

Xiahui Li

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ABOUT ME

I am a PhD student at the School of Mathematics and Statistics at the University of St Andrews. My research lies at the intersection of computational statistics and applied mathematics, where I develop methods for inference applied to complex dynamic systems in epidemiology and ecology.

EDUCATION

PhD in Statistics, University of St Andrews (UK) 2023-Present

- *Thesis*: Approximate Bayesian Inference Using Policy-informed Summary Statistics
- *Supervisor(s)*: Dr Ben Swallow and Dr Fergus Chadwick

Master in Statistics, University of Nottingham (UK) 2021-2022

- *Dissertation*: A Review on Approximate Bayesian Computation and Its Application in Density Estimation and Model-based Clustering
- *Supervisor(s)*: Dr Christopher Fallaize and Dr Riccardo Corradin

Bachelor in Statistics, Queen's University (Canada) 2015-2019

- *Related coursework*: Major in Statistics, Minor in German Studies
- *Referee(s)*: Professor Chunfang Devon Lin and Professor David Pugh

RESEARCH PROJECTS

Improving Bayesian Inference for Infectious Diseases Modelling

- Investigated the use of Approximate Bayesian Computation and Bayesian Synthetic Likelihood to address intractable likelihoods in complex infectious disease models.
- Developed novel approaches for selecting informative summary statistics, ensuring computational efficiency, and improving parameter estimation.
- Validated the proposed methods through simulation studies and real data application with increased complexity, comparing the accuracy and efficiency of varied posterior sampling strategies in Stan.

Best practice guide for estimating transmission intensity using multiple data sources

- Designed a comprehensive workflow for estimating transmission parameters, covering problem definition, data integration strategies (joint vs. independent modelling), model iteration, inference, and implementation.
- Participated in the development of case studies and a survey to assess and summarize SARS-CoV-2 data sources, guiding effective data selection and validation.
- Evaluated and compared methodologies for combining heterogeneous data sources, including modular approaches and Markov melding, and proposed best practices to address integration challenges.

PUBLICATIONS

Published

- Li, X., Chadwick, F., & Swallow, B. (2025). Advances in approximate Bayesian inference for models in epidemiology. *Epidemics*. <https://doi.org/10.1016/j.epidem.2025.100855>.

Preprint

- Li, X., Zhang, D., Clapham, H., Dyson, L., Hollingsworth, T. D., Leung, K., Mollison, D., Panngum, W., Swallow, B., Thompson, R. N., Tran-Kiem, C., Woodruff, J., & Bansal, S. (2025). Best Practices for Promoting Equity, Diversity, and Inclusion in Infectious Disease Modelling. Zenodo. <https://doi.org/10.5281/zenodo.16790419>.
- Li, X., Swallow, B., & Chadwick, F. J. (2024). A Novel Approximate Bayesian Inference Method for Compartmental Models in Epidemiology using Stan. arXiv preprint arXiv:2408.03415.

SELECTED PRESENTATIONS

- *Actionable Guidelines for Promoting Equity, Diversity and Inclusion in Infectious Disease Modelling*, JUNIPER Consortium, Virtual, UK (19 November 2025)
- *A Novel Approximate Bayesian Inference For Models in Epidemiology*, International Statistical Institute World Statistics Congress 2025, Hague, Netherland (6 October 2025)
- *A Novel Approximate Bayesian Inference Method for Infectious Disease Modeling Using Stan*, JUNIPER Consortium, Virtual, UK (29 January 2025)
- *Approximate Bayesian Inference Using Policy-informed Summary Statistics*, International Center for Mathematical Sciences, Edinburgh, UK (24 October 2024)
- *A Novel Approximate Bayesian Inference Method for Compartmental Models in Epidemiology Using Stan*, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK (8 August 2024)

RESEARCH ACTIVITIES

- **International Statistical Institute World Statistics Congress 2025** Conference in the Hague, Netherlands (05 October - 09 October 2025), attendance funded by University of St Andrews, Netherlands
- **Analysis and modelling for the design of future epidemic surveillance systems** Workshop, attendance funded by St Leonard's Travel Grant and Employability Bursary, Marseille, France (28 April - 02 May 2025)
- **Mathematical Models for Twenty-First Century Decisions** Workshop, attendance funded by International Center for Mathematical Sciences, Edinburgh, UK (21-25 October 2024)
- **Probabilistic Programming for Infectious Disease Models** Workshop, attendance funded by Mathematics for AI in Real-world Systems, Cambridge, UK (20 August 2024)
- **Preventing Future Pandemics: Key Challenges for Mathematical Modeling to Improve Pandemic Preparedness** Workshop, attendance funded by Newton Gateway to Mathematics, Cambridge, UK (13 August 2024)
- **Modeling and Inference for Pandemic Preparedness** Programme, attendance funded by Isaac Newton Institute, Cambridge, UK (4-30 August 2024)
- **International Workshop on Statistical Modeling (IWSM)** Short Course, attendance funded by IWSM, Durham, UK (14 July 2024)

PROFESSIONAL EXPERIENCE

Graduate Teaching Assistant

Sep 2023 – Present

School of Mathematics and Statistics, University of St Andrews

- Delivered tutoring for undergraduate-level modules, including Introductory Mathematics, Statistical Inference, and Linear Mathematics.
- Lead demonstrator for the Computing in Statistics module, facilitating practical computing sessions and assisting students with complex statistical problems.
- Co-supervised an undergraduate final year project on the application of a dynamical ecological model to financial market equilibrium.

Summer Team Enterprise Program Coach

May 2024 - August 2024

Center for Educational Engagement and Development, University of St Andrews

- Coached a team of undergraduate students in exploratory data analysis on oceanographic datasets, guiding them in formulating research questions and generating insights.
- Facilitated the production of reports that contributed to the development of the new undergraduate module, The History and Future of Data.

HONORS & AWARDS

- International Statistical Institute World Statistics Congress Presentation Award (2025)
- University of St Andrews Open Access Fund (2025)
- St Leonard's College Postgraduate Travel Award (2025)
- Durham Summer Grant (2024)
- China Scholarship Council - St Andrews Joint PhD Scholarship (2023)
- Nottingham Advantage Award (2022)
- Consul General (Toronto) Book Prize in German (2019)

PROFESSIONAL AFFILIATIONS

- **PhD Student Researcher**, Machine Learning and Statistics Methods Research Group
- **Review Committee Member**, the Laidlaw Scholars Programme of International Education and Lifelong Learning Institute
- **Researcher**, Joint Universities Pandemic and Epidemiological Research (JUNIPER) Consortium
- **Associate Fellow**, Graduate School for Interdisciplinary Studies, University of St Andrews