

- Developed and implemented a processing pipeline for the automatic delineation of computed tomography images collected from hospitals around Denmark. Analysed and validated this pipeline in the context of the dose received by the heart during radiotherapy for breast cancer.
- Reinforced collaboration between research groups in Australia and Denmark, including invited presentations and discussions with researchers and clinicians from around Denmark.

# Education.

**2016 - 2020**
**Doctor of Philosophy, Science (Physics)**
University of Sydney

*Getting to the Heart of the Problem: Automated Image Segmentation of Cardiac Structures for Radiotherapy Dosimetry*

During my doctoral research I developed a software framework for the automatic delineation of cardiac substructures. These tools are needed to better understand how radiation dose to the heart leads to observed increases in rates of cardiac toxicities and death from heart disease.

I applied this software for a dataset of over 1500 Danish women participating in a radiotherapy clinical trial for breast cancer, producing key data for future research in modelling treatment outcomes. Further, this framework has been translated into the clinical workflow at Liverpool Cancer Therapy Centre. Ongoing research is assessing its potential for use in the routine care of lung and breast cancer patients to reduce the workload and improve delineation consistency.

**2013 - 2015**
**Master of Physical Science, with Distinction**
University of Western Australia

*Refining Photometric Redshifts in the GAMA Survey*

This degree was an equal split of postgraduate coursework and a dissertation over 2 years. My research extended recent work in creating a catalogue of gravitationally bound galaxy clusters in a cosmological survey (Galaxy and Mass Assembly - GAMA). I developed a novel statistical algorithm to improve measurements of the distances to galaxies. The successful completion of this project provided new knowledge and capabilities for astronomers, as well as a suite of programs and data manipulation tools for easier and faster applications in the future.

**2010 - 2012**
**Bachelor of Science**
University of Western Australia

*Majors in Physics and Applied Mathematics.*

I graduated with the Physics Achievement Prize (Level III). Undergraduate research projects I conducted included measuring the mass of the Milky Way using the SRT radio telescope at UWA, and imaging of nearby star clusters using the SPIRIT II optical telescope, also located at UWA.

# Peer-Reviewed Publications.


**Finnegan R**, Lorenzen E, Dowling J, Thwaites D, Delaney G, Brink C, & Holloway L (2021) Validation of fully automatic cardiac segmentation with patient-specific dose uncertainty *Physics in Medicine & Biology.* **66 (3)** 035014.

**Finnegan R**, Orlandini L, Liao X, Yin J, Land, J, Dowling J, Fontanarosa D (2021) Feasibility of using a novel automatic cardiac segmentation algorithm in the clinical routine of lung cancer patients. *PLOS One*. **16 (1)** e0245364.

**Finnegan R**, Lorenzen E, Dowling J, Thwaites D, Jensen I, Berg M, Thomsen MS, Offersen BV, Brink C, & Holloway L (2020) Analysis of cardiac substructure dosimetry in a large, multi-centre Danish breast cancer cohort: trends and predictive modelling. *Radiotherapy & Oncology*. **153** 130-138.

**Finnegan R**, Lorenzen E, Dowling J, Holloway L, Thwaites D, Brink C (2020) Localised delineation uncertainty for iterative atlas selection in automatic cardiac segmentation. *Physics in Medicine & Biology* **65 (3)** 035011.

**Finnegan R**, Dowling J, Koh ES, Tang S, Otton J, Delaney G, Batumalai V, Luo C, Atluri P, Satchithanandha A, Thwaites D, Holloway L (2019) Feasibility of multi-atlas cardiac segmentation from thoracic planning CT in a probabilistic framework. *Physics in Medicine & Biology* **64 (8)** 085006.

Kafle PR, Robotham AS, Lagos CD, Davies LJ, Moffett AJ, Driver SP, Andrews SK, Baldry IK, Bland-Hawthorn J, Brough S, Cortese L, Drinkwater MJ, **Finnegan R,** Hopkins AM, Loveday J (2016) Galaxy And Mass Assembly (GAMA): the absence of stellar mass segregation in galaxy groups and consistent predictions from GALFORM and EAGLE simulations. *Monthly Notices of the Royal Astronomical Society*. **463(4)** 4194-4209.

# Awards, Prizes, and Stipends.

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|---|---|
| **2021** | Best Oral Presentation (Sydney Cancer Conference, judged by cancer consumers) |
| **2020** | Cancer Research Network Grant (Deep Learning course) |
| **2019** | First place judged oral presentation (U. Sydney HDR Physics Student Symposium) |
| **2019** | Best talk prize (Mathematical Modelling in Biology and Medicine) |
| **2018** | Cancer Research Network Travel Grant |
| **2018** | U. Sydney Postgraduate Research Scholarship Scheme Grant |
| **2017** | NSW/ACT ACPSEM Branch Prize (MedPhys17) |
| **2017** | U. Sydney Postgraduate Research Scholarship Scheme Grant |
| **2017 - 2019** | SWSLHD Medical Physics Radiation Oncology Scholarship |
| **2016 - 2020** | Australian Postgraduate Award |
| **2013** | Physics Achievement Award (Level II) (U. Western Australia) |

# Professional Involvement.

**Committee member.** ACPSEM Software Development Task Group

**Member.** Australian Institute of Physics

**Member**. The Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM)

**Member.** European Society for Radiotherapy and Oncology (ESTRO)

**Member.** European Society of Cardiology (ESC)

**Member.** Sydney West Translational Cancer Research Centre

**Member.** Sydney Vital Translational Cancer Research Centre

**Associate Editor.** Physical and Engineering Sciences in Medicine

# Professional and Academic Experience.

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|---|---|
| **2021 - Current.** | Guest lecturer: Advances in Disease Diagnosis and Treatment<br>(Sydney Medical School, University of Sydney) |
| **2021 - Current.** | Postgraduate research supervisor (2 master's, 1 honours student, University of Sydney) |
| **2020 - Current.** | Lecturer: Image Segmentation (Institute of Medical Physics, University of Sydney) |
| **2016 - Current.** | Tutor, mathematics and physics (Mana Yura, University of Sydney) |
| **2016 - 2019** | Teacher, mathematics (QED Education, Parramatta) |
| **2013 - 2015** | Science outreach demonstrator (School of Physics, University of WA) |
| **2014 - 2015** | John De Laeter Scholarship Student (Gravity Discovery Centre) |
| **2012 - 2015** | Tutor and coursework developer (School of Indigenous Studies, University of WA) |
| **2012 - 2013** | Student Research Fellow (Australian Astronomical Observatory) |
| **2011 - 2013** | Analyst and exploration geophysics data processing (ExploreGeo, Perth) |