Dr Josh Veitch-Michaelis

j.veitchmichaelis@gmail.com jveitchmichaelis

I am computer vision engineer with cross-domain expertise and 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. In my spare time I enjoy the satisfaction of making things – from woodwork to electronics to brewing. I boulder regularly, play the piano and am a solo glider pilot.

Experience

Feb 2022– **ETH Zürich / Restor Eco** Zürich, Switzerland
Postdoc in AI for Remote Sensing
- Developing machine learning algorithms for forest conservation

Aug 2020–Dec 2021 **Wisconsin-Madison University** South Pole, Antarctica
IceCube Winterover Experiments Operator
- Operate and maintain the IceCube Neutrino Observatory at the South Pole, providing critical hardware and software support (on-call 24/7 year-round).

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.
- Development of an automatic spectral calibration pipeline for the 2m Liverpool Telescope.

Jun 2019–Aug 2019 **Frontier Development Lab, Europe** Oxford, UK; ESRIN, Italy
Researcher
- Worked on a team developing a flood segmentation algorithm for deployment on a satellite, supported by UNICEF and the European Space Agency (ESA). Selected from over 400 applicants.
- Research presented orally at Humanitarian Aid and Disaster Response workshop at NeurIPS 2019 (hadr.ai).
- Launched on a D-Orbit satellite in June 2021 and is currently being flight-tested in space.

Dec 2017–Jun 2018 **I3D Robotics Ltd.** Tonbridge, UK
Computer vision/robotics engineer
- Designed bespoke 3D imaging systems; stereo, LIDAR, laser triangulation, high-speed image processing tools (> 400 fps).
- Led a successful InnovateUK-funded project for smart agriculture: an embedded system for deep learning-based fruit detection in greenhouses.
- Clients included robotics, heavy industry (steel), agriculture and nuclear.

Sep 2013–Dec 2017 **IS Instruments Ltd.** Tonbridge, UK
Photonics engineer, STFC-CASE (industrial) PhD student
- Led end-to-end design of a commercial IoT miniature spectrometer. This involved obtaining grant funding, PCB design and embedded firmware (Atmel AVR), opto-mechanical design and end-user software development.

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

- Remote Sensing and Photogrammetry Society award for best thesis 2017.
- STFC-CASE industrial studentship. Supervisors: Prof Jan-Peter Muller (UCL), Dr David Walton (UCL) and Dr Jonathan Storey (IS-Instruments Ltd.).
- Explored industrial applications of 3D imaging techniques used in space science.
- Optimised and parallelised stereo matching algorithms for planetary terrain reconstruction. Supervised machine learning to predict stereo matching performance; crack segmentation in cast steel.

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

programming:

- Python, C++, Qt (GUI development), shell
- Data science and machine learning tools (numpy, scikit-learn, pytorch), deployment onto edge devices
- 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 (EAGLE), digital electronics and firmware (Atmel AVR, ARM), use of standard lab test equipment

Awards

2021 **Antarctica Service Medal (Winterover)** — National Science Foundation, USA

2019 **Google Cloud Research Credit** — LJMU
$5k to support research into RGB-Thermal data fusion for ecology

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** — UCL
Postgraduate award for excellence in instrumentation research, nominated by UCL.

2011 **Undergraduate Research Scholarship** — Warwick
Calibrating the ULTRACAM High-Speed CCD Camera

Outreach

2018–2019 **Vice President, International Workshop for Astronomy**
IWA is a non-profit organisation that runs the International Astronomical Youth Camp (iayc.org). Supervised around 50 students since 2011 covering a variety of topics from photometry, exoplanets, remote sensing, electronics and robotics.

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.

Towards global flood mapping onboard low cost satellites with machine learning
Gonzalo Mateo-Garcia†, **Josh Veitch-Michaelis†**, Lewis Smith, Silviu Oprea, Guy Schumann, Yarin Gal, Atılım Güneş Baydin, and Dietmar Backes
Scientific Reports *11.7429 (2021)*

Assessing the influence of one astronomy camp over 50 years
Hannah Dalgleish and **Josh Veitch-Michaelis**
Nature Astron. *3 (2019)*

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-Garcia†, 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

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 Dalgleish 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