Max Cairney-Leeming

Vienna, Austria

maxcl.co.uk scholar.google.com/citations?user=tklkAnwAAAAJ max@cairneyleeming.co.uk

PhD student in machine learning working on differential privacy for deep learning, with a focus on the interactions between privacy and other trustworthiness concerns, e.g. fairness, reconstruction attacks, and generalisation.

Education

Institute of Science and Technology Austria (ISTA): PhD in Machine Learning

2023 – present

Supervised by Christoph Lampert; **ELLIS PhD Program**, co-supervised by Amartya Sanyal (University of Copenhagen).
Passed qualifying exam (Feb 2025); committee: C. Lampert, M. Mondelli, A. Sanyal, F. Praetorius (chair).
First-year rotations with Francesco Locatello, Marco Mondelli and Christoph Lampert.

University of Oxford, Lady Margaret Hall: MMathCompSci, Mathematics and Computer Science

2019 – 2023

First in Bachelor's (72.5%) and Distinction in Master's (71.15%); scholarships for performance in each of 1st–3rd years.
Master's thesis: "Deep generative modelling for encoding Gaussian process priors", supervised by Prof. Seth Flaxman.

Research Experience

University of Copenhagen, Department of Computer Science (DIKU): Visiting PhD Student

Apr – Jul 2025

Research visit to Amartya Sanyal's group as part of the ELLIS PhD Program; resulting in a paper on private worst-group optimisation (see publications).

University of Oxford, Department of Engineering Science: Research Intern

Summer 2022

Project: "Applying lattices & quaternions to the tractability of machine learning for polarisation adaptive optics", under Prof. Martin Booth.
Improved ML performance and resource use for detecting polarisation aberrations by identifying lattice structures in the modelled cost functions.

Publications & Preprints

2026 **M. Cairney-Leeming**, S. Bombari, M. Mondelli. "A Sharp Transition in Data Reconstruction under Differential Privacy." arXiv preprint, 2026.

2026 C. H. Lampert, **M. Cairney-Leeming**, H. Zakerinia. "From Privacy to Generalization: Linear Max-Information Bounds for Differentially Private Learning Algorithms." arXiv preprint, 2026.

2026 **M. Cairney-Leeming**, A. Sanyal, C. H. Lampert. "Adaptive Sampling and Clipping for Private Worst-Case Group Optimization." arXiv preprint, 2026.

2025 F. Montagna, **M. Cairney-Leeming**, D. Sridhar, F. Locatello. "Demystifying amortized causal discovery with transformers." *Transactions on Machine Learning Research (TMLR)*, 2025.

2023 E. Semenova, P. Verma, **M. Cairney-Leeming**, A. Solin, S. Bhatt, S. Flaxman. "PriorCVAE: scalable MCMC parameter inference with Bayesian deep generative modelling." arXiv preprint, 2023.

Talks & Posters

2026 Poster, Theory and Practice of Differential Privacy (TPDP), Boston: Private Worst-group Optimisation.

2026 Poster, Symposium on Foundations of Responsible Computing (FORC): Private Worst-group Optimisation.

2025 Poster, Privacy-Preserving ML workshop (PPML) @ EurIPS, Copenhagen: Private Worst-group Optimisation.

Also attended: ELLIS Doctoral Symposia (EDS) 2024 and 2025; ELSA Workshop on Privacy-Preserving Machine Learning, Bertinoro, 2025.

Service & Teaching

Reviewing

2025 – ICLR 2026; TMLR; PPML workshop @ EurIPS 2025.

Teaching Assistant, Modern Machine Learning, ISTA

2026 Teaching assistant for the graduate Modern Machine Learning course.

Student Representative, Computer Science track, ISTA

2026 – | Represent CS PhD students within ISTA.

Volunteering

| ICLR 2024, Vienna; PPML workshop @ EurIPS 2025, Copenhagen.

Industry & Outreach

Opsydia: R&D Intern

Summer 2021 | Integrated new laser hardware into the R&D optics table, from optical path calibration to control software tested on real diamond samples.
Designed software-level laser power safety, as the laser had no built-in safety features; documented and presented the system to the team.

Tom Rocks Maths: Maths Outreach Intern

Summer 2020 | Wrote, filmed and edited videos on fractals and 3D printing for young audiences; won a department prize for the first video.
Built fractals.maxcl.co.uk: interactive explanations of Lindenmayer systems and a Rust server converting fractals into 3D-printable meshes (millions of triangles).

J A Kemp LLP: Software Development Intern

Summers 2018, 2019 | Developed C# software to automatically file legal requests with supporting documentation, and to reconcile internal data with EU patent office records, working with patent lawyers on specifications.

Extra-curricular Interests

cantus iuvenis (Choir, Vienna): Committee Member

2026 – | Responsible for sourcing & organising sheet music, as well as website support.

Oxford Millennium Orchestra: President

2021 – 2022 | Ran a ~70-player orchestra, restarting it post-COVID by recruiting 30+ new players and organising two concerts in the Sheldonian Theatre; modernised ticketing, resulting in record sales.

Music

Cello | Chamber music @ ISTA; previously Oxford Millennium Orchestra. Grade 8 Distinction.

Singing | Bass in cantus iuvenis, Vienna; previously Philharmonischer Chor of the University of Vienna, and LMH and Jesus College chapel choirs, Oxford.