

## Paul James Wright

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CONTACT INFORMATION	Rm 614, Kelvin Building University of Glasgow Glasgow, G12 8QQ United Kingdom	Work: +44 (0)14133 08855 Web: <a href="http://www.pauljwright.co.uk">www.pauljwright.co.uk</a> Email: <a href="mailto:paul@pauljwright.co.uk">paul@pauljwright.co.uk</a> Publication List: <a href="#">SAO/NASA ADS</a>
RESEARCH SUMMARY	Physics PhD candidate with experience in time-series analysis techniques, deep learning, and methods for recovering the the temperature distribution of the solar atmosphere (the differential emission measure, an ill-posed inverse problem) from a wide range of spectroscopic and narrow-band data (e.g from the <i>Solar Dynamics Observatory</i> imager ( <i>SDO/AIA</i> ) which provides $\sim 0.7$ Tb/day). Presented at a wide range of conferences (11 oral presentations; 4 invited), including an invited workshop talk on accelerating differential emission measure inversion with neural networks, and extensive experience with technical writing, outreach and public engagement.	
EDUCATION	<b>University of Glasgow</b> , Glasgow, UK Ph.D. Solar Physics	2014 – present
	<b>University of Southampton</b> , Southampton, UK MPhys Astrophysics with a year abroad First-class honours (1:1)	2010 – 2014
	<b>Smithsonian Astrophysical Observatory</b> , Cambridge, MA, USA MPhys Astrophysics with a year abroad	2013 – 2014
EXPERIENCE & SKILLS	<b>Post-Graduate Research Assistant, University of Glasgow</b> <b>SUPA School of Physics and Astronomy</b> <ul style="list-style-type: none"><li>• Initiated observations of the Sun with a telescope not designed for heliophysics (<i>NuSTAR</i>). These novel observations are the most sensitive of their kind and have resulted in numerous, highly-collaborative peer-reviewed publications.</li><li>• extracted signatures of the mechanism heating to the solar atmosphere using techniques included time-lag analysis (cross-correlation); Fourier analysis; wavelet analysis; and local intermittency measure (LIM).</li><li>• Studied the temperature distribution of the solar atmosphere through the recovery of an ill-posed inverse problem (the differential emission measure, DEM) using techniques such as Tikhonov regularisation, Markov-chain Monte Carlo, Spline fitting, and Sparse Inversion (by Basis Pursuit).</li><li>• The press-release image produced from the <i>NuSTAR</i> observations obtained for <a href="#">Wright et al. 2017</a> was published by numerous news outlets and is one of the five iconic images from <i>NuSTAR</i>'s first five years in space.</li></ul>	2014 – present
	<b>Researcher, NASA Frontier Development Lab (FDL)</b> <b>SETI Institute/NASA Ames Research Center, Mountain View, CA</b> <ul style="list-style-type: none"><li>• A selective 8-week applied Artificial Intelligence accelerator established to tackle knowledge gaps useful to NASA's science and exploration goals, and humanity.</li><li>• Implemented Deep Learning algorithms (Convolutional Neural Networks; CNNs) such as U-Net, AlexNet and ResNet to predict disk-integrated Solar Spectral Irradiance (SSI) from from high-resolution images (<math>\sim 0.7</math> Tb/day) which share a common latent space.</li><li>• Predicted SSI with median absolute relative discrepancies of less than 1.6% using a CNN augmented with a Multi-Layer Perceptron (MLP), saving \$20 Million on a replacement instrument.</li><li>• Used a 1x1 CNN (equivalent to an MLP) to improve the computational speed for differential emission measure inversion (10000-times increase). Further improvement to the resulting temperature distribution was obtained by training a CNN to correct the profile to minimise the residual between observed and synthesized SSI.</li><li>• Received the NASA Frontier Development Lab "Contribution to Science" award.</li></ul>	2018

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EXPERIENCE & SKILLS (CONT.)	<b>Visiting Researcher, NASA Goddard Space Flight Center (GSFC)</b> 2016 <b>Heliophysics Science Division</b> <ul style="list-style-type: none"> <li>Explored the possibility of incorporating temperature maps (our data product) in to Helioviewer, and their usefulness as a scientific tool.</li> </ul>
	<b>Research Scholar, Center for Astrophysics   Harvard &amp; Smithsonian</b> 2013 – 2014 <b>Solar and Stellar X-ray Group</b> <ul style="list-style-type: none"> <li>Designed and implemented a sophisticated stellar flare detection routine (the most sensitive of its kind) based on Fourier analysis</li> <li>This work had coverage by <i>Science</i> and the <i>Smithsonian Magazine</i>.</li> </ul>
BOOK CHAPTERS	[1] <b>Wright, P. J.</b> , Cheung, M. C. M., Thomas, R., <i>et al</i> 2018 <i>DeepEM: A Deep Learning Approach to Differential Emission Measure Inversion</i> . In M. Bobra & J. Mason, eds., <i>Machine Learning, Statistics, and Data Mining for Heliophysics</i> , Chapter 4
SELECT AWARDS AND GRANTS	<b>University of Glasgow</b>
TOTAL: £7000	NASA Frontier Development Lab, Contribution to Science Award 2018 Solar Physics Division Meeting (AAS/SPD) Student Poster Award 2017 Solar Physics Division Meeting (AAS/SPD) Studentship Award 2017 National Astronomical Observatory of Japan Travel Award 2016 European Space Agency/Cambridge Philosophical Society Travel Award 2015
TEACHING	<b>Coursera Inc.</b> <b>“Data Scientists Toolbox” Community Mentor</b> 2017 – present An invited mentor of a course in the Data Science specialisation offered by Johns Hopkins University.  <b>University of Glasgow</b> <b>Astronomy 1 Tutorial Demonstrator</b> 2016 - 2017 <b>Astronomy 3/4 (Honours) Laboratory Demonstrator</b> 2015 - 2016 Demonstrated, supervised, and marked a number of final-year research projects. <b>Physics Pre-University Summer School</b> 2015
OUTREACH & PUBLIC ENGAGEMENT	<b>UK Solar Physics (UKSP) Nuggets</b> , concise, easy-to-read science articles 84. The first <i>NuSTAR</i> microflare 2017  <b>Glasgow Science Centre</b> , Demonstrator 2016 <b>British Science Week</b> , Demonstrator 2016 <b>Institute of Physics: Women and Girls in Science</b> , Demonstrator 2016 <b>Scottish Television (STV)</b> , Guest Presenter 2015 <b>World Wide Telescope</b> , Ambassador 2013 – 2014
PROFESSIONAL DEVELOPMENT	<b>Coursera, Inc. (MOOC Platform)</b> Using Coursera.org, a massive open online course (MOOC) platform, to take specialisations (a series of related courses plus a final capstone project) offered by accredited universities to further develop skills and understanding in a wide range of topics.  <b>Data Science</b> , Johns Hopkins University 2017 – present Nine-course (plus capstone) introduction to data science. <b>Mastering Software Development in R</b> , Johns Hopkins University 2018 – present Four-course (plus capstone) specialisation providing rigorous training in R.

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### TECHNICAL SKILLS:

*Computing:* IDL (5+ years), Python (3+ years), PyTorch, R, Bash,  $\LaTeX$ , PyCharm, IRAF, git (GitHub, Gitlab), Microsoft Office, Adobe Creative Cloud, Linux/Unix, Mac OSX, Microsoft Windows

*General:* Data Analysis, Data Visualisation, Interdisciplinary Collaboration, Public Speaking, Teaching, Writing (Technical & Lay)