

# Miles Weatherseed

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## Education

### University of Oxford

PhD in Applied Mathematics

2019 – 2024

Oxford

- › Thesis: "POEM: prediction of immunogenic epitopes using mechanistic modelling of the MHC class I antigen processing pathway".
- › Tutor in applied mathematics at Brasenose College (Introductory Calculus, Geometry, Applied PDEs and Fourier Series).
- › Undergraduate admissions interviewer for mathematics at Brasenose College.

### University of Oxford

Master of Mathematics

2015 – 2019

Oxford

- › First-class honours.
- › Dissertation: "Mathematical models of DNA-protein interactions" (80/100).

## Experience

### Oxford Centre for Immuno-Oncology

Postdoctoral Researcher

2024 – present

Oxford

- › Develop and apply machine learning models to identify targets for cancer vaccine development, contributing to cutting-edge immuno-oncology research.
- › Utilise software engineering skills to distribute and beta test the "POEM" algorithm, ensuring usability and reliability for end-users.
- › Present research findings and discuss progress with multidisciplinary collaborators to drive innovative solutions.
- › Provide mentorship and guidance to a PhD student, fostering their academic and professional development.

### Synteny Biotechnology

Machine Learning Intern

Sep 2023 – Dec 2023

Cambridge

- › Developed and tested efficient, scalable code for integrating new algorithms and methods into the main codebase, prioritising speed and memory optimisation.
- › Fine-tuned protein language model (ESM-2) to deconvolute large mass spectrometry datasets, doubling the training data for the company's binding prediction model.
- › Researched and manually benchmarked emerging algorithms for generating ensembles of protein structures from AlphaFold2.
- › Competed in [IMMREP23 Kaggle challenge](#), finishing 4th.

### J.P. Morgan

Sales & Trading Summer Analyst

Jun 2018 – Aug 2018

London

- › Contributed to trading operations on the European Repo Desk, supporting daily trading operations.
- › Built VBA macros, including a tool for calculating trade haircuts under FIN 41 netting regulations, streamlining workflows.
- › Placed 2nd in the EMEA Sales & Trading Intern Trading Challenge.
- › Earned a full-time offer for high performance and technical contributions.

## Projects

### POEM (Prediction of Epitopes using Mechanistic Modelling)

2024 – present

- › Developed a machine learning algorithm to predict vaccination targets for cancer and pathogens using output of mechanistic model.
- › Achieved superior predictive performance compared to state-of-the-art algorithms across diverse benchmarks, including cancer and SARS-CoV-2 datasets.
- › Research is currently unpublished and under embargo due to proprietary use in Oxford cancer vaccine development and pending licensing agreements.
- › Attracted significant interest from leading pharmaceutical companies, including BioNTech and GSK.

### Mechanistic Modelling of the Antigen Processing Pathway

2020 – 2024

- › Developed a mechanistic systems biology model using a large system of ODEs to represent complex immunological processes.
- › Integrated *de novo* parameter prediction with supervised learning (SVR) and Bayesian inference via MCMC for parameter estimation and identifiability analysis.

- › Demonstrated superior predictive accuracy compared to data-driven machine learning methods, addressing limitations in available training data.

#### **MHC-I Motif Deconvolution from Immunopectidomics data**

Sep 2023 – Oct 2023

- › Fine-tuned a large protein language model (ESM-2) to predict MHC-I allele sequences from presented peptide sequences.
- › Enabled accurate assignment of eluted ligands to one of six potential MHC-I alleles in multi-allelic immunopectidomics data.
- › Facilitated proper labeling of data for training the company's binding prediction model, improving its accuracy and robustness.

#### **Efficient Molecular Dynamics Simulation of Large Polymers**

Jan 2019 – May 2019

- › Developed a hybrid simulation framework combining coarse Langevin dynamics for low-interest regions and molecular dynamics for regions of high interest.
- › Improved computational efficiency while maintaining accuracy in modelling interactions between large polymers (e.g. DNA) and proteins.
- › Implemented performance-focused code in Fortran, demonstrating significant increase in simulation efficiency.

### **Leadership**

#### **Oriel College**

Jan 2024 – present

*Junior Dean*

*Oxford*

- › In charge of student discipline, applying college policies to uphold standards and resolve conflicts effectively.
- › Provide 24/7 on-call support for student welfare and discipline, ensuring a safe and respectful college environment.
- › Work collaboratively with welfare team to share workload, flag concerns, and ensure student wellbeing.
- › Manage challenging situations, requiring quick decision-making and transparency in judgements.

#### **Vincent's Club**

May 2021 – May 2022

*Club President*

*Oxford*

- › Elected President of social club of ~150 Oxford sportspeople.
- › Managed a committee of 16 people, revitalising this club in the aftermath of COVID and hitting record food and bar sales.
- › Oversaw migration of outdated membership database to new CLM system, enhancing alumni relations and donations.
- › Subsequently elected to the senior board as Governance Director (2024 – present).

#### **Oxford University Athletic Club**

May 2017 – May 2018

*Club President*

*Oxford*

- › Elected President of Oxford's largest sports club (over 200 members).
- › Established alumni society and regular giving scheme (The 1860 Club), providing sustainable cash flow after loss of main sponsor.
- › Led club to a record-breaking year, winning all matches against Cambridge.

### **Technical Skills**

#### PROGRAMMING LANGUAGES

<b>Experienced</b>	Python, $\LaTeX$ , Julia
<b>Intermediate</b>	Java, Fortran
<b>Basic</b>	C/C++, CSS, JavaScript, HTML

#### LIBRARIES/TOOLS

<b>Experienced</b>	Numpy, Pandas, scikit-learn, it, Terminal, functional programming
<b>Intermediate</b>	Pytorch, TensorFlow, Optuna, LightGBM, AnnData

### **Hobbies**

#### **Middle distance running (800m to 5k)**

- › Represented England at Junior and Senior levels for 1500m to 3000m.
- › British Olympic trialist in 1500m in 2021.
- › Sub 4-minute mile equivalent in 1500m (3:42.92)/
- › University of Oxford mile record holder (road). 3rd All Time in 1500m.

#### **Puzzles**

- › Cryptic crosswords (Times, Guardian, Observer).
- › Coding challenges (Jane Street puzzles, IMC 64BIDS finalist 2021).

#### **Games**

- › Board games (Catan, Splendor/Splendor Duel, Jaipur), Poker, Chess.