

Isaac Reid

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Research interests

I am interested in problems at the interface of ML, statistical physics and applied mathematics. Recently, I've focussed on efficient transformers for graph-structured data and foundation models for robotics. I hold a Google PhD Fellowship in Algorithms and Theory.

Education

Machine Learning, University of Cambridge, UK

Oct 2022 - present

PhD in Engineering

Supervisors: [Dr Adrian Weller](#) and [Prof. Rich Turner](#)

Advisor: [Prof. Carl Rasmussen](#)

Subject: Scalable and data-efficient machine learning. Close collaboration with [Prof. Krzysztof Choromanski](#).

Physics, University of Oxford, UK

Oct 2017 - Jun 2021

Master of Physics, MPhys

Grade: First class, 92%, top of Oxford cohort (out of ~ 150)

Research project: Quantum entanglement barriers in dual-unitary circuits

Supervisor: [Dr Bruno Bertini](#)

Select publications and preprints

Please see my [website](#) for an exhaustive list of papers. Some highlights (by my assessment) are listed below.

Gemini Robotics 1.5: Pushing the Frontier of Generalist Robots with Advanced Embodied Reasoning, Thinking, and Motion Transfer

GDM blog

GDM robotics team (very many authors)

Synopsis: A new family of robotics foundation models, with improved reasoning and cross-embodiment transfer.

[Gemini Robotics 1.5 Tech Report](#)

Wavelet-Induced Rotary Encodings: RoPE Meets Graphs

Preprint, under review

Isaac Reid*, Arijit Sehanobish*, Cederik Höfs*, Bruno Mlodozieniec, Leonhard Vulpius, Federico Barbero, Adrian Weller, Krzysztof Choromanski, Richard E. Turner, Petar Veličković

Synopsis: You can extend rotary position encodings (RoPE) to graphs, and it automatically inherits a bunch of nice properties.

<https://arxiv.org/abs/2509.22259>

Distributional Training Data Attribution

NeurIPS 2025, accepted as spotlight paper

Bruno Mlodozieniec*, **Isaac Reid***, Sam Power, David Krueger, Murat Erdogdu, Richard Turner, Roger Grosse

Synopsis: 'Influence' of samples can be understood by how drastically the distribution over final trained models changes if they are removed. Influence functions emerge organically from this new mathematical formulation.

<https://arxiv.org/abs/2506.12965>

Simplex Random Features

ICML 2023, accepted with oral presentation

Isaac Reid, Krzysztof Choromanski, Valerii Likhoshesterov, Adrian Weller

Synopsis: Derivation of an optimal random feature mechanism for unbiased approximation of the Gaussian kernel, motivated by a host of new analytical results and tested with transformer experiments

<https://arXiv.org/abs/2301.13856>

Entanglement Barriers in Dual-Unitary Circuits

Phys. Rev. B 104, 014301 – Published 1 July 2021

Isaac Reid, Bruno Bertini

Synopsis: Exact characterisation of the dynamics of quantum entanglement arising after a quantum quench in a many-body, locally interacting system, including both the integrable and completely chaotic regimes

<https://arxiv.org/abs/2103.12794>

Teaching

Cambridge MLMI

Lent 2025

Synopsis: Guest lecturer, providing an introduction to transformers.

Engineering 2P7

Michaelmas 2023 - Easter 2025

Synopsis: Supervisions in mathematics for engineers (vector calculus, linear algebra and probability)

Pembroke International Summer Programme

Jun-Aug 2023

Synopsis: Research project on density ratio estimation in machine learning

Talks

Efficient Transformers – Machine Learning Group, Cambridge

Nov 2024

Synopsis: Seminar on mathematical tricks for subquadratic attention

Quasi-Monte Carlo Graph Random Features – NeurIPS@Cambridge, Cambridge

Dec 2023

Synopsis: Invited talk to accompany NeurIPS spotlight paper

Simplex Random Features – ICML 2023, Honolulu

July 2023

Synopsis: Oral presentation to accompany paper

Simplex Random Features – Microsoft Research, Cambridge

Jun 2023

Synopsis: Research talk on ICML paper

Random Features for Kernel Approximation – Machine Learning Group, Cambridge

Mar 2023

Synopsis: Seminar on random feature methods and recent QMC schemes to improve their convergence

Experience

Student Researcher, Google DeepMind (NYC, US)

May 2025 - present

Gemini Robotics 1.5

Research Associate, IQ Capital (London, UK)

Nov 2024 - April 2025

1 day/week advising and investing in ML startups and supporting portfolio companies

Student Researcher, Google (London, UK)

May 2024 - Nov 2024

Project on efficient Transformers, working closely with [Krzysztof Choromanski](#) and [Avi Dubey](#)

Systems Engineer, Opsydia (Oxford, UK)

Sep 2021 - Sep 2022

R&D engineer at deep-tech startup specialising in laser technology and adaptive optics, spun out of Oxford University Engineering Department

Research Intern, Max Planck Institute (remote, UK)

Summer 2020

Computational study of Bose-Einstein condensation in active matter, applying theoretical results from many-body quantum physics to classical clustering phenomena observed in Kob-Andersen particle dynamics

Supervisors: [Dr Benoit Mahault](#) and [Prof. Ramin Golestanian](#)

Research Intern, Rudolf Peierls Centre for Theoretical Physics (Oxford, UK)

Summer 2019

Study of relationship between spectral properties of Hessian of loss function and Bayesian prior upon deep neural network initialisation, estimated using random sampling of weights and Gaussian processes

Supervisor: [Prof. Ard Louis](#)

Scholarships and awards

Google PhD Fellowship in Algorithms and Theory Funding from Google for remainder of PhD	<i>2024-2026</i>
G-Research Grant Financial award to help fund attendance of ICML conference	<i>July 2023</i>
Trinity College External Studentship Full scholarship for a PhD in Machine Learning	<i>2022-2025</i>
Encaenia One of six undergraduate students invited to attend Oxford's historic Encaenia ceremony	<i>Jun 2022</i>
Gibbs Prize For submitting the highest scoring MPhys research project (87%)	<i>2020-2021</i>
Scott Prize For best overall performance in the MPhys (92%)	<i>2017-2021</i>
Scott Prize For best performance in the third year (92%)	<i>2019-2020</i>
Winton Capital Prize For best performance in the second year (93%)	<i>2018-2019</i>
Hertford College Academic Scholarship For performance in first year (88%)	<i>2018-2021</i>