Lorenzo Rimella

Senior Research Associate

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Professional Experience

Lancaster University — *Lancaster, UK*
Senior Research Associate - Mathematics And Statistics — *04/21 – present*
Line manager: Prof. P. Fearnhead

Lancaster University — *Lancaster, UK*
CSML reading group organiser — *09/22 – present*

Lancaster University — *Lancaster, UK*
Masterclass on Parallel computing organiser — *06/23 – 10/23*

Lancaster University — *Lancaster, UK*
Master's thesis advisor — *06/21 – 09/21*

University of Bristol — *Bristol, UK*
Teaching Assistant — *01/18 – 05/19*

Università degli studi di Torino — *Torino, IT*
Teaching Assistant — *09/16 – 01/17*

Education

University of Bristol — *Bristol, UK*
PhD in Mathematics (Statistics) — *09/17 – 06/21*
- Advisor: Prof. N. Whiteley

Collegio Carlo Alberto — *Torino, IT*
Master in Statistics and Applied Mathematics — *09/15 – 07/17*
- Final mark: Pass with distinction (full mark)

Università degli studi di Torino — *Torino, IT*
M. Sc. in Stochastics and Data Science — *09/15 – 07/17*
- Final mark: 110/110 cum laude and special mention

Università degli studi di Torino — *Torino, IT*
B. Sc. in Mathematics for Finance and Insurance — *09/12 – 07/15*
- Final mark: 110/110 cum laude

Publications

Published

Rimella L, Whiteley N. 2022. Exploiting locality in high-dimensional factorial hidden Markov models. Journal of Machine Learning Research 23, 34.

Whiteley N, **Rimella L**. 2021. Inference in Stochastic Epidemic Models via Multinomial Approximations. International Conference on Artificial Intelligence and Statistics, 1297-1305.

Rimella L, Jewell C, Fearnhead P. 2023. Approximating optimal SMC proposal distributions in individual-based epidemic models. Statistica Sinica.

Whitehouse M, Whiteley N, **Rimella L**. 2023. Consistent and fast inference in compartmental models of epidemics using Poisson Approximate Likelihoods. Journal of the Royal Statistical Society: Series B.

Rimella L, Jewell C, Fearnhead P. 2023. Inference on Extended-Spectrum Beta-Lactamase *Escherichia coli* and *Klebsiella pneumoniae* data through SMC^2. Journal of the Royal Statistical Society: Series C.

Preprint

Rimella L, Whiteley N. 2019. Dynamic Bayesian Neural Networks. Arxiv paper (arXiv:2004.06963 [stat.ML]).

Duffield S, Power S, **Rimella L**. 2023. A State-Space Perspective on Modelling and Inference for Online Skill Rating. Arxiv paper (arXiv:2308.02414 [stat.AP]).

Rimella L, Jewell C, Fearnhead P. 2023. Simulation Based Composite Likelihood. Arxiv paper (arXiv:2310.10761 [stat.ME]).

Awards, Fellowships & Grants

10/19– 10/20 **Enrichment Scheme**, The Alan Turing Institute
Competitively awarded placement, including a stipend top-up (2500£ tot.)

10/17– 04/21 **Excellence Award**, Heilbronn Institute for Mathematical Research
Award giving extra financial support (8750£ tot.)

10/17– 04/21 **PG Scholarship**, EPSRC Doctoral Training Partnerships
Award covering tuition fees, maintenance, stipend

09/15– 09/17 **Allievi Honors Program**, Collegio Carlo Alberto
Award covering tuition fees of outstanding students enrolled in Torino's universities

Presentations

Invited Talks

Winter 2023. *Consistent and fast inference in compartmental models of epidemics using Poisson Approximate Likelihoods*. Invited talk at Durham university (Department of Mathematical Sciences). Durham, UK.

Autumn 2023. *Mini-Workshop on Epidemiological Modeling*. A 3h workshop at the University of the Philippines Diliman (Institute of Mathematics). Manila, Philippines.

Autumn 2023. *Inference in stochastic compartmental models: a Pharmacokinetics and Epidemiology perspective*. Online invited talk at the Università della Svizzera italiana (Faculty of Biomedical Sciences). Lugano, Switzerland.

Spring 2023. *Approximating optimal SMC proposal distributions in individual-based epidemic models.*. Invited talk at the Satellite event of BayesComp2023 Conference. Levi, Finland.

Summer 2022. *Exploiting locality in high-dimensional factorial hidden Markov models*. Invited talk at the ISBIS Conference 2022. Naples, Italy.

Spring 2022. *Inference on Extended-Spectrum Beta-Lactamase Escherichia coli and Klebsiella pneumoniae data through SMC*^{2}. Invited talk at the University of Padova (Department of Statistics). Padova, Italy.

Spring 2022. *Lecture on the SMC*^{2} *algorithm*. Sequential Monte Carlo masterclass at the University of Bristol. Bristol, UK.

Spring 2022. *Inference on Extended-Spectrum Beta-Lactamase Escherichia coli and Klebsiella pneumoniae data through SMC*^{2}. Invited talk at the DRUM Stakeholder meeting. Lilongwe, Malawi.

Autumn 2019. *Exploiting locality in high-dimensional factorial hidden Markov models*. Invited talk at the University of Bristol (Institute for Statistical Science). Bristol, UK.

Contributed Presentations

Autumn 2023. *Simulation Based Composite Likelihood*. Presentation at IDDconf2023. Ambleside, UK.

Summer 2023. *Exploiting locality in high-dimensional Factorial hidden Markov models.*. Poster presentation at G-Research. London, UK.

Summer 2023. *Exploiting locality in high-dimensional Factorial hidden Markov models.*. Poster presentation at ICML2023 Conference. Hawaii, US.

Spring 2023. *Localised filtering algorithm: the BPF and the Graph Filter*. Presentation for the CSML reading group at Lancaster University. Lancaster, UK.

Spring 2023. *Approximating optimal SMC proposal distributions in individual-based epidemic models*. Presentation for the Bayes4Health annual workshop at the University of Oxford. Oxford, UK.

Winter 2022. *Approximating optimal SMC proposal distributions in individual-based epidemic models*. Presentation for the Welcome Home 2022 workshop at Università degli studi di Torino. Torino, Italy.

Autumn 2022. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Presentation for the CSML reading group at Lancaster University. Lancaster, UK.

Spring 2022. *Inference on Extended-Spectrum Beta-Lactamase Escherichia coli and Klebsiella pneumoniae data through SMC*^{2}. Presentation for the Bayes4Health and CoSInES seminar. Online.

Winter 2021. *Inference on Extended-Spectrum Beta-Lactamase Escherichia coli and Klebsiella pneumoniae data through SMC*^{2}. Presentation for the Welcome Home 2021 workshop at Università degli studi di Torino. Torino, Italy.

Winter 2021. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Presentation for PG seminar at Lancaster University. Lancaster, UK.

Winter 2021. *Inference on Extended-Spectrum Beta-Lactamase Escherichia coli and Klebsiella pneumoniae data through SMC*^{2}. Presentation for the LURGiE reading group at Lancaster University. Lancaster, UK.

Autumn 2021. *Exploiting locality in high-dimensional factorial hidden Markov models*. Presentation for the Bayes4Health annual workshop at the University of Cambridge. Cambridge, UK.

Summer 2021. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Presentation for the Bayes4Health and CoSInES seminar. Online.

Spring 2021. *Dynamic Bayesian Neural Network*. Presentation for the CSML reading group at Lancaster University. Lancaster, UK.

Spring 2021. *Build Bayesian Neural Network in Pytorch*. Presentation for the JAX reading group at Lancaster University. Lancaster, UK.

Spring 2021. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Poster presentation for AISTAT2021. Online.

Winter 2020. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Presentation for the Welcome Home 2020 workshop at Università degli studi di Torino. Torino, Italy.

Teaching Experience

01/19 – 05/19	**Bayesian Modelling**, Teaching Assistant	*Bristol, UK*
09/18 – 12/18	**Statistics 2**, Teaching Assistant	*Bristol, UK*
01/18 – 05/18	**Statistics 1**, Teaching Assistant	*Bristol, UK*
09/16 – 01/17	**Probability and Statistics**, Teaching Assistant	*Torino, IT*

Mentoring

2021 **Katie Law**, Master's thesis advisor — *Lancaster University*

Title: Modelling the COVID-19 Epidemic and Non-pharmaceutical Interventions in England with Approximate Bayesian Computation

2023-present **Max Howell**, PhD student co-supervision with Prof. C. Sherlock and Prof. R. McCrea — *Lancaster University*

Title: Statistical Solutions for the Open Challenges of Integrated Population Models

Professional Profile

Academic interests

State-space models, computation of filtering distribution, smoothing distribution and likelihood in state-space models; their application to real data; development of approximate and scalable methods for high-dimensional scenarios; composite likelihood.

Deep Learning, development and training of deep neural networks in both frequentist and Bayesian frameworks.

Monte Carlo, implementation and theoretical properties of Monte Carlo algorithms, with a particular focus on Sequential Monte Carlo and the construction of smart proposal distributions and resampling schemes.

Epidemiology, use of compartmental models in epidemiology and the challenge of performing inference in complicated scenarios (e.g. agent-based models).

Coding skills

Operating system, advanced knowledge of Windows and Linux (e.g. Ubuntu, Fedora).

Programming Languages, advanced knowledge of Python; good knowledge of R, MATLAB, C /C++.

Python: state-space modelling with Numpy, JAX and TensorFlow; development of inference algorithms (e.g. EM, MCMC, SMC^2) using Numpy, JAX and TensorFlow; Machine Learning (e.g. Deep Learning) using scikit-learn, PyTorch, TensorFlow; database management using pandas; graph operations using NetworkX; GPU computations and auto differentiation with JAX, PyTorch and TensorFlow.

Others, High-performance computing with PBS and SLURM; SQL; Git and version control; LaTeX; Microsoft Office.

Development

Autumn 2020. **Deep Learning Specialization**, 5 courses on deep learning with assessments to learn about neural networks (e.g. CNN, RNN, LSTM), regularization techniques (e.g. DropOut) and implementation using Python (e.g. TensorFlow). coursera.

Peer Review

I serve as a reviewer for the following journals:

- Journal of Machine Learning Research
- Proceedings of Machine Learning Research
- Journal of Statistical Planning and Inference
- Biometrika