

David Yallup

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Research Themes: MCMC · Nested Sampling · GPU-Accelerated Inference · Generative AI for Science

Profile

Postdoctoral researcher in probabilistic machine learning and scientific inference, specialising in GPU-accelerated Bayesian computation and generative surrogate modelling for physical simulations. Lead developer and contributor to open-source JAX scientific software, with experience translating research methods into robust, reusable code and collaborating across academia and industry.

Skills

Statistical/Generative AI: Bayesian inference; simulation-based inference; uncertainty quantification; surrogate modelling; diffusion/flow-matching models

Software: Python; JAX; PyTorch; HPC; GPU; C++; version control (Git); CI/testing; packaging; documentation

Research: Method development; benchmarking; reproducible workflows; scientific computing for cosmology/GW/HEP

Collaboration: Cross-disciplinary research; industry-facing delivery; mentoring and supervision; data science seminar organiser

Experience

Kavli Institute for Cosmology, University of Cambridge

Postdoctoral Research Associate

2021–

Member of the Handley-lab research group:

- Developing GPU-accelerated inference for next-generation cosmology, gravitational wave, and particle physics experiments
- Building simulation-based inference and advanced MCMC tools in JAX/BlackJAX
- Bayesian statistics for scientific inference problems

Corpus Christi College, University of Cambridge

Research Associate

2022–

Polychord Ltd.

Research Scientist

2021–

Cambridge spin-out applying Bayesian methods to industrial problems including:

- Molecular structure prediction, battery design optimisation, sensor placement

Education

UCL

PhD Particle Physics

2015–2019

Thesis: “*Constraining new physics with fiducial LHC measurements*,” supervised by Prof J. Butterworth.

Recipient of UCL HEP postgraduate prize.

Durham University

MSc Particles, Strings and Cosmology

2014–2015

Durham University

MSci Natural Sciences, Maths and Physics

2009–2013

Grants

UKRI AIRR Gateway Award: Real-time gravitational wave inference

£50k Isambard-AI GPUh credits 2026

Google Cloud for Researchers

\$5k Google Compute Engine GPU credits 2025

Kavli Foundation

£3k to host Cosmological Inference in High Dimensions workshop 2024

Corpus Christi College, University of Cambridge

College Research Associateship 2023

Marie Curie Early Career Researcher

£30k for academic secondment and travel grant 2016–2019

Supervision

Part II Statistical Physics

Institute of Astronomy (Maths)

University of Cambridge

2025

4 groups of 2 students, ~40 hours

Part II Relativity

Natural Sciences Tripos (Physics)

University of Cambridge

2022

4 groups of 3 students, ~40 hours

Part III Projects

Natural Sciences Tripos (Physics)

University of Cambridge

2021–

Primary supervisor for 5 MSc projects, ~20 hours contact each

MSci Project Supervision

Physics and Astronomy

UCL

2016–2019

Co-supervisor for 1 MSc project and 8 MSci students with Prof Butterworth

Selected Talks (2024–)

NeurIPS – FPI Workshop

San Diego

2025

Particle Monte Carlo methods for lattice field theory

CamGW: Cambridge Gravitational Wave Network

KICC, University of Cambridge

2025

Towards real-time gravitational wave inference

Future of SED Fitting

KICC, University of Cambridge

2025

GPU-accelerated sampling methods

ICLR – FPI Workshop

Singapore

2025

Nested slice sampling

Gravitational Wave Analysis in the Era of Machine Learning

Royal Astronomical Society

2025

GPU-accelerated sampling methods

BayesAI Workshop

Lancaster University

2024

Neural network advances in nested sampling

EU AI for Fundamental Physics Conference

Amsterdam

2024

Diffusion meets nested sampling

Cavendish Astrophysics Seminar

University of Cambridge

2024

Diffusion models for accelerated inference

Astrophysics ML Seminar

University of Cambridge

2024

Simulation-based inference

Notable publications ★

- [1] **Yallup, David**, *Particle Monte Carlo methods for Lattice Field Theory*, in *39th Annual Conference on Neural Information Processing Systems: Includes Machine Learning and the Physical Sciences (ML4PS)*, 11, 2025 [[2511.15196](#)].
- [2] D.D.Y. Ong, **Yallup, David** and W. Handley, *A Bayesian Perspective on Evidence for Evolving Dark Energy*, [2511.10631](#).
- [3] **Yallup, David**, M. Prathaban, J. Alvey and W. Handley, *Parallel Nested Slice Sampling for Gravitational Wave Parameter Estimation*, in *2nd European AI for Fundamental Physics Conference*, 9, 2025 [[2509.24949](#)].
- [4] A.N. Ormondroyd, W.J. Handley, M.P. Hobson, A.N. Lasenby and **Yallup, David**, *Dynamic or Systematic? Bayesian model selection between dark energy and supernova biases*, [2509.13220](#).
- [5] T. Lovick, **Yallup, David**, D. Piras, A. Spurio Mancini and W. Handley, *High-Dimensional Bayesian Model Comparison in Cosmology with GPU-accelerated Nested Sampling and Neural Emulators*, [2509.13307](#).
- [6] M. Prathaban, **Yallup, David**, J. Alvey, M. Yang, W. Templeton and W. Handley, *Gravitational-wave inference at GPU speed: A bilby-like nested sampling kernel within blackjax-ns*, [2509.04336](#).
- [7] **Yallup, David**, N. Kroupa and W. Handley, *Nested slice sampling*, in *The Thirteenth International Conference on Learning Representations: Frontiers in Probabilistic Inference Workshop*, 2025, <https://openreview.net/forum?id=ekbkMSuPo4>.
- [8] N. Kroupa, **Yallup, David**, W. Handley and M. Hobson, *Kernel-, mean-, and noise-marginalized Gaussian processes for exoplanet transits and H_0 inference*, *Mon. Not. Roy. Astron. Soc.* **528** (2024) 1232 [[2311.04153](#)].
- [9] **Yallup, David** and W. Handley, *Hunting for bumps in the margins*, *JINST* **18** (2023) P05014 [[2211.10391](#)].
- [10] **Yallup, David**, W. Handley, M. Hobson, A. Lasenby and P. Lemos, *Split personalities in Bayesian Neural Networks: the case for full marginalisation*, [2205.11151](#).
- [11] **Yallup, David**, Janßen, Timo, Schumann, Steffen and Handley, Will, *Exploring phase space with nested sampling*, *Eur. Phys. J. C* **82** (2022) 678.
- [12] P. Lemos, M. Cranmer, M. Abidi, C. Hahn, M. Eickenberg, E. Massara et al., *Robust Simulation-Based Inference in Cosmology with Bayesian Neural Networks*, in *39th International Conference on Machine Learning Conference*, 7, 2022 [[2207.08435](#)].
- [13] A. Buckley et al., *Testing new physics models with global comparisons to collider measurements: the Contur toolkit*, *SciPost Phys. Core* **4** (2021) 013 [[2102.04377](#)].
- [14] S. Amrith, J. Butterworth, F. Deppisch, W. Liu and **Yallup, David**, *LHC Constraints on a $B - L$ Gauge Model using Contur*, *JHEP* **05** (2019) 154 [[1811.11452](#)].
- [15] G. Brooijmans et al., *Les Houches 2017: Physics at TeV Colliders New Physics Working Group Report*, in *10th Les Houches Workshop on Physics at TeV Colliders*, 3, 2018 [[1803.10379](#)].
- [16] J.M. Butterworth, D. Grellscheid, M. Krämer, B. Sarrazin and **Yallup, David**, *Constraining new physics with collider measurements of Standard Model signatures*, *JHEP* **03** (2017) 078 [[1606.05296](#)].

★ As an ATLAS collaboration author I was an author on over 280 collaboration papers; only external small-author-list papers are listed here.