Ashley C. Monaghan

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Objective

Master of Science (Physics) student with a strong research focus in extragalactic astrophysics, specifically Active Galactic Nuclei (AGN). Experienced in multi-wavelengthh data analysis, spectral modeling, and machine learning techniques applied to large astronomical datasets. Research interests include AGN orientation, accretion physics, black hole feedback, dark matter/energy and AGN evolution. A committed academic leader with a track record of coordinating outreach, mentoring, and student representation. Keen to contribute novel approaches to data-driven astronomy, exploring high-energy astrophysical phenomena, and pursue a research-driven career.

Education

- **University of Melbourne** *March 2024 - Present*
  Master of Science (Physics) Melbourne, Australia
  - First Class Honours WAM
  - Recipient of the N.D Goldsworthy Scholarship for Physics (Academic Excellence).
  - Recipient of the Helen R Freeman Scholarship in Physics (Academic Excellence).
- **University of Melbourne** *March 2021 - December 2023*
  Bachelor of Science (Physics) Melbourne, Australia
  - First Class Honours WAM
  - Recipient of the Duke of Edinburgh International Award (Community Engagement).
  - Recipient of the Melbourne Plus Award (Community Engagement).
  - Recipient of the Kwong Lee Dow Young Scholars Award (Academic Excellence).

Experience

- **iTelescope** *Feb 2025 – Present*
  Junior Astronomer – Telescope Adviser Remote/Siding Spring Observatory, Australia
  - Provided expert guidance on telescope operations, optimising observational strategies and troubleshooting technical issues to support uninterrupted astronomical research
  - Delivered hands-on support for astrophotography projects, including image processing techniques and telescope configuration for high-quality data acquisition
  - Developed comprehensive educational materials on astrophotography, observational methods, and data processing to enhance user engagement and scientific outcomes
- **University of Melbourne** *Nov 2024 – Present*
  Postgraduate Research Student Melbourne, Australia
  - Applied machine learning to enhance multidimensional regression models for quasar orientation estimation, advancing AGN structural understanding
  - Implemented weighted orthogonal distance regression to address heteroscedasticity in emission line data, improving model accuracy for black hole orientation
  - Conducted statistical analysis of Civ, Mgii, and Ciii] emission lines, revealing insights into quasar structure and SMBH environments
- **University of Melbourne** *July 2024 – Present*
  Academic Tutor – Faculty of Science Melbourne, Australia
  - Delivered interactive astronomy tutorials using tools such as Stellarium, iTelescope, and planetarium software to visualise astronomical phenomena
  - Simplified complex STEM topics for diverse learners through tailored, engaging instruction
  - Collaborated with faculty to align tutorials with curriculum objectives and improve student learning outcomes
- **University of Melbourne** *May 2024 – Present*
  Women in Physics Coordinator – Faculty of Science Melbourne, Australia
  - Coordinated and managed events aimed at promoting diversity in physics, including social catchups, workshops, and networking events
  - Secured partnerships and sponsorships through collaboration with internal and external stakeholders to enhance program reach and impact
  - Conducted surveys and analysed data to identify demographic in physics and to inform program development
- **Commonwealth Bank Australia** *Nov 2024 – Jan 2025*
  Technology Engineering Intern Melbourne, Australia

- Designed and implemented data-driven solutions using Python to optimise operational workflows and improve efficiency
- Developed and maintained RISE documentation to ensure clarity, alignment, and compliance with cybersecurity standards
- Contributed to policies on quantum-resistant cryptography, demonstrating foresight in securing financial systems against emerging threats

- **University of Melbourne** *Feb 2024 – Present*
  Peer Programs – Student and Scholarly Services Melbourne, Australia
  - Conducted demographic analyses and feedback synthesis to design inclusive, student-centred peer programs
  - Facilitated advising sessions and workshops across student services, adapting to a range of academic and cultural needs
  - Boosted engagement with student initiatives via strategic use of social media and marketing campaigns
- **University of Melbourne – School of Physics: Green Impact** *Jan 2023 – Apr 2023*
  Data Analyst Intern Melbourne, Australia
  - Processed electricity usage data and forecasted trends using Python to reduce electrical waste
  - Created predictive models for energy demand, pricing, and pandemic-era shifts in consumption
  - Collaborated across disciplines to identify optimal energy use strategies from empirical data

PROJECTS

- **Quasar Orientation** *Nov 2024 – Present*
  Tools: `Python, Astropy, XSPEC, TOPCAT, VO Tools`
  - Applied machine learning techniques to enhance multi-dimensional regression models for quasar orientation estimation, improving AGN structure models.
  - Implemented weighted orthogonal distance regression (WODR) to handle heteroscedasticity in spectral line measurements.
  - Analysed correlations between Civ, Mgii, and Ciii] emission lines to uncover insights into supermassive black hole environments.
- **SABRE South Analysis (ARC Centre of Excellence for Dark Matter Particle Physics)** *Feb 2024 – Dec 2024*
  Tools: Python, C, ROOT, SciPy
  - Built Python/C algorithms to detect low-mass dark matter particles and optimise signal extraction in SABRE South.
  - Applied machine learning and statistical models to improve sensitivity analysis for WIMPs.
  - Extracted detector limitations using phenomenological simulations, advancing dark matter detection strategies.
- **Belle II Dark Sector Analysis (KEK – High Energy Accelerator Research Organization)** *Jun 2023 – Nov 2024*
  Tools: Python, R, C, basf2, ROOT
  - Conducted large-scale data analysis of B-meson decays and dark sector particles at Belle II.
  - Designed ML algorithms for particle event reconstruction to extract physical features from experimental data.
- **Meta-Optics Light Conversion (ARC for Transformative Meta-Optics Systems)** *Nov 2022 – Feb 2023*
  Tools: COMSOL Multiphysics, Python
  - Investigated plasmonic metasurfaces with up-converting nanoparticles for medical and sensing applications.
  - Enhanced infrared-to-visible light conversion efficiency through nanoscale optical design.
  - Contributed to development of miniaturised optical systems for photon manipulation at sub-wavelength scales.

SKILLS

- **Programming Languages:** Python, C++, C, R, Bash, LaTeX
- **Web Technologies:** HTML, CSS, Markdown, Overleaf, GitHub Pages
- **Database Systems:** SQLite, PostgreSQL (basic), Astroquery, VizieR, Virtual Observatory (VO) Tables
- **Data Science & Machine Learning:** scikit-learn, XGBoost, TMVA, pandas, statsmodels, seaborn, AstroML
- **DevOps & Version Control:** Git, GitHub, Snakemake, Docker (basic)
- **Specialized Astrophysics Skills:** AGN Spectral Fitting (XSPEC, Sherpa), X-ray Data Reduction and Analysis, Emission Line Diagnostics, Multiwavelength Crossmatching, Machine Learning Applications in Astronomy
- **Mathematical & Statistical Tools:** SciPy, NumPy, scipy.odr, Matplotlib, SymPy, Astropy
- **Other Tools & Technologies:** ROOT, COMSOL Multiphysics, basf2, TOPCAT, HEASoft, CIAO
- **Research Skills:** Multiwavelength Data Analysis, Stacked Spectral Modelling, Simulation-Based Inference, Large International Collaboration, Scientific Writing, Grant Writing, Presentations, Stakeholder Engagement

Leadership and Volunteer Experience

- **Committee Member – Student-Staff Reference Committee** *May 2025 – Present*
  Faculty of Science, University of Melbourne [🌐]
  - Contributed to high-level decision-making regarding student experience and curriculum quality across the Faculty of Science
  - Collaborated with academic leadership and student reps to discuss equity, communication, and teaching innovations
  - Raised student concerns and co-developed policy recommendations with university staff
- **Representative – SSLC (Student-Staff Liaison Committee)** *Mar 2021 – Present*
  School of Physics and Mathematics & Statistics, University of Melbourne
  - Collected and analysed student feedback through surveys and informal discussions to evaluate subject delivery
  - Presented findings and actionable suggestions directly to Heads of School and senior academic staff
  - Advocated for improvements in assessment fairness, communication clarity, and inclusive teaching practices
- **Outreach Assistant – School of Physics and Mathematics** *Jun 2022 – Present*
  University of Melbourne
  - Delivered engaging science workshops to primary and secondary school students, covering optics and mathematical modelling
  - Assisted students with hands-on programming and data analysis tasks to interpret experimental results
  - Designed educational content and interactive activities to promote STEM curiosity and skills development
- **Member – Rotary Club of Footscray** *Jun 2019 – Present*
  Rotary International, District 9800 [🌐]
  - Advocated for national adoption of community-led initiatives, supporting rollout across over 100 Rotary Clubs in Australia
  - Mentored National Youth Science Forum (NYSF) candidates, guiding students through STEM career pathways and outreach programs
  - Participated in local service projects and inter-club collaborations promoting youth leadership and scientific literacy
- **President – Physics Students Society** *Mar 2021 – May 2024*
  The University of Melbourne [🌐]
  - Led a student society of 500+ members, coordinating up to 4 events weekly including lab tours, academic panels, astronomy nights, and networking events
  - Implemented student engagement strategies, increasing membership retention and visibility across campus
  - Produced promotional videos, secured financial grants, and maintained accurate budgeting for UMSU reporting
  - Represented students in monthly Faculty of Science meetings, advocating for improved undergraduate learning experiences
- **Peer Mentor – Student Life Program** *Dec 2021 – Jul 2022*
  University of Melbourne
  - Provided one-on-one mentoring for first-year science students, supporting personal, academic, and career development
  - Guided mentees in setting goals, navigating university resources, and building resilience during transition to tertiary study
  - Awarded **Best Mentor 2022** for outstanding contributions to peer mentoring and student engagement

References

Available upon request