Joshua Weston

Curriculum Vitae

Astrophysics Research Centre
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Final year Ph.D. Student in Astrophysics and member of the Leverhulme Interdisciplinary Network on Algorithmic Solutions (LINAS). Machine Learning-focused astronomer with interest in transients and the societal impact of AI and ML, and previous experience in the data science industry. Currently focused on transient detection and classification in the Rubin Observatory's Legacy Survey of Space & Time (LSST).

Education / Affiliations

Ph.D. Astrophysics *Oct 2022 - Present*
Queen's University Belfast, Leverhulme Interdisciplinary Network on Algorithmic Solutions (LINAS)
Thesis Title: *Machine and Algorithm-driven Discovery in Big Data*
Supervisors: Professor Stephen Smartt, Dr Matt Nicholl, Professor Muiris MacCarthaigh

Balzan Junior Research Fellow *Oct 2025 - Dec 2025*
University of Oxford, Department of Physics, New College

M.Phys. with Astronomy *Sep 2016 - Jun 2020*
University of Southampton First Class Honours
Dissertation Title: *Dust Reverberation Mapping in Type I Active Galactic Nuclei*

Other Employment History

Risk Analyst Lead *2022*
Risk Decision Science & Analytical Innovation, Nationwide Building Society

Supported development of junior colleagues and helped champion best practices. Lead development of skills developed in model development from judgment-based to machine learning models, as well as evaluation metrics and monitoring techniques.

Risk Analyst *2020 - 2022*
Risk Decision Science & Analytical Innovation, Nationwide Building Society

Role supporting projects regarding development, maintenance and monitoring of credit risk and economic crime decision models. Experience gained learning and using SAS software for data analysis throughout various model development cycles.

Skills & Expertise

Machine Learning & Coding: Python, SQL, R, SAS, Git, VBA, LaTeX, HTML, CSS, Keras, TensorFlow, PyTorch, Artifical Neural Networks, Convolutional Neural Networks, Linear/Logistic Regression, XGBoost, Random Forests

Research Interests: Transient Detection, Supernovae, Machine Learning, Data Processing, Automation, AI, Transient Host Galaxies, Transient Classification, Big Data ...

First Author Publications

J.G. Weston, D.R. Young, S.J. Smartt, M. Nicholl, M.J. Jarvis, I.H. Whittam,, *Identifying Transient Hosts in the LSST Deep Drilling Fields*, 2025, ArXiv Preprint (Accepted by Astrophysical Journal)
Reviewed and collated pre-existing coverage of LSST's Deep Drilling Fields for faint and high-redshift transient host data. Selected the best catalogues for implementation into crossmatching software for the Lasair Alert Broker. Tested morphology-based approaches and machine learning confidence scores for host selection.

J.G. Weston, K.W. Smith, S.J. Smartt, J.L. Tonry, H.F. Stevance, *Training a convolutional neural network for real–bogus classification in the ATLAS survey*, 2024, RAS Techniques and Instruments
Developed Convolutional Neural Networks for real/bogus transient classification on ATLAS difference images, reducing the amount of bogus data passed to astronomers for review and increasing efficiency of detection efforts. Demonstrated the importance of regular retraining in the implementation of machine learning models in astronomical data pipelines.

Co-Author Publications

S. Srivastav, S.J. Smartt, T. Moore, ... , **J.G. Weston**, et al., *ATLAS100 – I. A volume-limited sample of supernovae and related transients within 100 Mpc*, 2026, ArXiv Preprint

J. H. Gillanders, L. Rhodes, S. Srivastav, ... , **J.G. Weston**, et al., *Discovery of the Optical and Radio Counterpart to the Fast X-Ray Transient EP 240315a*, 2024, The Astrophysical Journal Letters

M. Nicholl, D.R. Pashem, A. Mummery, ... , **J.G. Weston**, et al., *Quasi-periodic X-ray eruptions years after a nearby tidal disruption event*, 2024, Nature

T. Moore, S.J. Smartt, M. Nicholl, ... , **J.G. Weston**, et al., *SN 2022jli: A Type Ic Supernova with Periodic Modulation of Its Light Curve and an Unusually Long Rise*, 2024, The Astrophysical Journal Letters

Selected Coding Projects

Lestrade, *Python, SQL, Git, Markdown* *2025*
Python-based package for automated catalogue analysis and extragalactic transient-host matching. Integrates multiple catalogues to enable morphology-based analysis and machine learning applications.

Fletcher, *Python, Javascript, CSS, Git* *2026*
Python-based package for machine learning classifier analysis. Allows for model data fine-tuning and threshold calibration.

Ongoing Projects

Rubin Difference Detectives: Finding Truth and Expertise *2025 - Present*
Rubin Difference Detectives is a Zooniverse citizen science project launched in November 2025, tasking volunteers with real/bogus classification of LSST transient alert stamp triplets. A parallel expert labelling project ran alongside it, restricted to experienced annotators from the QUB/Oxford Transient Group. The project investigates how citizen scientist labelling compares to expert annotation. The resulting label set will be used to train and evaluate machine learning classifiers for the LSST alert stream.

Astronomy, Noesis & The AI Co-Scientist *2025 - Present*
We argue that while AI tools are a natural continuation of astronomy's co-evolution with technology, their adoption risks undermining opportunities for noetic thought: the reflective, creative intelligence that generates genuinely new knowledge. We assess both the entropic risks of AI over-reliance and the negentropic potential of practices such as citizen science, human validation and model monitoring.

Teaching Experience

LINAS Intro to Python & Machine Learning *Spring 2026*
Lead Instructor, Leverhulme Interdisciplinary Network on Algorithmic Solutions, QUB
A course covering the foundational aspects of machine learning for students in the humanities, from basics of Python programming to constructing a neural network model.

Senior Academy Tutor (Maths & Physics) *2024 – Present*
Widening Participation Unit, Queen's University Belfast
Provided personalised subject tutoring to Year 13 and 14 students from underrepresented backgrounds, supporting progression into Higher Education, Further Education, or Higher Level Apprenticeships.

Demonstrator *2023 – Present*
School of Mathematics & Physics, Queen's University Belfast

- PHY3009 Computational Physics — A third-year module covering numerical methods for PDEs, Bayesian statistics, and parameter estimation.
- PHY2006 Mathematical Physics — A second-year module covering advanced linear algebra, Fourier analysis, PDEs, and numerical methods.
- PHY1002 Mathematics for Scientists and Engineers — A first-year module covering calculus, linear algebra, complex numbers, and vector calculus.

Teaching Fellowship Scheme *September 2024 – Present*
Structured programme developing teaching skills in early career researchers through training, practice and mentorship. Upon completion, will receive accreditation as an **Associate Fellow of the Higher Education Academy (AFHEA)**.

Leadership Positions

ATLAS Eyeballing, *Queen's University Belfast* *2022 - Present*
Reviewed nightly transient alert data for the ATLAS survey. Coordinated alert 'eyeballing' duties for collaboration members in QUB and University of Oxford.

LINAS PGR Conference Committee/Co-Chair, *Queen's University Belfast* *2023, 2024*
Organising Committee for the 2023 LINAS PGR Conference. In 2024 I co-chaired the conference, expanding the event to including 30 speakers across 6 panels in a one-day meeting.

LINAS Student Rep, *Queen's University Belfast* *2024 - Present*
Set up the LINAS Student Rep programme and organised representative meetings as part of cohort.

Outreach, Science Communication, & Diversity Initiatives

Articles for The Conversation, *Queen's University Belfast* *March 2026*
Articles written on the Rubin Observatory and the Legacy Survey of Space and Time.

- How big data is transforming what we know about the universe
- World's biggest astronomy camera seeks to answer pressing questions about the universe

NI Science Festival, *Queen's University Belfast* *Feb 2024, Feb 2025*
Assisted at multiple booths during the Astrophysics Research Centre's Astronomy Day. Principally assisted in the "Supernova hunting" booth, explaining and assisting in transient identification with the general public using real data.

Girls in Maths and Physics, *Queen's University Belfast* *Jun 2024, Jun 2025*
This event was designed to inspire young female physics and maths students and showcase different aspects of the degrees offered by Queen's University Belfast. Assisted in an exoplanet detection programming exercise in 2024. In 2025, I assisted in the "Supernova hunting" booth, discussing my own work with secondary education students.

Conference & workshop contributed talks

LINAS PGR Conference (QUB, April 2023)
Objects in Space: Real or Bogus?

Astroinformatics (INAF OACN, October 2023)
Improvements to the ATLAS Real/Bogus Classifier

Machine learning for transient science (University of Warwick, December 2023)
Improvements to the ATLAS Real/Bogus Classifier

ARC Seminar Series (QUB, January 2024)
Improvements to the ATLAS Real/Bogus Classifier

LINAS Seminar Series (QUB, February 2024)
Objects in Space: Real or Bogus?

LINAS PGR Conference (QUB, April 2024)
Improvements to the ATLAS Real/Bogus Classifier

Rubin Alerts and Broker Workshop (University of Oxford, January 2025)
Identifying Transient Hosts in the LSST Deep Drilling Fields

EAS 2025 (University College Cork, June 2025)
Identifying Transient Hosts in the LSST Deep Drilling Fields

NAM 2025 (Durham University, July 2025)
Identifying Transient Hosts in the LSST Deep Drilling Fields

AI Ethics (University of Oxford, January 2026)
Knowledge production in the age of AI

LSST:UK All Hands Meeting (University of Manchester, April 2026)
Expert Labelling for Rubin Difference Detectives

LINAS PGR Conference (QUB, April 2026)
Expert Labelling for Rubin Difference Detectives

Symposia, Workshops & Training Attended

IBM Data Science Specialization, *Awarded by IBM with Coursera*	*August 2020*
Fundamentals of Deep Learning, *Awarded by NVIDIA*	*Nov 2022*
ARCHER2 Software Carpentry Workshop, *Queen's University Belfast*	*Dec 2022*
Machine Learning Specialization, *Awarded by Stanford University with Coursera*	*Jan 2023*
Code/Astro Workshop, *Northwestern University*	*July 2024*
Critical AI Symposium, *Queen's University Belfast*	*May 2025*
Astrostatistics Summer School, *University of Crete*	*June 2025*

Personal References

Dr. Stephen Smartt	**Dr. Matt Nicholl**	**Dr. Heloise Stevance**
Professor, QUB	Reader, QUB	Schmidt AI in Science Fellow