

Dr Josh Veitch-Michaelis

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I'm an applied machine learning researcher, specialising in remote sensing, with over a decade of software development experience. I have worked in academia and industry, from space science to ecology and I'm passionate about using technology for social good and planetary stewardship. I have wintered in Antarctica for two world-class telescopes (IceCube and SPT). I like to make things, boulder, play the piano and am a solo glider pilot.

Experience

Nov 2023– **University of Chicago** South Pole, Antarctica
10-meter South Pole Telescope (SPT) Winterover

- Maintained SPT, on-call 24/7. Hardware and cluster management, supported Event Horizon Telescope operations and contributed to SPT's codebase.

June 2023 **Frontier Development Lab** Zürich, Switzerland
Project Faculty

- Co-supervised a research group to now-cast space weather events like flares and CMEs, working with ESA's VIGIL team (on-ground and on-satellite ML deployment).

Feb 2022–Nov 2023 **ETH Zürich / Restor** Zürich, Switzerland
Postdoc in AI for Remote Sensing (Systems Group)

- Informed Restor's AI strategy applied to remotely sensed data from partner orgs. Developed Restor's open-source tree crown delineation pipeline, including dataset curation/annotation, ML model training and benchmarking on user data.

Aug 2020–Dec 2021 **Wisconsin-Madison University** South Pole, Antarctica
IceCube Winterover Experiments Operator

- Operated the IceCube Neutrino Observatory at the South Pole, providing 24/7 critical hardware and software support. Maintained an on-prem cluster of 100+ machines.

Jun 2018–Jun 2020 **Liverpool John Moores University** Liverpool, UK
Postdoctoral Research Assistant in Drone Image Analyses (Astro-Ecology)

- Led instrument design for a real-time, drone-mounted endangered species. detection system using thermal/visible imaging and deep learning. Collaborations with Save The Elephants (Kenya), WWF, ZSL (London), Durrell (Madagascar) and Knowsley Safari.

Jun 2019–Aug 2019 **Frontier Development Lab, Europe** Oxford, UK; ESRIN, Italy
Researcher

- Development of a satellite-based flood segmentation model, supported by UNICEF and the European Space Agency (ESA). Presented at NeurIPS HADR workshop, 2 follow-up papers in Sci. Rep.
- Launched on a D-Orbit satellite in June 2021 and was flight-tested in space.

Sep 2013–Jun 2018 **I3D Robotics Ltd. & IS Instruments Ltd** Tonbridge, UK
Computer vision/robotics and photonics engineering

- Designed bespoke 3D imaging and analysis systems, including embedded ML. Clients included robotics, heavy industry (steel), agriculture and nuclear.

Education

2012–2016 **PhD in Space and Climate Physics** Mullard Space Science Lab, University College London
Fusion of LIDAR with stereo camera data – an assessment

- Optimised and parallelised stereo matching algorithms for planetary terrain reconstruction and supervised ML for industrial imaging analysis, supervised by Prof. Jan-Peter Muller.

2008–2012 **BSc MPhys in Physics, first class honours** University of Warwick
Systematics of Quark masses and mixings, supervised by Prof. Paul Harrison.

Technical Skills

compute/programming:

- Python, C++, Qt (GUI development), shell
- Data science and machine learning tools (primarily Pytorch stack), deployment onto edge devices (EdgeTPU, NCS, Jetson)
- Geospatial Information Systems (GIS)
- Computer vision/robotics, OpenCV (contributor), ROS
- Linux system administration, Git, Cloud (GCP), Docker

hardware: Camera/LIDAR systems, CAD (SolidWorks), rapid prototyping (3D Printing), multi-layer PCB design, digital electronics and firmware, large telescope systems

Awards

2021, 2024	Antarctica Service Medal (Winterover) For supporting US Antarctic science operations (South Pole Telescope and IceCube Neutrino Observatory)	National Science Foundation, USA
2019	Google Cloud Research Credit \$5k to support research into RGB-Thermal data fusion for ecology	LJMU
2018	Astronomical Data Analysis Software and Systems Hackathon, 3rd place Project: Automated Periodogram Selection using Machine Learning	
2017	Remote Sensing and Photogrammetry Society (RSPSOC) award for best PhD thesis	
2016	SIM Scholar, Worshipful Company of Scientific Instrument Makers Postgraduate award for excellence in instrumentation research, nominated by UCL.	UCL
2011	Undergraduate Research Scholarship Calibrating the ULTRACAM High-Speed CCD Camera	Warwick

Outreach

2011–	International Workshop for Astronomy I have worked on the board of the IWA for over a decade. IWA is a non-profit organisation that runs the International Astronomical Youth Camp (iayc.org). I have supervised over 50 participants in that time, held various board positions and continue to support the camp.
2016–Now	Webmaster, International Workshop for Astronomy Linux server administration, deployment on GCP.

Selected Publications

I am a scientific editor for the Royal Astronomical Society's Techniques and Instruments (RAS T&I) journal. † implies equal contribution. More publications may be found on my Google Scholar profile. I have reviewed for NeurIPS Datasets and Benchmarks and am a mentor for the Climate Change AI workshop at NeurIPS 2024.

OAM-TCD: A globally diverse dataset of high-resolution tree cover maps

Josh Veitch-Michaelis, Andrew Cottam, Daniella Schweizer, Eben N. Broadbent, David Dao, Ce Zhang, Angelica Almeyda Zambrano, and Simeon Max
(2024). *arXiv preprint, currently under peer review*, DOI: [10.48550/2407.11743](https://doi.org/10.48550/2407.11743)

In-orbit demonstration of a re-trainable Machine Learning Payload for processing optical imagery

Gonzalo Mateo-García, **Josh Veitch-Michaelis**, Cormac Purcell, Nicolas Longepe, Pierre Philippe Mathieu, Simon Reid, Alice Anlind, Fredrik Bruhn, and James Parr
Scientific Reports 13.10391 (2023). DOI: [10.10238/s41598-023-34436-w](https://doi.org/10.10238/s41598-023-34436-w)

Towards global flood mapping onboard low cost satellites with machine learning

Gonzalo Mateo-García†, **Josh Veitch-Michaelis**†, Lewis Smith, Silviu Oprea, Guy Schumann, Yarin Gal, Atılım Güneş Baydin, and Dietmar Backes
Scientific Reports 11.7429 (2021). DOI: [10.1038/s41598-021-86650-z](https://doi.org/10.1038/s41598-021-86650-z)

Assessing the influence of one astronomy camp over 50 years

Hannah Dalglish and **Josh Veitch-Michaelis**
Nature Astron. 3 (2019). DOI: [10.1038/s41550-019-0965-y](https://doi.org/10.1038/s41550-019-0965-y)

Massive stereo-based DTM production for Mars on cloud computers

Yu Tao, Jan-Peter Muller, Panos Sidiropoulos, Si-Ting Xiong, ARD Putri, SHG Walter, **Josh Veitch-Michaelis**, and Vladimir Yershov
Planetary and Space Science 154 (2018)

Flood Detection On Low Cost Orbital Hardware

Gonzalo Mateo-García†, Silviu Oprea†, Lewis Smith†, **Josh Veitch-Michaelis**†, Atılım Güneş Baydin, Dietmar Backes, Yarin Gal, and Guy Schumann
Artificial Intelligence for Humanitarian Assistance and Disaster Response Workshop at NeurIPS, 2019. DOI: [10.48550/arXiv.1910.03019](https://doi.org/10.48550/arXiv.1910.03019)

Saving Endangered Animals with Astro-Ecology

Paul Ross McWhirter and **Josh Veitch-Michaelis**
Astronomical Data Analysis Software and Systems XXVII, 2019

RASCAL: Towards automated spectral wavelength calibration

Josh Veitch-Michaelis and Marco Lam
Astronomical Data Analysis Software and Systems XXVIII, 2020

The International Astronomical Youth Camp: Lessons Learned in 50 Years

Hannah Dalglish and **Josh Veitch-Michaelis**
Communicating Astronomy with the Public Conference 2018 2nd Edition, 2018

Enhancement of stereo imagery by artificial texture projection generated using a LIDAR

Josh Veitch-Michaelis, Jan-Peter Muller, David Walton, Jonathan Storey, Michael Foster, and Benjamin Crutchley
International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 2016

Crack Detection in “As-Cast” Steel Using Laser Triangulation and Machine Learning

Josh Veitch-Michaelis, Yu Tao, Dave Walton, Jan-Peter Muller, Benjamin Crutchley, Jonathan Storey, Christopher Paterson, and Andrew Chown
13th Conference on Computer and Robot Vision (CRV), 2016

An Optimised System for Generating Multi-Resolution DTMs using NASA MRO Datasets

Yu Tao, Jan-Peter Muller, Panos Sidiropoulos, **Josh Veitch-Michaelis**, and Vladimir Yershov
International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences, 2016