Yue Liu

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Citizen of Canada, currently hold J-1 visa for USA

Academic Interests

- Data-driven modelling of biological systems by combining topological data analysis, machine learning, and parameter inference
- Biological pattern formation arising from cell and developmental biology
- Analysis of differential equations and agent-based models
- Combining machine learning with mechanistic modelling toward optimal control of biological systems

Education and Research Experience

Purdue University **West Lafayette, IN, USA**
Postdoctoral Research Associate *September 2024 – Present*
Data-driven modelling of complex biological patterns, agent-based modelling, applications toward developmental biology. Supervised by Prof. Alexandria Volkening.

University of Oxford **Oxford, UK**
Doctor of Philosophy *2019–2024*
Mathematics, focus on PDE and data-driven modelling of biological systems. Supervised by Prof. Ruth Baker and Prof. Philip Maini

University of British Columbia **Vancouver, BC, Canada**
Master of Science *2017–2019*
Applied Mathematics, focus on mathematical modelling and analysis of biological systems. Graduating average 93.2% (A+). Supervised by Prof. Leah Edelstein-Keshet

University of Waterloo **Waterloo, ON, Canada**
Bachelor of Mathematics (Honours, Co-op) *2012–2017*
Double major in Computer Science and Mathematical Physics, minor Pure Mathematics, Graduated with overall average 95.5% and With Distinction – Dean's Honours List

Publications

Yue Liu and Alexandria Volkening. Bayesian parameter inference in agent-based models of pattern formation in zebrafish using topological data analysis. In preparation.

Yue Liu, Philip K. Maini, and Ruth E. Baker. Optimal experiment design for practical parameter identifiability and model discrimination. *submitted to Mathematical Biosciences*, 2025.

Yue Liu, Kevin Suh, Philip K Maini, Daniel J Cohen, and Ruth E Baker. Parameter identifiability and model selection for partial differential equation models of cell invasion. *Journal of the Royal Society Interface*, 21(212):20230607, 2024.

Yue Liu, Philip K. Maini, and Ruth E. Baker. Control of diffusion-driven pattern formation behind a wave of competency. *Physica D: Nonlinear Phenomena*, 438:133297, 2022.

Dario Domingo, Stanislaw Biber, Gabriele Dian, Patrick Dorey, Kays Haddad, Paul Heslop, Ingrid

Holm, **Yue Liu**, and Raymond Pang. Trans-national equitable strategies of vaccine distribution during the covid-19 pandemic. *Mathematics in Industry Reports*, 2021.

Yue Liu, Elisabeth G Rens, and Leah Edelstein-Keshet. Spots, stripes, and spiral waves in models for static and motile cells. *Journal of Mathematical Biology*, 82(4):1–38, 2021.

Andreas Buttenschön, **Yue Liu**, and Leah Edelstein-Keshet. Cell size, mechanical tension, and GTPase signaling in the single cell. *Bulletin of Mathematical Biology*, 82(2):28, 2020.

Yue Liu. Analysis of pattern formation in reaction-diffusion models for cell polarization. Master's thesis, University of British Columbia, 2019.

Yue Liu, John Milton, and Sue Ann Campbell. Outgrowing seizures in childhood absence epilepsy: time delays and bistability. *Journal of Computational Neuroscience*, 46(2):197–209, 2019.

Priyank Jaini, Abdullah Rashwan, Han Zhao, **Yue Liu**, Ershad Banijamali, Zhitang Chen, and Pascal Poupart. Online algorithms for sum-product networks with continuous variables. In *Conference on Probabilistic Graphical Models*, pages 228–239, 2016. `proceedings.mlr.press/v52/jaini16.pdf`.

Selected Awards and Scholarships

2025	Purdue Postdoc Travel Award. Purdue University, $550
2023	BAMC Travel Award. British Applied Mathematics Colloquium (BAMC), £250
2022	Landahl Travel Grant. Society for Mathematical Biology (SMB), $800
2022	SIAM Student Travel Award. Society for Industrial and Applied Mathematics (SIAM). $800
2021	Canadian Centennial Scholarship. Canadian Centennial Scholarship Fund, £5,000
2019-2022	Canada Postgraduate Scholarships – Doctoral (PGS-D). Natural Sciences and Engineering Research Council of Canada (NSERC), $63,000
2017-2018	Canada Graduate Scholarships-Master's (CGS-M). NSERC, $17,500
2017-2019	Faculty of Science Graduate Award. University of British Columbia (UBC), $5,500
2017	R Howard Webster Foundation Fellowship. UBC, $2,500
2017	Lloyd Switzer Scholarship in Applied Mathematics. University of Waterloo (UW), $2,500
2016	Arthur Beaumont Memorial Scholarship. UW, $2,000
2015	Frank Goodman Memorial Scholarship. UW, $2,000
2012-2016	University of Waterloo Descartes National Scholarship. UW, $12,000

Teaching and Industry Experience

Purdue University — **West Lafayette, IN, USA**
Tutor for undergraduate research — *September 2025–present*

Supervised three undergraduate students on a research project investigating opinion dynamics in social network models.

St Hugh's College, Oxford — **Oxford, UK**
Stipendiary Lecturer — *January 2020– May 2024*

Taught tutorials for first and second year applied mathematics modules. Conducted interviews for undergraduate admissions.

University of Oxford **Oxford, UK**
Teaching Assistant (2019–2020), Tutor (2020–) *October 2019– May 2024*

Responsible for grading and assisting tutorials for Theory of Deep Learning, Mathematical Physiology and Stochastic Analysis and PDEs. Taught classes for Mathematical Biology, Applied PDEs, Mathematical Finance.

University of British Columbia **Vancouver, BC, Canada**
EDUCE Teaching Assistant *September 2018–April 2019*

Responsible for developing curriculum and delivering data science workshops for the Experiential Data science for Undergraduate Cross-disciplinary Education (EDUCE) program.

Facebook, Inc. **Menlo Park, CA, USA**
Software Engineer (intern) *May–August 2016*

Implemented new database schema and interface for efficient storage of records. Developed new machine learning model for messaging inactive users, which significantly improved user retention.

Amazon Web Services **Seattle, WA, USA**
Software Development Engineering (intern) *September–December 2015*

Developed automated testing framework for Amazon API Gateway.

Technical Skills

- Proficient in: C++, Python, Matlab, Bash
- Intermediate experience in: C, Julia, Perl
- Familiar TensorFlow and theories of machine learning

Presented Seminars

2024/11/07	Data-driven approaches in mathematical modelling. Guest lecture for Mathematical Modelling class, Purdue University
2021/11/12	Parameter identifiability and model selection. Computational Biology Seminar, University of Oxford
2020/06/18	Control of Agent-based models and Turing patterns. Wolfson Mathematical Biology Seminar, University of Oxford
2018/11/07	Modelling the dynamics of GTPase activity. Mathematical Biology Seminar, Pacific Institute for the Mathematical Sciences
2018/12/03	Mathematical Modelling in Biology. Member's Series Seminar, Green College, UBC

Selected Conferences presentation

2025/09	Minisymposium talk: SIAM Great Lakes Section Annual Meeting. Illinois Institute of Technology, Chicago, USA
2025/08	Poster: NITMB Convergence Conference. Chicago, USA
2025/07	Minisymposium talk: Society for Mathematical Biology Annual Conference (SMB). Edmonton, Canada
2025/05	Minisymposium talk: SIAM Dynamical Systems (DS25). Denver, USA
2024/10	Contributed talk: SIAM Great Lakes Section Annual Meeting. Purdue Northwest, Hammond, Indiana, USA

2023/11 Contributed talk: Oxford Cancer Spatial Biology Symposium. Oxford, UK
2023/10 Invited talk: Data-driven mechanistic mathematical modelling for life-science applications Chalmers University, Gothenburg, Sweden
2023/08 Contributed talk: International Congress on Industrial and Applied Mathematics (ICIAM) Tokyo (virtual), Japan
2023/06 Contributed talk: SIAM UKIE National Student Chapter Conference *Best Presentation Award.* Oxford, UK
2023/04 Minisymposium talk: British Applied Mathematics Colloquium (BAMC). Bristol, UK
2022/09 Minisymposium talk: European Conference on Mathematical and Theoretical Biology (ECMTB). University of Heidelberg, Germany
2022/07 Poster: SIAM Conference on the Life Sciences (LS22). Pittsburgh, USA
2022/05 Poster: Inference in Mathematical Biology. Oxford, UK
2022/04 Contributed talk: BAMC. University of Loughborough, UK
2021/06 Contributed talk: SMB Annual Conference. Virtual
2021/06 Contributed talk: SIAM UK Student Chapter Conference. Virtual
2020/08 Contributed talk: SMB Annual Conference. Virtual
2020/06 Contributed talk: SIAM/Canadian Applied and Industrial Mathematics Society (CAIMS) Annual Meeting (AN20). Virtual
2019/06 Minisymposium talk: CAIMS Annual Meeting. Whistler, Canada
2019/05 Poster: SIAM Conference on Applications of Dynamical Systems (DS19). Snowbird, Utah, USA
2018/12 Minisymposium talk: Canadian Mathematical Society (CMS) Winter Meeting. Vancouver, Canada

Selected Workshop Participation

2025/01 Patterns, Dynamics, and Data in Complex System. ICERM, Providence, Rhode Island, USA
2025/01 Biological Systems That Learn. National Institute for Theory and Mathematics in Biology, Chicago, Illinois, USA
2023/08 Collective Behaviour. Isaac Newton Institute, Cambridge, UK
2022/07 European Study Group with Industry (ESGI 167). University of Kent, Canterbury, UK
2021/04 European Study Group with Industry (ESGI 165). Virtual
2018/09 PIMS Workshop on Stochastic and Deterministic Modelling in Biology Jasper, Canada
2018/08 PIMS Industrial Problem Solving Workshop. U of Calgary, Canada
2018/06 BC Data Science Workshop. UBC, Canada

Professional Activities

Journal peer review:
- Reviewer for Journal of Mathematical Biology (2019)
- Reviewer for Biological Cybernetics (2020, 2021)
- Reviewer for Computational and Applied Mathematics (2022)
- Reviewer for npj Systems Biology and Applications (2023)

- Reviewer for European Physical Journal Plus (2024, 2025)
- Reviewer for Bulletin of Mathematical Biology (2024, 2025)
- Reviewer for Methodology and Computing in Applied Probability (2025)
- Reviewer for PLOS Computational Biology (2025)
- Reviewer for Physica D (2025)

Community engagement:

- Judge for posters and talks in Purdue Fall Undergraduate Research Conference (Nov 2024)
- Judge for Lafayette Regional Science and Engineering Fair (May 2025)
- Judge for posters in Purdue Spring Undergraduate Research Conference (Apr 2025)
- Minisymposium organiser for SIAM DS25 (2025)
- Judge for posters at Purdue Interdisciplinary Graduate Programs Spring Reception (2025)
- Minisymposium organiser for SIAM Great Lakes Section Meeting (2025)