

# David Yallup

Kavli Institute for Cosmology, University of Cambridge  
✉ david.yallup@gmail.com • 🌐 yallup.github.io • in dyallup  
🔗 yallup • ORCID: 0000-0003-4716-5817 Google Scholar: david.yallup

*Research Themes: Probabilistic Machine Learning, Explainable AI, Scientific applications of Machine Learning*

## Appointments

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- 2021- **Postdoctoral Research Associate**, *Kavli Institute for Cosmology*, University of Cambridge, Cambridge.
- Cosmology, High Energy Physics, accelerated likelihoods for Gravitational Wave Physics and CMB physics.
  - Simulation Based inference, interfacing generative AI with scientific inference problems.
  - MCMC methods, particularly with a view to building scalable GPU inference tools.

## Previously

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- 2019-2020 **Postdoctoral Research Associate**, *High Energy Physics group*, UCL, London.  
Developing Machine Learning tools for inference over theoretical models at the highest energy frontiers. Assisting supervision of six masters students using software tools I wrote.
- 2015-2019 **Doctoral candidate**, *High Energy Physics group*, UCL, London.  
PhD student working on the ATLAS experiment and with the MCnet collaboration for collider physics theory. Leading development of tools for simulating collider physics, and analysing big data from the experiments for dark matter signals.

## Associations

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- 2022- **Corpus Christi College**, *University of Cambridge*, Research Associate.  
Associate member of college research community
- 2021- **Polychord Ltd.**, Research associate.  
Partnered with a Cambridge spin out startup data science consultancy, aiding development of novel Bayesian techniques for a wide array of industrial challenges.

## Previously

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- 2015-2019 **MCnet Collaboration**.  
International multi-institute theory collaboration, core member of UCL node.
- 2015-2019 **ATLAS Experiment**, *CERN*.  
Qualified author on the ATLAS experiment
- 2017 **Visiting researcher**, *ATLAS Experiment*.  
STFC funding secondment at CERN for 9 months on the ATLAS experiment.
- 2016 **Visiting Researcher**, *Karlsruhe Institute of Technology*, Institute of Theoretical Physics.  
Marie Curie early career visiting researcher four month project
- 2013-2014 **Simcorp Ltd.**, *Business Consultant*, Simcorp Ltd., London.

## Education

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- 2015–2019 **PhD. Particle Physics**, *UCL*.  
Recipient of UCL HEP postgraduate prize for outstanding postgraduate research.  
Thesis titled, “*Constraining new physics with fiducial LHC measurements.*” supervised by Prof J. Butterworth
- 2014–2015 **MSc Particles, Strings and Cosmology**, *Durham University*.
- 2009–2013 **MSci Natural Sciences, Maths and Physics**, *Durham University*.

## Grants

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- 2024 **Kavli Focus Meeting**,  $\sim \pounds 2k$ , Kavli Institute for Cosmology Cambridge.  
Funding to host Cosmological inference in High dimension workshop.
- 2017 **Marie Curie short term Early Stage Researcher grant**,  $\sim \pounds 30k$ .  
Fully funded Marie Curie visiting position at KIT for 5 months.
- 2015-2019 **MCnet mobility allowance**, *Totalling  $\sim \pounds 5k$* .  
Awarded numerous travel grants for international conferences under MCnet Marie Curie network.

## Students

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- 2023-24 **Pratyush Mishra**, *University of Cambridge*, Part III Natural Sciences project.  
Simulation Based inference bump hunting.
- 2022-23 **Namu Kroupa**, *University of Cambridge*, Part III Natural Sciences project.  
Marginalised Gaussian Processes for Cosmology
- 2022-23 **Boris Deletic**, *University of Cambridge*, Part III Natural Sciences project, co-supervised w. Dr. Will Barker.  
Modified gravity on the lattice
- 2018 **Harry Saunders**, *UCL*, MSc in Scientific Computing, Lead supervisor Profesor Jon Butterworth.  
Adaptive sampling for physics models in high dimension

## Teaching

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### Undergraduate teaching

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- 2025 **Part II Statistical Physics**, *University of Cambridge*, Institute of Astronomy (Maths).  
4 groups of 2 students,  $\sim 40$  hours
- 2022 **Part II Relativity**, *University of Cambridge*, Natural sciences tripos (Physics).  
4 groups of 3 students,  $\sim 40$  hours
- 2015-2019 **Masters project supervision**, *UCL*, MSci Physics projects.  
Lead supervisor Prof. Jon Butterworth, assisted over 10 project students
- 2016 **First year physics lab demonstrator**, *UCL*.

### Technical teaching

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- 2019 Original author of software tutorials for RIVET and CONTUR particle physics packages.  
Delivered at two MCnet summer schools.
- 2019 Young Experiment and Theorist Institute school tutor on RIVET and CONTUR.
- 2018-2019 ATLAS UK meeting tutor on the RIVET package and Monte Carlo methods for particle physics.

## Dissemination

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### Invited Talks

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- 2024 **BayesAI Workshop**, *Lancaster University*.  
Diffusion Meets Nested Sampling
- 2024 **EUCAIFCon**, *Amsterdam*.  
Diffusion Meets Nested Sampling
- 2024 **Hills Coffee Talks**, *University of Cambridge*.  
Diffusion Meets Nested Sampling
- 2024 **Cambridge Astrophysics Machine Learning Seminar**, *University of Cambridge*.  
Simulation Based Inference
- 2023 **Voyages Beyond the Standard Model**, *Athens*.

- 2023 **UKLFT**, *University of Cambridge*.  
Nested Sampling for Lattice Field Theory
- 2022 **Bayesian Inference in High Energy Physics**, *Durham University*.
- 2022 **Likelihood Free in Paris**, *L'École Normale Supérieure*, Paris, France.
- 2021 **Learn the Universe - LFI for Cosmology**, *Flatiron Institute*, NY, USA.
- 2019 **Les Houches Physics at TeV Colliders**, *Chamonix*, France.
- 2019 **ATLAS Exotics workshop**, *Naples*, Italy.
- 2019 **Rencontres de Moriond - EW Interactions and Unified Theories**, *La Thuile*, Italy.
- 2019 **Young Experimentalist and Theorists Institute**, *Durham*, UK.
- 2018 **Institute of Physics annual meeting**, *Bristol*, UK.
- 2018 **MC4BSM**, *Durham*, UK.
- 2017 **Alpine LHC Summit**, *Innsbruck*, Austria.

### Invited Seminars.....

- 2023 **Evidence is all you need: Nested Sampling for particle physics**, *University College London*, High Energy Physics group seminar.
- 2022 **Evidence is all you need: Nested Sampling for particle physics**, *University of Cambridge*, High Energy Physics seminar.

### Outreach.....

- 2018 **Science Centre Lectures**, *University College London*, Physics at the energy frontier.  
Outreach talk to a group of over 100 sixth form students
- 2017-2019 **Life at CERN**, *University College London*.  
Research introduction talks to third year students in physics at UCL.

### Notable publications ★

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- [1] D. Yallup and W. Handley, *Nested slice sampling*, 2025.
- [2] N. Kroupa, D. Yallup, W. Handley and M. Hobson, *Kernel-, mean-, and noise-marginalized Gaussian processes for exoplanet transits and  $H0$  inference*, *Mon. Not. Roy. Astron. Soc.* **528** (2024) 1232 [2311.04153].
- [3] D. Yallup and W. Handley, *Hunting for bumps in the margins*, *JINST* **18** (2023) P05014 [2211.10391].
- [4] D. Yallup, W. Handley, M. Hobson, A. Lasenby and P. Lemos, *Split personalities in Bayesian Neural Networks: the case for full marginalisation*, 2205.11151.
- [5] Yallup, David, Janßen, Timo, Schumann, Steffen and Handley, Will, *Exploring phase space with nested sampling*, *Eur. Phys. J. C* **82** (2022) 678.
- [6] 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].
- [7] 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].
- [8] S. Amrith, J. Butterworth, F. Deppisch, W. Liu and D. Yallup, *LHC Constraints on a  $B - L$  Gauge Model using Contur*, *JHEP* **05** (2019) 154 [1811.11452].
- [9] J.M. Butterworth, D. Grellscheid, M. Krämer, B. Sarrazin and D. Yallup, *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 authorlist papers are listed here. Inclusion here represents a first author level contribution.*