David Liu

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Education

2020-current **PhD Computational Neuroscience**
University of Cambridge, Wolfson College
Supervised by Prof Máté Lengyel at the Computational and Biological Learning Lab

- Scalable Bayesian methods for analysing neural spiking variability in data
- Latent variable modelling for structure discovery in neural population data
- Efficient and exact gradients in general integrate-and-fire spiking neural networks

2015-2019 **MSci and BA (Hons) Natural Sciences**
University of Cambridge, Queens' College
Result: Quadruple First Class, ranked 2/92 in Part III Physics (4th year) and 7/140 in Part II (specialization computational and theoretical physics, 3rd year)
Dissertation: Signal propagation in systems of hydrodynamically coupled active oscillators (supervised by Prof Pietro Cicuta, in progress for publication)

Publications

Conference papers

Liu D, Lengyel M. A universal probabilistic spike count model reveals ongoing modulation of neural variability. *Advances in Neural Information Processing Systems* (2021).

Conference abstracts

Liu D, Amvrosiadis T, Rochefort N, Lengyel M. Diverse covariates modulate neural variability: a widespread (sub)cortical phenomenon. *Cosyne Abstracts* (2022).

Jensen KT, **Liu D**, Kao TC, Tripodi M, Lengyel M, Hennequin G. Beyond the Euclidean brain: inferring non-Euclidean latent trajectories from spike trains. *Cosyne Abstracts* (2021).

Research experience

2022 **Research Scientist intern (neuromotor interfaces), Reality Labs (previously CTRL labs)**
Interned at the Science team of the neuromotor interface team at Reality Labs, working on computational modelling, signal processing and deep learning of wrist EMG signals

2018 **Ludwig-Prandtl internship, MPIDS Göttingen**
Worked with Dr Marco G. Mazza on formulating a Langevin-type equation for self-diffusion in charged granular gases based on theory and MD simulations

2017 **Undergraduate internship, Maxwell Centre Cambridge**
Joined the Sebastian Quantum group working on low temperature experimental physics. Measured heat capacities and studied quantum oscillations in crystals

2013-2014 **Junior Med School**, **Erasmus Medical Centre, Rotterdam**
Pre-university programme with a research project, joined the Frens neuroscience lab studying cerebellum motor control by conducting and analysing experiments with human subjects

Work experience

2021 **Part-time Machine Learning engineer, CardiaTec**
Help design and implement a natural language processing pipeline using BioBERT to parse medical literature and extract protein relations, used to construct a knowledge graph to accelerate medical research for coronary heart disease

2016 **Summer software internship at Siemens Traffic Solutions Poole**
Developed a tool in Java for converting and editing navigation map files

Teaching

2020-current **Supervisor, University of Cambridge**
Co-supervised master's student with Prof Máté Lengyel on applying Bayesian nonparametric methods to studying rat hippocampal theta precession in 1D and 2D navigation, supervising undergraduate engineering courses on statistical signal processing (3F3) and mathematical physiology (3G2)

2020-current **Introductory workshops on machine learning, University of Cambridge**
Organized and taught annual ML workshops for all members of technical student societies. Covered theory for backpropagation, PyTorch code sessions, CNNs for image data, RNNs for language data, and writing DNNs from scratch

2018-2019 **Online tutoring, MyTutor**
IB, A level and GCSE tutoring with topics in mathematics, physics, chemistry, and biology. Provided mentorship with university applications

Organization

2020-current **Executive Chairman, Cambridge University Artificial Intelligence society (CuAI)**
Part of the executive committee. Invited speakers and organized talks from big institutions as Microsoft and Google Brain, discussed and planned other events, committee recruitment, organizing collaborations with start-ups, and setting up society sponsorships

Summer Schools

2020 **Poster presentation, Eastern European Machine Learning Summer School**
Presented work on applying recent normalizing flow models to approximate complicated probability densities

Awards

2020-current **Cambridge Trust Scholar**

Undergraduate prizes

2017-2019 Foundation Scholar of Queens' College, Cambridge
2019 President's Prize NatSci - awarded to a 4th year undergraduate for distinction
2018 The Chalmers Prize - for best first of the current academic year in Physics
2018 Treglowan Fund - travel grant for research projects
2017 Alison Roper Prize - all round award for excellence in Natural Sciences

Other awards

2015 Honourable mention (top 67%), 46th International Physics Olympiad
2015 3rd place, Dutch National Physics Olympiad
2014 9th place, Dutch National Biology Olympiad

Technical Skills

Python, C++, MATLAB – experienced for scientific modelling and data analysis
PyTorch – experienced for building machine learning models
JAX – familiar for differentiable computational modelling
CUDA C, OpenGL, Java, React, React Native – basic knowledge and use
Tools: LaTeX, git, Linux command line, Microsoft Office

Other interests and skills

Fluent in English, Mandarin and Dutch

2018-2019	Principal violist in the Cambridge University Sinfonia, and violist in symphonic projects with the Cambridge University Orchestra
2015	DELF B2 level diploma for French language
2015	Pre-conservatory level piano examination, practice and theory
2013	Performed in piano trio at the Storioni Festival, Eindhoven