

## Specific Skill Areas

◆ **Technical skills:** Quantitative data analysis, logical problem solving, programming in multiple scripting and coding languages including Python, Matlab, C++, CUDA & SQL, data mining, timing & spectral analysis. Knowledge of Big Data tools including Hadoop (MapR), Apache Kafka, SPARK, Drill, NoSQL databases and data stores such as Apache AVRO. Knowledge of machine learning libraries such Scikit-learn, SPARK-MILib, DQN and Tensorflow. Experience using Esri ArcGIS software and GeoPandas (a GIS platform for Python). Experience developing Graph trees (using networkX) for geographical routing problems.

◆ **Supervision and Leadership:** Experienced Agile lead developer as a Scrum Master. Supervised junior team members, contractors and students (e.g. Physics tutor at Oxford University). Course demonstrator/trainer on C++, Python and statistics for the physical sciences. Work group lead for EU research action (*'Black Holes in a Violent Universe'*).

◆ **Communication skills:** Adept at communicating scientific results and ideas to multiple audiences in a variety of venues and using a variety of media including scientific journals, technical reports, conferences, grant and observing proposals, press releases, and public open days. Experienced workshops facilitator and organiser of large international conferences (e.g. organised and a executed NATS R&D one-day workshop and multiple astrophysical conferences).

◆ **Project management experience:** Responsible for successfully bidding on €250k Marie Curie European fellowship together with its subsequent management. Experience working collaboratively on EU R&D projects. Member of international research collaborations and have acted as Management Committee leader on work packages within these collaborations. Responsible for the entire lifecycle of projects including initial design, implementation, validation and final reporting of results.

## Employment

07/2016-present **Senior Research Scientist at NATS.**

I am a leading Big Data scientist in the Air transport industry. I am responsible for the solution development of a real-time Air Traffic Management messaging systems from internet-based sources into a distributed (Apache Hadoop) cluster of virtual machines hosted on Microsoft Azure. I developed a real-time message buffering architecture using Apache Kafka and performing in memory analytics with Apache Spark. I also prototyped a front-end Big Data user-interface using a python web-framework (flask, pandas, numpy, etc.) and automate D3.js based visualisations using Websockets (SocketIO), jQuery and CSS. My projects involve taking real-world data (such as aircraft radar tracks) to drive posterior probability distribution used to predict future aircraft behaviour using machine learning algorithms such as random forest.

I am also responsible for managing and supervising the work of junior staff, contractors and students. I have been the Scrum Master for Agile projects and have responsible for ensuring the product development over a sprint cycle. I have also been responsible for delivering partnerships between industrial research and university academics by organising research workshops and contributing to the UK's industrial strategy.

- **Big Data** science studying: voluminous, high velocity and varied formats of data on an Hadoop HDFS platform (using MapR).
- **Industrial research** working between University academics and the private sector.
- Development of **distributed data tools** with Apache Hadoop, Kafka, SPARK, HIVE & Drill.
- Use of **Machine Learning** libraries, such as Scikit-Learn, SPARK-MLlib and TensorFlow, using: Regression, SVR, Random Forest, Supervised learning, unsupervised learning and reinforced learning.
- Custom **visualisation dashboards** using Matplotlib, Google Charts, D3, Plotly and Tableau.

- **Continuous integration** (DevOps) using Jenkins, Git and JIRA.
- **Agile** development including role as Scrum Master.
- **Full-stack development**, linking front-end JavaScript libraries (such as Bootstrap, jQuery, and AngularJS) to back-end SQL databases using frameworks like Django, Flask and NodeJS.
- **Cloud deployment** with Microsoft Azure and other PaaS/IaaS providers.
- **Domain expertise** in Air Traffic Management, trajectory prediction, flight safety, aircraft environmental impact and radar monitoring.

03/2013-07/2016 **Senior Research Fellow at the Department of Physics, University of Oxford.**

Research lead on Big Data problems with radio astronomy. Was responsible for the development of complex data models using vast amounts of telescope data (TBs) from the radio and X-rays emitted near to active black holes. I developed data-driven models of how black holes accrete matter using semi-empirical calculations to estimate how variables are related.

- **Lead author publications** in international peer-reviewed journals (e.g. Month Notices of the Royal Astronomical Society).
- Designing experiments, testing hypotheses, and building physics models.
- **Departmental tutor** for the Astrophysics Masters degree at Oxford University.
- **Invited speaker** at international conferences.
- Built decision making tools for the **robotic automation** of data collection.
- **Project manager** for EU Horizon 2020 (Europe's R&D framework).
- **Domain expertise** in black hole physics and radio astronomy.

02/2010-03/2013 **Marie Curie fellowship at the European Southern Observatory** (based in Sweden).

Awarded a prestigious three-year grant to conduct an independent research project and become actively involved with the construction of a billion dollar telescope in the Atacama desert.

- Led an **independent research** project to study black holes.
- **Supervised** undergraduate and postgraduate students.
- Led data analysis for the **commissioning** of a new observatory (ALMA telescope in Chile).
- Led the Swedish participation in a European FP7 R&D project (titled "NEXPreS").
- Provided project **operational support**.

## Education

2005-2009 **Postgraduate student at the Jodrell Bank Observatory, University of Manchester.**

*Thesis titled: Radio and X-ray observations of known X-ray binaries.*

- Designing complex algorithms for **advanced data analysis**.
- **Data Storage** and processing of large volumes of radio telescope data.
- **Network** testing and configuration of 10 Gbps transatlantic data links.
- **Synchronisation** and correlation of telescope arrays.
- Astronomical studies of black holes.

2001-2005 **MPhys, Physics with Astrophysics**  
University of Manchester

1994-2001 **GCSEs and A-Levels**  
Saint Ambrose College for boys, Hale Barns, Cheshire

1. A.J. Tetarenko, G.R. Sivakoff, J.C.A Miller-Jones, E.W. Rosolowsky, G. Petitpas, M. Gurwell, J. Wouterloot, R. Fender, S. Heinz, D. Maitra, S.B. Markoff, S. Migliari, M. P. Rupen, **A.P. Rushton**, D.M. Russell, T.D. Russell, C.L. Sarazin, *Extreme Jet Ejections from the Black Hole X-ray Binary V404 Cygni*, MNRAS, V. 469, p.3141-3162 ([arXiv:1704.08726](#))
2. **A. P. Rushton**, J. C. A. Miller-Jones, P. A. Curran, G. R. Sivakoff, M. P. Rupen, Z. Paragi, R. E. Spencer, J. Yang, D. Altamirano, T. Belloni, R. P. Fender, H. A. Krimm, D. Maitra, S. Migliari, D. M. Russell, T. D. Russell R. Soria, and V. Tudose, *Jet expansion from the BHC XTE J1908+904*, 2017, MNRAS V. 469, p.3141-3162 ([arXiv:1703.02110](#))
3. G. E. Anderson, A. Horesh, K. P. Mooley, **A. P. Rushton**, R. P. Fender, T. D. Staley, S. R. Kulkarni, M. M. Kasliwal, P. J. Hancock, Y. C. Perrott, R. M. Plotkin, C. Rumsey and D. J. Titterington, *The peculiar mass-loss history of SN 2014C as revealed through AMI radio observations*, 2016, MNRAS, V. 466, p.3648-3662 ([arXiv:1612.06059](#))
4. **A. P. Rushton**, A. W. Shaw, R. P. Fender, D. Altamirano, P. Gandhi, P. Uttley, P. A. Charles, M. Kolehmainen, G. E. Anderson, T. D. Staley, C. Rumsey and D. J. Titterington, *Disk-Jet quenching and variation of a Galactic Black Hole: Swift J1753.5-0127*, 2016, MNRAS, V. 463, P. 628-634 ([arXiv:1608.02886](#))
5. R. M. Plotkin, E. Gallo, P. G. Jonker, J. C. A. Miller-Jones, J. Homan, T. Munoz-Darias, S. Markoff, P. M. Armas, R. Fender, **A. P. Rushton**, D. M. Russell, M A. Torres, *A Clean Sightline to Quiescence: Multiwavelength Observations of the High Galactic Latitude Black Hole X-ray Binary Swift J1357.2-0933*, 2016, MNRAS V. 456, P.2707-2716 ([arXiv:1512.01941](#))
6. P. A. Curran, J. C. A. Miller-Jones, **A. P. Rushton**, et al., *Radio polarimetry as a probe of unresolved jets: the 2013 outburst of XTE J1908+094*, 2015, MNRAS V. 451, p.3975-3985 ([arXiv:1506.01141](#))
7. ALMA Partnership; Fomalont, E. B. et al., *The 2014 ALMA Long Baseline Campaign: An Overview*, 2015, ApJ V. 808 L1 11 pp. ([arXiv:1504.04877](#))
8. A. Tetarenko, G.R. Sivakoff, J.C.A. Miller-Jones, P.A. Curran, T.D. Russell, S. Heinz, D. Maitra, S.B. Markoff, S. Migliari, M.P. Rupen, **A. P. Rushton**, D.M. Russell, C.L. Sarazin, *Sub-MM jet properties of the X-ray binary J1745-26*, 2015, ApJ, Volume 805, 10 pp. ([arXiv:1502.00039](#))
9. C. Brinkerink, H. Falcke, C. J. Law, D. Barkats, G. C. Bower, A. Brunthaler, C. Gammie, V. Impellizzeri, S. Markoff, K. M. Menten, M. Moscibrodzka, A. Peck, **A. P. Rushton**, R. Schaaf, and M. Wright, *ALMA and VLA measurements of frequency-dependent time lags in Sagittarius A\*: evidence for a relativistic outflow* accepted in A&A ([arXiv:1502.03423](#))
10. G. Bower, S. Markoff, J. Dexter, M. Gurwell, J. Moran, A. Brunthaler, H. Falcke, C. Fragile, D. Maitra, D. Marrone, A. Peck, **A. P. Rushton**, M. Wrigh, *Radio and Millimeter Monitoring of Sgr A\*: Constraints on the G2 Encounter and the Spectrum and Variability of Sgr A\**, ApJ V. 802 14 pp. ([arXiv:1502.06534](#))
11. G. Ponti, S. Bianchi, T. Munoz-Darias, B. DeMarco, T. Dwelly, R. P. Fender, K. Nandra, N. Rea, K. Mori, D. Haggard, C. O. Heinke, N. Degenaar, M. Clave, A. Goldwurm, M. R. Morris, **A. P. Rushton** and R. Terrier, *On the Fe K absorption - accretion state connection in the Galactic center neutron star X-ray binary AXJ 1745.6-2901*, MNRAS, V. 446, p. 1536-1550 ([arXiv:1409.3224](#))
12. G. C. Bower, A. Deller, P. Demorest, A. Brunthaler, H. Falcke, M. Moscibrodzka, R. M. O'Leary, R. P. Eatough, M. Kramer, K.J. Lee, L. Spitler, G. Desvignes, **A. P. Rushton**, S. Doleman, M. J. Reid, *The Proper Motion of the Galactic Center Pulsar Relative to Sagittarius A\**, ApJ, V. 798, I. 2, 120, 13 pp. ([arXiv:1411.0399](#))
13. Z. Paragi, et al., *Very Long Baseline Interferometry with the SKA*, Advancing Astrophysics with the Square Kilometre Array, Giardini Naxos, Italy ([arXiv:1412.5971](#))
14. A. Wolter, **A. P. Rushton**, M. Mezcuca, D. Cseh, F. Pintore, I. Prandoni, Z. Paragi, L. Zampieri, *Radio*

*investigation of Ultra-luminous X-ray sources*, Advancing Astrophysics with the Square Kilometre Array, Giardini Naxos, Italy ([arXiv:1412.5643](https://arxiv.org/abs/1412.5643))

15. R. Beswick, **et al.**, *SKA studies of nearby galaxies: star-formation, accretion processes and molecular gas across all environments*, Advancing Astrophysics with the Square Kilometre Array, Giardini Naxos, Italy ([arXiv:1412.5810](https://arxiv.org/abs/1412.5810))
16. S. Corbel, **et al.**, *Incoherent transient radio emission from stellar-mass compact objects*, Advancing Astrophysics with the Square Kilometre Array, Giardini Naxos, Italy ([arXiv:1501.04716](https://arxiv.org/abs/1501.04716))
17. R. E. Spencer, **A. P. Rushton**, M. Balucińska-Church, Z. Paragi, N. S. Schulz, J. Wilms, G. G. Pooley, M. J. Church, *Radio and X-ray observations of jet ejection in Cygnus X-2*, 2013, MNRAS, L. V. 435, p. L48-L52 ([arXiv:1306.0599](https://arxiv.org/abs/1306.0599))
18. F. Batejat, J. E. Conway, **A. Rushton**, R. Parra, P. J. Diamond, C. J. Lonsdale, and C. J. Lonsdale, *Rapid variability of the compact radio sources in Arp220: Evidence for a population of microblazars?*, 2012, A&A V. 542, L24 ([arXiv:1205.3173](https://arxiv.org/abs/1205.3173))
19. **A. Rushton**, J. Miller-Jones, Z. Paragi, T. Maccarone, G. Pooley, V. Tudose, R. Fender, R. Spencer, V. Dhawan, and M. Garrett *A weak compact jet in a soft state of Cygnus X-1*, 2012, MNRAS V. 419, pp. 3194-3199 ([arXiv:1110.4374](https://arxiv.org/abs/1110.4374))
20. Balucinska-Church, N. S. Schulz, J. Wilms, A. Gibiec, M. Hanke, R. E. Spencer, **A. Rushton**, and M. J. Church *Dipping in CygnusX-2 in a multi-wavelength campaign due to absorption of extended ADC emission*, 2011, A&A, V. 530, pp. A102 ([arXiv:1104.1715v1](https://arxiv.org/abs/1104.1715v1))
21. **A. Rushton**, R., Spencer, R., Fender and G., Pooley *Steady jets from radiatively efficient hard states in GRS 1915+105*, 2010, A&A, V. 524, pp. A29 ([arXiv:1101.4945](https://arxiv.org/abs/1101.4945))
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25. N. M. H., Vaytet, **A. Rushton**, M., Lloyd, J. A., Lopez, J., Meaburn, T. J., O'Brien, D. L., Mitchell, D. Pollacco, *High-speed bipolar knots and jets in the hourglass shaped planetary nebula Hubble 12*, 2009, MNRAS, V. 398, pp. 385-393 ([arXiv:0905.4625v1](https://arxiv.org/abs/0905.4625v1))
26. R. E. Spencer, R. Hughes-Jones, M. Strong, S. Casey, **A. Rushton**, P. Burgess and C. Greenwood, *The Role of ESLEA in the development of e-VLBI*, 2009, Future Generation Computer Systems 26 (2010), pp. 111-119 ([arXiv:0910.1726v1](https://arxiv.org/abs/0910.1726v1))
27. J. C. A. Miller-Jones, M. P. Rupen, R. P. Fender, **A. Rushton**, G. G. Pooley and R. E. Spencer, *Evidence for deceleration in the radio jets of GRS1915+105?*, 2007, MNRAS, V. 375, I. 3, pp. 1087-1098 ([arXiv:astro-ph/0612211](https://arxiv.org/abs/astro-ph/0612211))
28. N. M. H Vaytet, T. J. O'Brien and **A. P. Rushton**, *Evidence for ablated flows in the shell of the nova DQ Herculis*, 2007, MNRAS, V. 380, I. 1, pp. 175-180 ([arXiv:0706.0054](https://arxiv.org/abs/0706.0054))
29. **A. Rushton**, R. E. Spencer, M. Strong, R. M. Campbell, S. Casey, R. P. Fender, M. A. Garrett, J. C. A. Miller-Jones, G. G. Pooley, C. Reynolds, A. Szomoru, V. Tudose, Z. and Paragi, *First e-VLBI observations of GRS 1915+105*, 2007, MNRAS, Letters 374 (1), L47-L50. ([arXiv:astro-ph/0611049](https://arxiv.org/abs/astro-ph/0611049))