CHARLOTTE SWEENEY

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EDUCATION

DPhil Machine Learning 2024 - Current
University of Oxford

- Supervised by Prof. Xiaowen Dong and co-supervised by Prof. Michael Bronstein.
- Research focused on the intersection of graph neural networks with geometry and topology.
- EPSRC funded doctoral program, Autonomous Intelligent Machines and Systems (AIMS), focusing on machine learning and its applications in the areas of robotics, vision, cyber-physical systems, control, and verification.

MSc Statistical Science, *Distinction* 2023 - 2024
University of Oxford

- Highlighted Courses: *Advanced Statistical Machine Learning, Bayes Methods, Probability and Statistics for Network Analysis, Graphical Models.*

BSc (Hons) Computer Science and Mathematics, *First Class* 2019 - 2023
University of Edinburgh

- Computer Science Honours Courses: *Machine Learning and Pattern Recognition, Reinforcement Learning, Randomised Algorithms, Introduction to Theoretical Computer Science.*
- Maths Honours Courses: *Algebraic Topology, General Topology, Combinatorics and Graph Theory, Complex Variables, Analysis, Algebra, Symmetry and Geometry.*

RESEARCH EXPERIENCE AND PROJECTS

Master's Dissertation (3 months) 2024
Uncertainty Quantification of Protein Structure Predictions in the Context of Protein Flexibility

- Master's dissertation, supervised by Prof. Yee Whye Teh.
- Estimated the conformational flexibility of AlphaFold2's protein structure predictions through quantification of the prediction's aleatoric uncertainty.
- Involved the adaptation of AlphaFold2's Structure Module to produce uncertainty estimates and an analysis of the reliability of such estimates.

Undergraduate Dissertation 2022 - 2023
An Experimental Study of Persistent Homology Dimension Regularisation

- Honours Project dissertation, supervised by Dr Rik Sarkar.
- Explored the links between generalisation, compressibility, and the noise distribution of network trajectories in SGD through an existing persistent homology dimension regularisation method.
- Involved work in the fields of topological data analysis, network pruning, and basic stochastic differential equations.

Research Assistant (6 months) 2022 - 2023
University of Oxford

- Research project titled *Double Descent and Deep Learning* under the supervision of Prof. Seth Flaxman and Prof. Samir Bhatt.
- Work concerned with exploring how the generalisation accuracy of neural networks varies with the number of parameters.

- Involved testing a conjecture relating the Double Descent phenomenon to the increasing number of solutions in an over-parameterised system within kernel regression and Gaussian processes.
- Delivered a presentation on the findings of the project in a conference-like setting to my peers and supervisors.
- Work was initially part of a 10 week UNIQ+ DeepMind Internship and later continued for an additional 3 months.

PUBLICATIONS AND WORKSHOPS

- Charlotte Sweeney, Nele Quast, Fabian Spoendlin, Yee Whye Teh, *Uncertainty Quantification of Protein Structure Predictions in the Context of Protein Flexibility*, 2024 NeurIPS Machine Learning in Structural Biology Workshop

PUBLIC ENGAGEMENT

Oxplore Festival June 2025
Bradford and Warrington

- Ran an exhibition stall for secondary school students on how we can model the impact of climate initiatives through a carnival-style game and discussion.
- The festival is an outreach event for secondary school pupils in areas with a low university application rate. The students are able to engage with a stalls on a wide variety of subjects that they could pursue in further study.