

Leigh Smith

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RESEARCH INTERESTS

Wide-field time-domain and astrometric surveys; exoplanet transit detection; stellar occultations by irregularly shaped objects; Galactic structure and dynamics; low-mass stars and brown dwarfs, particularly thick-disk, halo, and benchmark examples; and completing the census of the solar neighbourhood. I have a strong interest in the challenges of working with massive datasets and in writing efficient, scalable code.

SELECTED PUBLICATIONS

h-index: 31 · Full list: scholar.google.co.uk/citations?user=eXlu9p4AAAAJ

Smith, L.C. et al. (2025). *CETRA: a fast, sensitive exoplanet transit detection algorithm implemented for GPUs*. MNRAS, **539**, 297–306.

Smith, L.C. et al. (2025). *VIRAC2: NIR astrometry and time series photometry for 500M+ stars from the VVV and VVVX surveys*. MNRAS, **536**, 3707–3738.

Smith, L.C. et al. (2021). *VVV-WIT-08: the giant star that blinked*. MNRAS, **505**, 1992–2008. · **Press coverage: National Geographic**

Smith, L.C. et al. (2018). *VIRAC: the VVV infrared astrometric catalogue*. MNRAS, **474**, 1826–1849.

EXPERIENCE

Senior Research Associate

Sept 2022 – present

Institute of Astronomy, University of Cambridge

- Led development of CETRA, a CUDA GPU-accelerated exoplanet transit detection pipeline now incorporated into the ESA PLATO Exoplanet Analysis System; published in MNRAS 2025.
- Developed GPU-accelerated transit light curve modelling code and novel models for ring-bearing exoplanets.
- Produced geometric and intensity distortion calibration models for Euclid and VISTA instrumentation.

Research Associate

Oct 2017 – Aug 2022

Institute of Astronomy, University of Cambridge

- Built and maintained the VIRAC pipeline, processing 14 terapixels of VISTA/VVV infrared imaging, cleaning a catalogue of over 100 billion detections, and producing photometric and astrometric time series for more than one billion stars.
- Derived near-IR proper motions for over 300 million stars via robust regression, producing VIRAC2 — a world-leading near-infrared astrometric catalogue of the Milky Way (MNRAS 2025).
- Discovered VVV-WIT-08 — a giant star that dimmed by 97% for 200 days — while mining VIRAC data; the finding attracted international press coverage including National Geographic.
- Mined VIRAC for periodic pulsating stars using supervised machine learning classification (scikit-learn).
- Performed Bayesian analysis of stellar occultation light curves for irregularly shaped solar system objects.
- Supervised graduate and postgraduate students in survey data mining and neural-network-based source extraction from crowded near-IR fields.
- Extensive use of Python, NumPy, SciPy, PostgreSQL, MPI, and distributed storage across multi-node HPC systems.

Research IT System Manager

Oct 2015 – Sept 2017

University of Hertfordshire, Hatfield

- Administered and supported the University's high-performance computing cluster, Linux servers, and storage infrastructure, while maintaining an active research programme in large-scale stellar survey analysis.
- Developed PHP-based user-facing web tools for MySQL databases used by the research group.

EDUCATION

PhD Astrophysics

2011 – 2015

University of Hertfordshire, Hatfield

- Developed software for geometric distortion correction of astrophysical images.
- Measured proper motions for millions of stars in wide-field survey data, identifying over a thousand high proper-motion objects — candidate nearby and halo stars — in the solar neighbourhood.

BSc Astrophysics (First Class Honours)

2008 – 2011

University of Hertfordshire, Hatfield

- Awarded the Robert Jack Prize for outstanding undergraduate performance.

TECHNICAL SKILLS

Proficient

Python · SQL · Bash · CUDA

Familiar

C/C++ · PHP · JavaScript

Libraries MySQL

NumPy · SciPy · Astropy · Numba · PyCUDA · Scikit-learn · Pandas · Matplotlib · PostgreSQL ·

Methods

GPU / distributed computing · MPI · Machine learning · Bayesian inference · Time-series analysis · Statistical modelling · Data wrangling · Error analysis

Tools

Git · Jupyter · FITS / HDF5 · Slurm / HPC job schedulers