



# Michael J. Smith



I like applying novel deep learning techniques (particularly foundational, self-supervised, unsupervised, and generative learning methods) to cross-disciplinary problems in astrophysics, earth observation, medical diagnosis and imagery, and other fields. I especially enjoy applying these methods to out-of-domain problems where deep learning ‘shouldn’t work’!

## Skills

· BASH · Deep learning · GPU HPC · Git · HTML/CSS · High performance computing · Linux · Numpy · Public speaking · Python · Pytorch · Scientific computing · Tensorflow ·  $\text{\LaTeX}$  ·

## Contact

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LinkedIn · GitHub · ORCID

## Service and outreach

· RAS fellow · EAS member · MNRAS reviewer · Bayfordbury & Queen’s Uni observatory outreach · Astro-on-tap demonstrator · Festival outreach · Lecturer · Cosmodrome operator ·

## Experience

2022 → Now: **Director of AI at Aspia Space**

Responsible for the development of the company’s AI products including: ClearSky, a patented generative deep learning-based cloud removal algorithm for satellite imagery; GrassMax, a grass/crop height and mass estimation algorithm that only needs satellite imagery as input; and EOPT, the first foundation model for earth observation.

2021 → Now: **Co-founder and Managing Partner at Aspia Space**

Built Aspia Space alongside co-founders from inception to a team of 6, and developed Aspia’s first products.

## Education

2018 → 2022: **PhD Astrophysics at the University of Hertfordshire, Hatfield, UK**

Thesis title: ‘Deep Learning to Explore Ultra-Large Scale Astronomical Datasets’ · Advisor: James Geach  
I published one review paper, four method papers, and one patent during my PhD on the application of deep learning to large astronomical and remote sensing datasets. I also spent two years at the Alan Turing Institute in London as part of their enrichment scheme scholarship, and two years at Queen’s University, Canada as part of Stéphane Courteau’s group.

2013 → 2017: **First class MPhys and BSc in Physics at Leeds Uni, UK with intl. year at Queen's Uni, Canada**

Thesis title: ‘Machine Learning with CNNs in Medical Diagnosis’ · Advisors: Ben Varcoe and John Mooney  
Developed a convolutional neural network to diagnose heart disease from electrocardiograms and magnetocardiograms. The network achieved state-of-the-art accuracies for both ECG and MCG prompted diagnosis.

## Awards and scholarships

2022: **International Astronomical Union (IAU) PhD Prize**

My PhD thesis was awarded an honourable mention (i.e. second place) in its category.

2020, 2021: **Alan Turing Institute Enrichment Scholarship, London, UK**

Awarded in 2020 and 2021. £3,958 per year. I attended online in 2020 due to COVID-19.

## Selected publications

[1] **Astronomia Ex Machina: a history, primer, and outlook on neural networks in astronomy.**

Michael J. Smith, James E. Geach. <https://doi.org/10.1098/rsos.221454>. RSOS. 2023-05.

This work predicted and advocated for the current explosion in scientific foundational modelling.

[2] **Realistic galaxy image simulation via score-based generative models.**

Michael J. Smith, James E. Geach, Ryan A. Jackson, Nikhil Arora, Connor Stone, Stéphane Courteau. <https://doi.org/10.1093/mnras/stac130>. MNRAS. 2022-01.

This was the first application of diffusion modelling to an astronomical problem. This work was featured by NASA’s Astronomy Picture Of The Day, in Astronomy Magazine, and in the Daily Mail.

[3] **Predicting visible/infrared band images using radar reflectance/backscatter images of a terrestrial region.**

Michael J. Smith, James E. Geach. <https://patentscope.wipo.int/search/en/detail.jsf?docId=GB342277434>. 2021-11. UK patent. Patented or patent pending in Australia, Brazil, Canada, Europe, and the USA.

This work has been spun out into a start up company (Aspia Space).

During my PhD I published six papers and patents. A full list is available on ORCID.