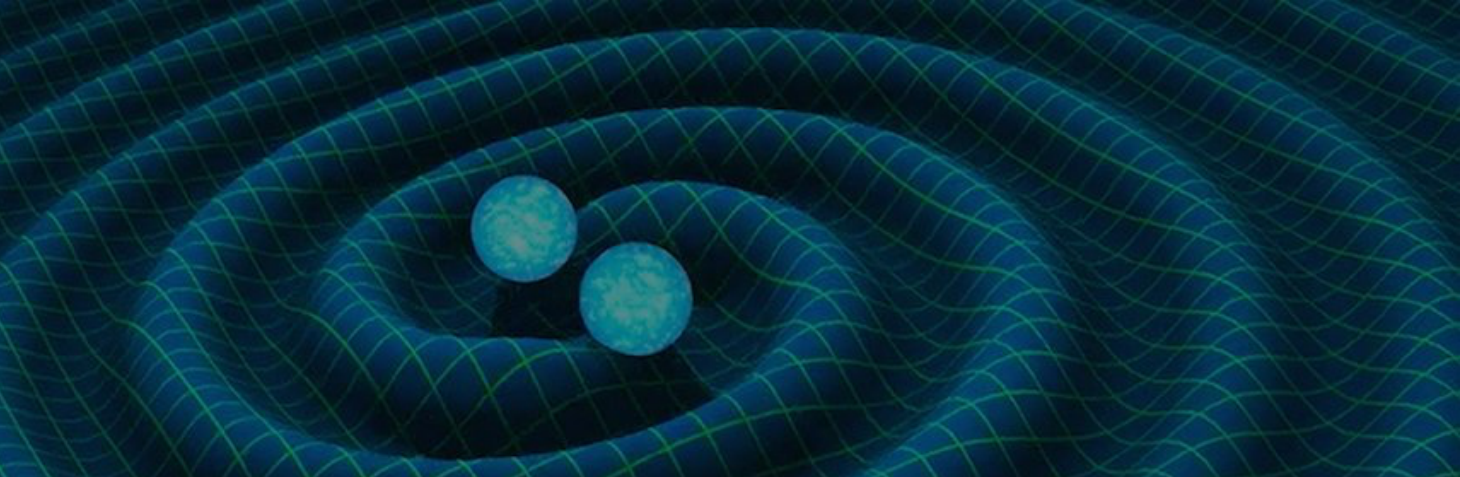




GWDC

Gravitational Wave Data Centre



ADACS

ASTRONOMY DATA AND COMPUTING SERVICES



Professional Software Services:

- System analysis and design
- Scientific computing, GPU programming
- HPC workflow optimization
- Large-scale scientific databases
- Data science methodologies
- Machine learning
- Web development/portals
- Cloud computing
- Scientific visualisation

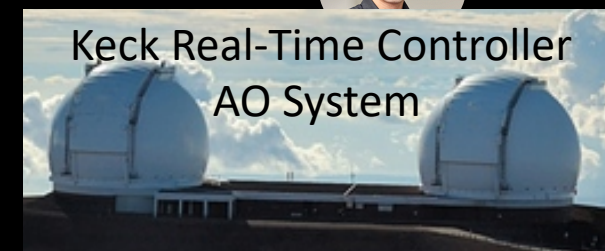


\$2M NCRIS Funding (annual)



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Astronomy-focused training, support and expertise to maximise scientific return on investments in astronomical data and computing infrastructure

Funded through the astronomy NCRIS allocation to AAL

Commenced operations March 2017

Three service components:

- Training – face-to-face, webinars, internships
- National Support
 - Professional Software Services (merit-allocated, 2 calls/year)
 - Astronomy Supercomputer Time Allocation Committee
 - Data Management and Collaboration Platform
- OzSTAR astronomy software support

Two nodes:

- Swinburne University of Technology (Melbourne)
- Curtin University and Pawsey Supercomputing Centre (Perth)



Home / Learning Materials

Search course...

Search

INTRODUCTION TO PYTHON

- Installation
- variables and data Structures
- Functions
- package management



Introduction to Python

Free [ADACS Learning Resources](#)

INTRODUCTION TO ASTROPY

- Units and quantities
- Working with N-dimensional data
- Reading and writing Files
- Models and Fitting



Introduction to Astropy

Free [ADACS Learning Resources](#)

INTRODUCTION TO HDF5

- File objects
- Groups
- Datasets
- Attributes
- Parallel HDF5 and MPI



Introduction to HDF5

Free [ADACS Learning Resources](#)

INTRODUCTION TO ASTROPY

- Units and quantities
- Working with N-dimensional data
- Reading and writing Files
- Models and Fitting



Introduction to Astropy

INTRODUCTION TO MPI

- mpi4py
- Point-to-point communication
- Collective Communication



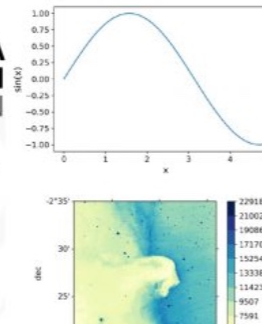
INTRODUCTION TO VERSION CONTROL WITH GIT

- Basic concepts
- commits
- branching
- merging and conflict
- collaborative online hosting



SCIENTIFIC DATA VISUALIZATION WITH PYTHON

- choosing a visualization
- visualization types
- visualization packages



- 2017-B** “Building and Supporting User Communities with GPU-Accelerated Computing”, Bekiaris, **CSIRO** (13 weeks)
“Speeding-up Reionisation with GPUs”, Mutch, **Melbourne** (9 weeks)
- 2018-A** “An Automated Data Reduction Pipeline for AAO Data Central”, O’Toole, **AAO** (12 weeks)
“Galaxy and Black Hole Co-evolution Survey using Machine Learning”, Banfield, **ANU** (15 weeks)
“GPU Acceleration of Gravitational Wave Signal Models”, Smith, **Monash** (13 weeks)
- 2018-B** “Extended MWA Survey Progress and Monitoring”, Hurley-Walker, **Curtin** (11 weeks)
“Corrfunc – Blazing Fast Correlation Functions on GPUs”, Sinha, **Swinburne** (7 weeks)
“Bringing LIGO Science to the Masses”, Lasky, **Monash** (11 weeks)
“Multi-threading ASKAPSoft Synthesis Imaging”, Mitchell, **CSIRO** (24 weeks)
“Model Dispersion with PRISM”, van der Velden, **Swinburne** (11 weeks)
- 2019-A** “An Astronomical Spectrum Viewer for Modern Web Environments”, Wolf, **ANU** (25 weeks)
“Bilby 2.0”, Lasky, **Monash** (7 weeks)
“Building on the Bilby-UI – Continuous Waves”, Clearwater, **Melbourne** (7 weeks)
“DWF Portal and Database”, Cooke, **Swinburne** (13 weeks)
- 2019-B** “ProFound”, Robotham, **UWA** (14 weeks)
“Parallelisation of the SOFIA source finding program”, Westmeier, **UWA** (9 weeks)
“N-body and VR, Elahi, **UWA** (13 weeks)
“An implementation of BFDMT in CUDA”, Bannister, **CSIRO** (4 weeks)
- 2020-A** “Global Cosmic Ray Detection”, Duffy, **Swinburne** (16 weeks)
“Rapidly and optimally identifying GW optical counterparts for GOTO”, Ackley, **Monash** (12 weeks)
“Fast becomes faster: a full OpenCL rewrite of Corrfunc”, Sinha, **Swinburne** (13 weeks)
“Software support for the SMART pulsar survey”, Bhat, **Curtin** (7 weeks)

Gravitational Wave Data Centre

- Established July 1st 2019
(contract signed August 28th 2019)
- \$2.63M funding through to end 2021
 - “The GWDC will provide the infrastructure, training and support to enable gravitational wave researchers nationally to lead the discovery of events from the latest data on an international scale and to maximise the scientific impact of these discoveries.”
- Based at Swinburne with ADACS node

Gravitational **W**ave **D**ata **C**entre

Activities will broadly fall within five areas:

1. Systems Support

- Access to supercomputing resources for ingesting/processing/exploring GW data

2. Software Development

- Creating/maintaining software infrastructure for GW workflows

3. Optimisation

- Mapping workflows to hardware, profiling, parallelisation

4. Hardware

- Acquiring, provisioning and maintaining required hardware

5. Training

- Ensuring researchers are trained in the use of relevant infrastructure



- Next generation hybrid HPC facility
- National facility for the astronomy community
 - 4212 Intel SkyLake cores
 - 234 NVIDIA P100/V100 GPUs
 - 6.2PiB lustre/zfs filesystem
 - 100 Gbps OmniPath network
- 1.25 Petaflop/s (DP) performance
- National / OzGrav / Swinburne
- Linked to Swinburne OpenStack Cloud



What works well:

- Supportive team environment, encouragement to work outside of existing skill areas
- Knowledge transfer and continuity
- Repurposing and evolution of infrastructure

What we can work on collectively:

- Skill sharing linkages?
- Longer-term career paths beyond 1-2 year contracts
- Continued collective education of researchers in professional development practices