Thomas Andrew Lamb

https://tomalamb.github.io/

Education

- **University of Oxford** — Oxford, UK
  DPhil Machine Learning — *Oct. 2023 - Present*
  - Supervised by Prof. Philip H.S. Torr
  - My research interests include geometrical and Bayesian methods and uncertainty quantification in machine learning.
  - Auditing the Advanced Simulation course within the Statistics department.
- **University of Edinburgh** — Edinburgh, UK
  MSc Artificial Intelligence: Distinction. — *Sept. 2022 - Aug. 2023*
  - Courses: Machine Learning and Pattern Recognition, Reinforcement Learning (91%), Bayesian Theory (97%), Probabilistic Modelling and Reasoning (85%), Accelerated Natural Language Processing, and Natural Language Understanding, Generation and Machine Translation (84%). Audited Targeted Causal Learning, Methods of Causal Inference, and Algorithmic Game Theory.
  - My MSc dissertation was titled 'Self-Supervised Learning of Tractable Generative Models' and was supervised by Dr. Antonio Vergari. This project looked at using conditional composite log-likelihood estimation (CCLE) with various novel patching schemes as an alternative method of training EiNet models, a class of probabilistic models that allows for exact forms of inference. Here, we aimed to investigate if a CCLE objective function can act as a form of implicit regularisation, as well as if CCLE objective can aid in improving inpainting performance on image datasets.
  - Received the MSc Artificial Intelligence Class Prize.
- **University of Durham** — Durham, UK
  MMath Mathematics: First-Class Honours — *Oct 2016 - July 2020*
  - Specialised in Pure Mathematics. Selection of courses taken: Algebraic Topology, Riemannian Geometry, Representation Theory, Algebraic Curves, Partial Differential Equations, Algebraic Number Theory, Elementary Geometry, Complex Analysis, Galois Theory, Statistics, Probability, Special Relativity and Electromagnetism, Analysis in Many Variables, Algebra, Mathematics for Computer Science, Introduction to Programming, Computer Systems and Numerical Analysis.
  - My MMath thesis was titled 'An Introduction to Modular Forms and the Eichler-Shimura Isomorphism' and was supervised by Prof. Herbert Gangl. Here I aimed to provide a comprehensive introduction to the theory and results of classical Modular Forms. This included detailed discussions on Hecke operators, Maeda's conjecture, L-functions and was concluded by proving the Eichler-Shimura Isomorphism.
  - Averaged 90% overall and received the John Crowther and the Percey Heywood prizes.

Prizes

- **MSc Artificial Intelligence Class Prize (School of Informatics, University of Edinburgh):** Awarded to the student who gained the highest overall mark in the MSc Artificial Intelligence course.
- **The Percy Heywood Prize (Department of Mathematical Sciences, University of Durham):** Awarded to a student graduating with an MMath Master of Mathematics whose performance is outstanding in the final year.
- **The John Crowther Prize (University College, University of Durham):** Awarded by University College for performance in my third year Mathematics exams.

Preprints

- Lamb, Tom A., et al. "Faithful Knowledge Distillation." arXiv preprint arXiv:2306.04431 (2023).

Research Experience

- **Oxford University** — Oxford, UK
  UNIQ+ DeepMind Machine Learning Research Intern — *July 2022 - Present*
  - Research intern in machine learning at Oxford University based in the Torr Vision Group (TVG). Here, I was supervised by Francisco Girbal Eiras and Prof. Philip H.S. Torr.
  - Our research introduced a faithful imitation framework in which to discuss the relative calibration of teacher-student neural network pairs. We computed upper and lower bounds on the maximum difference in confidences of teacher-student pairs in perturbation neighborhoods surrounding images using LP methods. Finally, we introduced a new form of distillation that produced empirically and verifiably more faithful teacher-student pairs than other forms of knowledge distillation.
  - Currently making final edits before submitting to a conference. This work can be found on ArXiV under the title 'Faithful Knowledge Distillation'.
- **University of Durham** — Durham, UK
  Summer Research Student — *June 2019 - Sept. 2019*
  - Inspired by Prof. Michael Hoffman's paper 'Polylogarithmic Integrals and MZV (Multiple Zeta Values)', we conjectured and subsequently proved novel results that relate integrals over the unit square of polylogarithms multiplied with different two variable polynomial fractions to linear combinations of MZVs.

Skills Summary

- **Languages:** Python, Bash, Java, Matlab, SQL
- **Specific Python Packages Used:** PyTorch, GPyTorch, Transformers, OpenAI, Pandas, GurobiPy, SciPy, Scikit-learn, NLTK.

Outreach and Teaching

- **OXAi Education Team Member:** Responsible for creating resources (including blog-posts that can be found on my website) on ML covering technical through to introductory topics. Moreover, I am responsible for developing talks for later year groups of secondary school students in the UK as part of OxAi outreach.
- **Mathematics Homework Assessor:** Marked and assessed the homework of second year Mathematics studetns at the University of Durham who were taking the second year Algebra course.
- **Mathematics Teacher:** Prior to my MSc degree, I taught Mathematics to secondary school students, mainly 6th form students studying for A Levels Mathematics and Further Mathematics qualifications in the UK.
- **Mathematics Tutor:** I have tutored Mathematics for several years. This involved teaching GCSE and A Level Mathematics and Further Mathematics, as well as university level Mathematics.