

William Alston

Senior Lecturer in Data Science

e: w.alston@herts.ac.uk

University of Hertfordshire
College Lane, Hatfield, AL101AB

Astrophysicist working on understanding the most extreme objects in the universe: black holes and neutron stars, using signal processing analysis of the source light curves. I also work on data science methods and their application across astronomy, and developing future X-ray missions.

- Author of 60 refereed papers, 10 as first author (one single author), and two book chapters.
- Mentor of 3 PhD students, 6 graduate students and 6 under-graduate students.

Professional appointments

2023/01-present **Senior Lecturer in Data Science**
University of Hertfordshire, Centre for Astrophysics Research

2020/09-2023/01 **ESA Research Fellow**
ESAC, Madrid

2014/11-2020/08 **Post-Doctoral Research Associate**
Institute of Astronomy
University of Cambridge
2017-2020: ERC grant 340442: *Feedback*
2014-2017: EU FP7 project: *Strong Gravity*

Education

2010-2013 **Doctor of Philosophy (Ph.D.)**
Probing the black hole region in active galaxies using time delays
University of Leicester. Awarded: Feb 2014

2010 **Master of Physics with Astrophysics (MPhys)**
University of Sheffield

Telescope Time Awarded

PI XMM-Newton A019 **855 ks** (largest program awarded this AO)
An unprecedented view of QPO phenomena with RE J1034+396
XMM-Newton DDT **100 ks**
Understanding the X-ray QPO in the active galaxy MS 22549-3712
Liverpool Telescope Sem15A **31 hrs**
Reverberation mass mapping the central black hole in RE J1034+396
XMM-Newton AO13 **620 ks** (largest program on an individual source this AO)
Understanding the X-ray Time delays in the NLS1: PG 1244+026

Co-I NuStar cycle 7 **500 ks (+260 ks XMM)**, PI Fabian. Timing studies of 1H 1934-063
XMM-Newton A020 **130 ks**, PI Mallick, Constraining the inner disc of low mass AGN
XMM-Newton AO15 **1.5 Ms**, PI Fabian. *Mapping the inner accretion ow of IRAS 13224*
XMM-Newton AO17 **700 ks**, PI Pinto. *Exploring the ULXs in NGC 1313*
XMM-Newton AO18 **400 ks**, PI Kara. *Disc & corona reverberation mapping in Mrk 335*

Select Talks

Invited: *X-ray Reverberation*. The X-ray Universe 2020, Noordwijk
QPOs across the mass range. Lorentz Centre meeting on Spectral-Timing, 2017
QPOs and X-ray reverberation in AGN. Strasbourg Observatory, May 2016

Contributed: *X-ray Reverberation mapping active galaxies, HEAD, Monterey, Feb 2019*
Probing the inner accretion region with a 2 Ms XMM obs. COSPAR, July 2018
Phase-resolving HFQPOs in AGN, X-ray Universe 2017, Rome, June 2017

The QPO-reverberation connection in AGN. Black Hole Accretion, Madrid, June 2015
QPOs in Active Galaxies. RAS meeting on Accretion States, London, Apr 2015

Press Releases/Media:

- ESA - [XMM-Newton maps black hole surroundings](#)
- National Geographic - [Astronomers just got a deep peek at a black hole](#)
- Phys.org – [Periodic dipping in an ultraluminous X-ray source](#)

Experience / Skills

- Time and frequency-domain signal processing, including Monte Carlo time series simulations
- Statistical analysis and interpretation, including Bayesian inference and Machine Learning
- **Computer software:** Python, IDL, R, LaTeX, Shell, HTML, XSPEC, STARLINK, IRAF
- **Multi-wavelength data reduction:** XMM-Newton (EPIC, OM, RGS), NICER, NuSTAR, Swift (XRT, UVOT), ASTROSAT, RXTE, Hubble (WFPC-2), LT (SPRAT, IO:O), JCMT (SCUBA-2), NTT (EMMI)

Teaching Experience

- Mathematics Course leader/lecturer (Leicester, 2011-2013): Years 1 & 2 iScience (Nat. Sci.)
- Supervising ESA trainees (2020-present)
- Supervising Ph.D students (IoA, 2013-present)
- Final year undergraduate project supervisor (IoA, 2013-2020): 'Astrophysics project'
- Seminar/problems class Leader (Leicester, 2010-2013):
- Physics & Mathematics Laboratory demonstrator (Leicester, 2010-2013): Physics & Astronomy
- A-level physics tutor (2012-2013)

Affiliations

- *Athena* (satellite) working groups 2.3 and 2.4
- Strobe-X science working group member
- Fellow of the Royal Statistical Society (UK)
- Member of Astrostatistics & Astroinformatics Portal

Services to the community

- Journal/textbook referee for: MNRAS, ApJ, Astro. Nach., PASPJ, MPI, Taylor & Francis
- Telescope proposal reviewer (OTAC): *XMM-Newton*, Liverpool Telescope

Outreach

- Talk on accreting black holes, IoA observing evenings, Oct 2017
- Radio interview: From beer to black holes Cambridge 105 FM (Sep 2015)
- Astronomy open day for Cambridge Science Festival 2014, 2015
- Public talk on black holes at the Wunderkammer improv show, London, Aug 2014.
- Chairing the expert speaker session for BBC Stargazing Live 2013 at University of Leicester
- Talk on studying physics and astronomy at university to GCSE and A-level students

Other relevant experience

- 50hr observation experience (5 nights) at JCMT, Mauna Kea, Hawaii (May 2012)
- Experience with 13", 16" and 20" teaching telescopes (Cambridge, Leicester and Sheffield)
- Organiser for internal astronomy seminars at Leicester (2011-2013)
- *Unconscious Bias* training course certificate (University of Cambridge)
- Postgraduate training courses, including 'Scientific Inference' and 'Numerical Methods'
- UCAS open day tours of the Physics and Astronomy department and Space Research Centre

References

Available on request.

Publication list – William N. Alston

10 first author (1 single author), 40 co-author, 2 textbook chapter contributions
50 refereed, 5 under review
h-index of 22 (19 without self-citations)

ADS link:

[https://ui.adsabs.harvard.edu/search/q=author%3A\(%22Alston%2C%20W%22\)&sort=date%20desc%2C%20bibcode%20desc&p=0](https://ui.adsabs.harvard.edu/search/q=author%3A(%22Alston%2C%20W%22)&sort=date%20desc%2C%20bibcode%20desc&p=0)

First author papers

(10) Quasi-periodic dipping in the ultraluminous X-ray source, NGC 247 ULX-1

Alston, Pinto, Barret, D'Ai, Del Santo, Earnshaw, Fabian, Fuerst, Kara, Kosec, Middleton, Parker, Pintore, Robba, Roberts, Sathyaprakash, Walton, Ambrosi, 2021, MNRAS, 505, 3722. <https://arxiv.org/abs/2104.11163>

(9) A dynamic black hole corona in an active galaxy through X-ray reverberation mapping

Alston, Fabian, Kara, Dovciak, Pinto, Jiang, Middleton, Parker, Miniutti, Walton, Wilkins, Buisson, Caballero-Garcia, Cackett, De Marco, Gallo, Lohfink, Reynolds, Uttley, Young & Zoghbi
Nature Astronomy, 2020, <https://www.nature.com/articles/s41550-019-1002-x>

(8) Non-stationary variability in accreting compact objects

Alston, 2019, MNRAS, 485, 260. <https://arxiv.org/abs/1902.03036>

(7) The remarkable X-ray variability of IRAS 13224-3809 I: the variability process

Alston, Fabian, Buisson, Kara, Parker, Lohfink, Uttley, Wilkins, Pinto, De Marco, Cackett, Middleton, Walton, Reynolds, Jiang, Gallo, Zoghbi, Miniutti, Dovciak & Young, 2019, MNRAS, 482, 2088. <https://arxiv.org/abs/1803.10444>

(6) Quasi periodic oscillations in active galactic nuclei

Alston, Fabian, Markeviciute, Parker, Middleton & Kara, 2016, *Astro. Nach.*, 337, 417.
<https://arxiv.org/abs/1510.01111>

(5) Discovery of a ~2 hr high frequency X-ray QPO and iron K alpha reverberation in MS 2254.9

Alston, Parker, Markeviciute, Fabian, Middleton, Lohfink, Kara & Pinto, 2015, MNRAS, 449, 467.
<https://arxiv.org/abs/1411.0684>

(4) Detection of a QPO in five XMM-Newton observations of RE J1034+396

Alston, Markevičiūtė, Kara, Fabian & Middleton, 2014, MNRAS, 445, 16.
<https://arxiv.org/abs/1407.7657>

(3) X-ray time delays in the narrow line Seyfert 1 galaxy PG 1244+026

Alston, Done & Vaughan, 2014, MNRAS, 439, 1548. <https://arxiv.org/abs/1311.5165>

(2) The flux-dependent X-ray time lags in NGC 4051

Alston, Vaughan & Uttley, 2013, MNRAS, 435, 1511. <https://arxiv.org/abs/1307.6371>

(1) Ultraviolet and X-ray variability of NGC 4051 over 45 days with XMM-Newton and Swift

Alston, Vaughan & Uttley, 2013, MNRAS, 429, 75. <https://arxiv.org/abs/1210.8329>

Textbooks

Fundamental Concepts in X-ray Astronomy (Springer)

2020, Springer. <https://www.springer.com/gp/book/9789811563362>

I contributed chapter 7 on time series analysis methods and their application to accretion physics

Handbook of X-ray and Gamma-ray Astrophysics (Springer)

My contribution is a chapter on the close environments of Active Galaxies

<https://ui.adsabs.harvard.edu/abs/2022arXiv220611790A/abstract>

Coauthor papers (* indicates major contribution)

- (40) **X-ray Reverberation Mapping of Ark 564 using Gaussian Process Regression**
Lewin, Kara, Wilkins, Mastroserio, García, Zhang, Alston, Connors, Dauser, Fabian, Ingram, Jiang, Lohfink, Lucchini, Reynolds, Tombesi, van der Klis, Wang
2022, ApJ, in press, <https://ui.adsabs.harvard.edu/abs/2022arXiv221001810L/abstract>
- (39) **XMM-Newton observations of the narrow-line Seyfert 1 galaxy IRAS 13224-3809: X-ray spectral analysis II**
Jiang, Dauser, Fabian, Alston, Gallo, Parker, Reynolds
2022, MNRAS, 514, 1107. <https://ui.adsabs.harvard.edu/abs/2022MNRAS.514.1107J/abstract>
- (38) **High-density disc reflection spectroscopy of low-mass active galactic nuclei**
Mallick, Fabian Garcia, Alston, et al
2022, MNRAS, 513, 4361. <https://ui.adsabs.harvard.edu/abs/2022MNRAS.513.4361M/abstract>
- (37) **Ejection-accretion connection in NLS1 AGN 1H 1934-063**
Xu, Pinto, Kara, Masterson, Garcia, Fabian, Parker, Barret, Alston, Cusumano
2022, MNRAS, 513, 191. <https://ui.adsabs.harvard.edu/abs/2022MNRAS.513.1910X/abstract>
- (36*) **Evidence for a compact object in the aftermath of the extragalactic transient AT2018cow**
Pasham, Ho, Alston, et al
2022, Nat. Ast. 6, 249. <https://ui.adsabs.harvard.edu/abs/2022NatAs...6..249P/abstract>
- (35) **Extreme relativistic reflection in the active galaxy, ESO 033-G002**
Walton, Baloković, Fabian, Gallo, Koss, Nardini, Reynolds, Ricci, Stern, Alston, Dauser, García, Kosec, Reynolds, Harrison, Miller
2021, MNRAS, 505, 1557. <https://ui.adsabs.harvard.edu/abs/2021MNRAS.506.1557W/abstract>
- (34*) **XMM-Newton campaign on the ultraluminous X-ray source NGC 247 ULX-1: outflows**
Pinto, Soria, Walton, D'Ai, Pintore, Kosec, Alston, Fuerst, Middleton, Roberts, Del Santo, Barret, Ambrosi, Robba, Earnshaw, Fabian
2021, MNRAS, *sub*, <https://arxiv.org/abs/2104.11164>
- (33) **Modelling the Multiwavelength Variability of Mrk 335 using Gaussian Processes**
Griffiths, Jiang, Buisson, Wilkins, Gallo, Ingram, Lee, Grupe, Kara, Parker, Alston, Bourached, Cann, Young, Komossa
2020, ApJ, *in press*, <https://arxiv.org/abs/2103.06838>
- (32*) **Discovery of soft and hard X-ray time lags in low-mass AGNs**
Mallick, Wilkins, Alston, Markowitz, De Marco, Parker, Lohfink, Stalin,
2020, MNRAS, 503, 3775, <https://arxiv.org/abs/2101.09594>
- (31) **Modelling X-ray RMS spectra II: the ultra-fast outflow of PDS 456**
Härer, L.; Parker, M. L.; Joyce, A.; Igo, Z.; Alston, W. N.; Fürst, F.; Lobban, A. P.; Matzeu, G. A.; Reeves, J. N.
2020, MNRAS, 500,4506, <https://arxiv.org/pdf/2011.06472.pdf>
- (30*) **A full characterization of the supermassive black hole in IRAS 09149-6206**
Walton, D. J.; Alston, W. N.; Kosec, P.; Fabian, A. C.; Gallo, L. C.; Garcia, J. A.; Miller, J. M.; Nardini, E.; Reynolds, M. T.; Ricci, C.; Stern, D.; Dauser, T.; Harrison, F. A.; Reynolds, C. S.
2020, MNRAS, 499, 1480. <https://arxiv.org/pdf/2009.10734.pdf>
- (29) **Detection of a possible multiphase ultra-fast outflow in IRAS 13349+2438 with NuSTAR and XMM-Newton**
Parker, M. L.; Matzeu, G. A.; Alston, W. N.; Fabian, A. C.; Lobban, A.; Miniutti, G.; Pinto, C.; Santos-Lleó, M.; Schartel, N.
2020, MNRAS, 498, 140. <https://arxiv.org/pdf/2008.05965.pdf>
- (28) **The first broad-band X-ray view of the narrow-line Seyfert 1 Ton S180**
Matzeu, G. A.; Nardini, E.; Parker, M. L.; Reeves, J. N.; Braito, V.; Porquet, D.; Middei, R.; Kammoun, E.; Lusso, E.; Alston, W. N.; et al

2020, MNRAS, 497, 2352. <https://arxiv.org/pdf/2007.06575.pdf>

(27) Characterizing continuum variability in the radio-loud narrow-line Seyfert 1 galaxy IRAS 17020+4544

Gonzalez, A. G.; Gallo, L. C.; Kosec, P.; Fabian, A. C.; Alston, W. N.; Berton, M.; Wilkins, D. R. 2020, MNRAS, 496, 3708. <https://arxiv.org/pdf/2006.09330.pdf>

(26) Blueshifted absorption lines from X-ray reflection in IRAS 13224-3809

Fabian, A. C.; Reynolds, C. S.; Jiang, J.; Pinto, C.; Gallo, L. C.; Parker, M. L.; Lasenby, A. N.; Alston, W. N.; Buisson, D. J. K.; Cackett, E. M.; De Marco, B.; Garcia, J.; Kara, E.; Kosec, P. 2020, MNRAS, 493, 2518, <https://arxiv.org/abs/2002.06388>

(25*) Searching for Ultra-fast Outflows in AGN using Variability Spectra

Igo, Parker, Matzeu, Alston, Alvarez Crespo, Buisson, Fürst, Joyce, Mallick, Schartel, Santos-Lleo 2020, MNRAS, 493, 1088. <https://arxiv.org/abs/2001.08208>

(24*) Modelling X-ray rms spectra I: intrinsically variable AGN

Parker, Alston, Igo, Fabian 2020, MNRAS, 492, 1363. <https://arxiv.org/pdf/1910.12808.pdf>

(23*) NuSTAR reveals the hidden nature of SS433

Middleton, Walton, Alston, T. Dauser, S. Eikenberry, Y-F Jiang, A. C. Fabian, F. Fuerst, M. Brightman, H. Marshall, M. Parker, C. Pinto, F. A. Harrison, M. Bachetti, D. Altamirano, A. J. Bird, MNRAS, <https://arxiv.org/abs/1810.10518>

(22) The Unusual Broadband X-ray Spectral Variability of NGC 1313 X-1 seen with XMM-Newton, Chandra and NuSTAR

Walton, Pinto, WA et al 2019, MNRAS, 494, 6012. <https://arxiv.org/pdf/1911.09622.pdf>

(21) Discovery of a soft X-ray lag in the Ultraluminous X-ray Source NGC 1313 X-1

Kara, E.; Pinto, C.; Walton, D. J.; Alston, W. N.; Bachetti, M.; Barret, D.; Brightman, M.; Canizares, C. R.; Earnshaw, H. P.; Fabian, A. C.; Furst, F.; Kosec, P.; Middleton, M. J.; Roberts, T. P.; Soria, R.; Tao, L.; Webb, N. A. (2019), MNRAS, 491, 5172 <https://arxiv.org/pdf/1911.09582.pdf>

(20) XMM-Newton Campaign On Ultraluminous X-ray Source NGC 1313 X-1: Wind vs. State Variability

Pinto, Walton, D. J.; Kara, E.; Parker, M. L.; Soria, R.; Kosec, P.; Middleton, M. J.; Alston, W. N.; Fabian, A. C.; Guainazzi, M.; Roberts, T. P.; Fuerst, F.; Earnshaw, H. P.; Sathyaprakash, R.; Bar 2019, MNRAS, 492, 4646 <https://arxiv.org/pdf/1911.09568.pdf>

(19) The discovery of weak coherent pulsations in the ultraluminous X-ray source NGC 1313 X2

Sathyaprakash, Roberts, Walton, Fuerst, Bachetti, Pinto, Alston, Earnshaw, Fabian, Middleton & Soria, 2019, MNRAS, 488, 35. <https://arxiv.org/abs/1906.00640>

(18*) A high-density relativistic reflection origin for the soft and hard X-ray excess emission from Mrk 1044

Mallick, Alston, Parker, Fabian, Pinto, Dewangan, Markowitz, Gandhi, Kembhavi & Misra, 2018, MNRAS, 479, 615. <https://arxiv.org/abs/1804.02703>

(17*) The 1.5 Ms Observing Campaign on IRAS 13224-3809: X-ray Spectral Analysis I

Jiang, Parker, Fabian, Alston, Buisson, Cackett, Chiang, Dauser, Gallo, García, Harrison, Lohfink, De Marco, Kara, Miller, Miniutti, Pinto, Walton & Wilkins, 2018, MNRAS, 477, 3711. <https://arxiv.org/abs/1804.00349>

(16*) Ultrafast outflows disappear in high radiation fields

Pinto, Alston, Parker, Fabian, Gallo, Buisson, Walton, Kara, Jiang, Lohfink & Reynolds, 2018, MNRAS, 476, 1021. <https://arxiv.org/abs/1708.09422>

(15*) Is there a UV/X-ray connection in IRAS 13224-3809?

Buisson, Lohfink, Alston, Cackett, Chiang, Dauser, De Marco, Fabian, Gallo, García, Jiang, Kara, Middleton, Miniutti, Parker, Pinto, Uttley, Walton & Wilkins

2018, MNRAS, 475, 2306. <https://arxiv.org/abs/1712.06606>

- (14*) Revealing the ultra-fast outflow in IRAS 13224-3809 through spectral variability**
Parker, Alston, Buisson, Fabian, Jiang, Kara, Lohfink, Pinto & Reynolds
2017, MNRAS, 469, 1553. <https://arxiv.org/abs/1704.05545>
- (13*) From ultraluminous X-ray sources to ultraluminous supersoft sources: NGC 55 ULX**
Pinto, Alston, Soria, Middleton, Walton, Sutton, Fabian, Earnshaw, Urquhart, Kara & Roberts
2017, MNRAS, 468, 2865. <https://arxiv.org/abs/1612.05569>
- (12*) The response of relativistic outflowing gas to the inner accretion disk of a black hole**
Parker, Pinto, Fabian, Lohfink, Buisson, Alston, Kara, Cackett, Chiang, Dauser, De Marco, Gallo, Garcia, Harrison, King, Middleton, Miller, Miniutti, Reynolds, Uttley, Vasudevan, Walton, Wilkins & Zoghbi, 2017, Nature, 543, 83. <https://arxiv.org/abs/1703.00071>
- (11*) The Future of X-ray Reverberation from AGN**
Fabian, Alston, Cackett, Kara, Uttley & Wilkins,
2016, Astro. Nach., 338, 269. <https://arxiv.org/abs/1611.06909>
- (10*) Ultraviolet and X-ray variability of active galactic nuclei with Swift**
Buisson, Lohfink, Alston & Fabian
2016, MNRAS, 464, 3194. <https://arxiv.org/abs/1609.08638>
- (9*) A global look at X-ray time lags in Seyfert Galaxies**
Kara, Alston, Fabian, Cackett, Uttley, Reynolds & Zoghbi, 2016, MNRAS, 462, 511.
<https://arxiv.org/abs/1605.02631>
- (8*) False periodicities in quasar time-domain surveys**
Vaughan, Uttley, Markowitz, Huppenkothen, Middleton, Alston, Scargle & Farr, 2016, MNRAS, 461, 3145. <https://arxiv.org/abs/1606.02620>
- (7*) A global look at X-ray time lags in Seyfert Galaxies**
Kara, Alston & Fabian, 2016, Astro. Nach., 337, 473. <https://arxiv.org/abs/1605.02631>
- (6*) The Rhythm of Fairall 9. I. Observing the Spectral Variability with XMM-Newton and NuSTAR**
Lohfink, Reynolds, Pinto, Alston, Boggs, Christensen, Craig, Fabian, Hailey, Harrison, Kara, Matt, Parker, Stern, Walton & Zhang, 2016, ApJ, 821, 11. <https://arxiv.org/abs/1602.05589>
- (5) NuSTAR and Suzaku observations of the hard state in Cygnus X-1: locating the inner accretion disk**
Parker, Tomsick, Miller, Yamaoka, Lohfink, Nowak, Fabian, Alston, Boggs, Christensen, Craig, Fuerst, Gandhi, Grefenstette, Grinberg, Hailey, Harrison, Kara, King, Stern, Walton, Wilms & Zhang, 2015, ApJ, 808, 9. <https://arxiv.org/abs/1506.00007>
- (4*) Revealing the X-ray variability of AGN with principal component analysis**
Parker, Fabian, Matt, Koljonen, Kara, Alston, Walton, Marinucci & Risaliti, 2015, MNRAS, 447, 72.
<https://arxiv.org/abs/1411.4054>
- (3*) X-ray time delays from the Seyfert 2 galaxy IRAS 18325-5926**
Lobban, Alston & Vaughan, 2014, MNRAS, 445, 3229. <https://arxiv.org/abs/1409.3189>
- (2*) The changing X-ray time lag in MCG-6-30-15**
Kara, Fabian, Marinucci, Matt, Parker, Alston, Brenneman, Cackett & Miniutti, 2014, MNRAS, 445, 56. <https://arxiv.org/abs/1408.5051>
- (1*) A non-thermal study of the brightest cluster galaxy NGC 1275 - the Gamma-Radio connection**
Dutson, Edge, Hinton, Hogan, Gurwell & Alston, 2014, MNRAS, 442, 2048.
<https://arxiv.org/abs/1405.3647>