HAMISH M. BLAIR

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EDUCATION & RESEARCH EXPERIENCE

Stanford University September 2022 - July 2027 (expected)

Ph.D. in Mathematics; advised by Rhiju Das (Biochemistry) and George Papanicolaou (Mathematics).

- Part of the *Ribonanza* initiative for training structure-informed RNA foundation models
- Advanced methods for extracting RNA structural information from large-scale experimental datasets.

University of Sydney March 2018 - December 2021

Bachelor of Science and Bachelor of Advanced Studies, with majors in mathematics and physics. Applied mathematics honours supervised by Leo Tzou.

- Graduated with first class honours and the university medal
- Advanced theoretic results in computed tomography as part of the applied geometric analysis group
- Awarded the Joye Medal for greatest proficiency across the pure and applied mathematics honours programs.

PUBLICATIONS & THESES

1. Shujun He et al. Ribonanza: deep learning of RNA structure through dual crowdsourcing. *Under review at Nature Methods*.
2. **Hamish Blair**, Wipapat Kladwang, Rhiju Das. Prediction and reduction of read-depth bias in MaP-seq experiments. *In progress*.
3. **Hamish Blair**, Rhiju Das. Mutational profiling beyond the transcriptome scale with `cmuts`. *In progress*.
4. **Hamish Blair**, George Papanicolaou. Advances in sparse autocorrelation approaches to Cryo-EM. *In progress*.
5. **Hamish Blair**. Microlocal analysis and the geometry of distributions. *Honours thesis*.

SOFTWARE

`rn-filter` : fine-tuned foundation model to aid in the design of RNA mutational profiling experiments.

`cmuts` : modern multi-threaded RNA/DNA mutation counting software for use in machine learning pipelines.

`fld` : design of RNA mutational profiling libraries at the scale required for training foundation models.

`bioeq` : PyTorch-based software for training geometric deep learning models on biomolecular data, with custom CUDA kernels for reduced memory usage and up to a $10\times$ inference speedup.

TEACHING & SERVICE

Stanford University, Course Assistant

- *Calculus I*; Fall 2022 (under Lernik Asserian)
- *Applied Matrix Theory*; Spring 2023 (under Gene Kim) and Fall 2024 (under Emmanuel Candès)
- *Fundamental Concepts of Analysis*; Fall 2023 (under Cole Graham)

Stanford University, Teaching Assistant

- *Linear Algebra, Multivariable Calculus, and Modern Applications*; Winter 2024 (under Mark Lucianovic) and Winter 2025 (under Christine Taylor)

Reviewer, *Nature Communications* 2024

Early Career Reviewer, *Science* 2025

SKILLS

Software Development:

- Proficiency in Python (5 years), MATLAB (3 years), C (2 years), and C++ (2 years).
- Experience with Mathematica (1 year), CUDA (1 year) and Lua (6 months).

Machine Learning & Data Science:

- Extensive experience with computational applied mathematics, especially numerical linear algebra (`numpy`, `scipy.linalg`, `cuBLAS`) and optimization (`cvxpy`, `scipy.optimize`) packages
- Three years' experience using PyTorch to train and fine-tune deep learning models
- Experience with multi-GPU fine-tuning and inference of foundation models via PyTorch Lightning.