Payton E. **Rodman**

in /payton-rodman   🌐 www.paytonelyce.com   ○ /paytonrodman

Summary

Graduate researcher with a strong foundation in scientific computing and expertise in data analysis using Python, Matlab, and C++. Proficient in delivering impactful insights using advanced data science methodologies, visualization tools (e.g. matplotlib, seaborn), and high-performance computing (HPC) resources on large data sets (>80TB). Adept at translating technical concepts for diverse audiences, I thrive in roles requiring innovation, precision, and scalable solutions to data-driven challenges. I am seeking a role focusing on Data Analysis, Machine Learning, and Software Development where I may apply my skills to high-impact problems and learn new methods.

Education

PhD Astronomy   2019 – 2024
University of Cambridge, Institute of Astronomy / Churchill College   Cambridge, UK

BSc (Hons) Physics   2018
University of Tasmania, GPA: 7.0/7.0   Hobart, AUS

BSc Physics and Applied Mathematics   2015 – 2017
University of Tasmania, GPA: 7.0/7.0   Hobart, AUS

Technical Skills

Programming / scripting languages: Python (pandas, numpy, scipy, mpi4py), C++, Matlab, SQL, LaTeX
Visualisation: VisIt, matplotlib, seaborn
Other tools: git, Athena++, Pluto, High-Performance Computing (HPC)

Experience and Projects

Mapping barometric pressure migraine risk worldwide   Dec 2024 – Jan 2025
- Mapped geographic trends in barometric pressure variation, a common trigger for migraine headache.
- Analysed and cleaned 10 years of historical weather data from 8,189 weather stations across 210 countries in Python.
- Produced unit tests to verify the output of core functions under the pytest framework.

Magnetic field evolution in black hole accretion disks and relativistic jets   Oct 2019 – Dec 2024
PhD thesis
- Produced and analysed simulated accretion disk and relativistic jet data, quantifying the evolution of magnetic fields.
- Contributed novel C++ code to existing simulation frameworks, adhering to the established best practices and code style.
- Analysed large ($\sim$100TB combined) datasets using parallelised Python on HPC.
- Produced journal articles and presentations on the findings, presented to both expert and non-expert audiences.

Probing intracluster gas with Faraday Rotation from black hole jets   Feb 2018 – Nov 2018
Honours thesis
- Used Faraday Rotation measurements of black hole jets to investigate their potential for constraining host galaxy properties.
- Produced and analysed analytic jet and galaxy cluster models in Python.
- Improved galaxy mass estimates sixfold by including Faraday Rotation data.

- Reported findings in print and contributed talks at conferences and meetings.

The spectral signature of interstellar scintillation   Nov 2016 – Feb 2017
Summer Research Internship
- Analysed spectral data from 2,232 quasars observed in the Australian Telescope Extreme Scattering Events (ATESE) survey to quantify radio source variability.
- Developed and validated a structure function-based approach for assessing scintillation strength.
- Verified a new method for real-time detection of Extreme Scattering Events on historical data, identifying three new candidates.

Environmental drivers of radio jet asymmetry   Nov 2015 – Feb 2016
Summer Research Internship
- Utilised data from the citizen science project *Radio Galaxy Zoo* to study whether nearby galaxy clustering affects the physical properties of galaxy jets.
- Analysed properties of an initial sample of 2,679 candidate sources, utilising observational data from SDSS and radio surveys (FIRST and ATLAS) obtained using SQL.
- Validated predictions of radio source dynamics models, showing that denser environments negatively correlate with lobe extension and luminosity for FR-II sources at a 4σ level.
- Findings reported in print and presented at conferences.

Presentations and Posters

Apr 2024: Churchill College Conference on Everything, *Contributed talk (non-expert audience)*
Nov 2022: University of Bremen, *Invited talk*
Sep 2022: 31st Symposium on Relativistic Astrophysics, Prague, *Contributed talk*
Jan 2020: X-ray BunClub, *Department talk*
Sep 2019: UTAS School of Natural Sciences, *Department talk*
Dec 2017: AIP 2017 Summer Meeting, *Poster*
Aug 2017: From Black Hole to Environment, *Poster*
Feb 2017: CSIRO 15 Minutes of Fame event, *Project presentation*

Publications

4 publications in peer-reviewed journals, 2 first-author. 1 first-author in preparation. Full record available at ⓘD https://orcid.org/0000-0002-1624-9359

Highlighted Awards and Scholarships

2024: Churchill College Conference On Everything Prize *for best talk in the physical sciences*
2019: Gates-Cambridge Scholarship
2019: University Medal
2018: Dean's Honour Roll *for Bachelor of Science with Honours*
2018: Ken McCracken Prize *for the best Honours thesis in the discipline of Physics*
2018: Vice-Chancellor's Leadership Award