Lorenzo Rimella

Research Associate (Assegno di Ricerca)

ESOMAS, Università degli studi di Torino and Collegio Carlo Alberto, Torino, IT

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Professional Experience

Università degli studi di Torino *Torino, IT*
Research Associate - ESOMAS *04/24 – present*
Line manager: Dr. G. Rebaudo

Collegio Carlo Alberto *Torino, IT*
Affiliation - Statistics Initiative *04/24 – present*

Università degli studi di Bergamo *Bergamo, IT*
Professore a contratto - Dipartimento di Scienze Aziendali *02/25 – present*

Lancaster University *Lancaster, UK*
Senior Research Associate - Mathematics And Statistics *04/21 – 03/24*
Line manager: Prof. P. Fearnhead

Education

University of Bristol *Bristol, UK*
PhD in Mathematics (Statistics) *09/17 – 06/21*
- Supervisor: Prof. N. Whiteley
- Thesis: High-dimensional Hidden Markov Models

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

Articles in Peer-Reviewed Journals

Rimella L, Jewell C, Fearnhead P. 2025. Simulation Based Composite Likelihood. To appear in Statistics and Computing (arXiv:2310.10761 [stat.ME]).

Rimella N, **Rimella L**, Osello A. 2025. Machine Learning Method for As-Is Tunnels Information Model Reconstruction. Automation in Construction.

Rimella L, Whiteley N. 2025. Hidden Markov Neural Networks. Entropy.

Duffield S, Power S, **Rimella L**. 2024. A State-Space Perspective on Modelling and Inference for Online Skill Rating. Journal of the Royal Statistical Society: Series C.

Mwapasa T, Chidziwisano K, Mphasa M, Cocker D, **Rimella L**, Amos S, Feasey N, Morse T. 2024. Key environmental exposure pathways to antimicrobial resistant bacteria in southern Malawi: A SaniPath approach. Science of the Total Environment

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.

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

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

International Conference Proceedings (Peer-Reviewed)

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

Preprints and Submitted Articles

Rimella L, Whiteley N, Jewell C, Fearnhead P, Whitehouse M. 2025. Scalable calibration for partially observed individual-based epidemic models through categorical approximations. Arxiv paper (arXiv:2501.03950 [stat.ME]).

Battiston M, **Rimella L**. 2024. Disclosure risk assessment with Bayesian non-parametric hierarchical modelling. Submitted (arXiv:2408.12521 [stat.AP]).

Open-source Softwares

Rimella L. 2025. CAL: https://github.com/LorenzoRimella/CAL.

Rimella N, **Rimella L**. 2024. ML_tunneling: https://github.com/LorenzoRimella/ML_tunneling.

Rimella L. 2024. BNP_DR: https://github.com/LorenzoRimella/BNP_DR.

Duffield S, **Rimella L**. 2024. abile: https://github.com/SamDuffield/abile.

Rimella L. 2023. SimBa-CL: https://github.com/LorenzoRimella/SimBa-CL.

Whitehouse M, **Rimella L**. 2023. PAL: https://github.com/LorenzoRimella/PAL.

Rimella L. 2022. SMC2-ILM: https://github.com/LorenzoRimella/SMC2-ILM.

Rimella L. 2022. Optimal_IBM_proposal: https://github.com/LorenzoRimella/Optimal_IBM_proposal.

Rimella L. 2021. GraphFilter-GraphSmoother: https://github.com/LorenzoRimella/GraphFilter-GraphSmoother.

Rimella L. 2020. HiddenMarkovNeuralNetwork: https://github.com/LorenzoRimella/HiddenMarkovNeuralNetwork.

Rimella L. 2020. Multinomial-Approximations-for-compartmental-models: https://github.com/LorenzoRimella/Multinomial-Approximations-for-compartmental-models.

Awards, Fellowships & Grants

07/24– 07/24 **Travel Award**, International Society for Bayesian Analysis
Travel award for the conference 2024 ISBA World Meeting (400USD tot.)

04/21– 03/24 **Member of Bayes4Health**,
Funded by the EPSRC grant EP/R018561/1: salary, and access to travel funds. Principal investigators: Prof. Paul Fearnhead and Prof. Chris Jewell.

04/21– 03/22 **Member of the DRUM consortium**,
Funded by the DRUM consortium: access to travel funds. Principal investigator: Prof. Nicholas Feasey.

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

10/17– 04/21 **Excellence Award**, Heilbronn Institute for Mathematical Research
Award giving extra financial support (8750GBP 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 Presentations

Dec. 2024. *Consistent and fast inference in compartmental models of epidemics using Poisson Approximate Likelihoods*. Invited talk at the "Advances in Bayesian methods" session of CMStatistics 2024. London, UK.

Jun. 2024. *Consistent and fast inference in compartmental models of epidemics using Poisson Approximate Likelihoods*. Invited talk at the Satellite workshop to International Society for Bayesian Analysis (ISBA) world meeting. Lugano, Switzerland.

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

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

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

Mar. 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.

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

Contributed Presentations

Jul. 2024. *Simulation Based Composite Likelihood*. Presentation for the conference ISBA 2024 in the Multi-track session 4F "Simulation-Based inference". Venice, IT.

Oct. 2023. *Lecture on parallel computing for epidemiological modelling*. Lecture for the Parallel computing masterclass at Lancaster University. Lancaster, UK.

Sept. 2023. *Simulation Based Composite Likelihood*. Presentation for the conference IDDconf2023. Ambleside, UK.

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

Dec. 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.

Dec. 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.

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

Seminars

Mar. 2024. *Consistent and fast inference in compartmental models of epidemics using Poisson Approximate Likelihoods*. Seminar at University of Nottingham (School of Mathematical Sciences). Nottingham, UK.

Dec. 2023. *Consistent and fast inference in compartmental models of epidemics using Poisson Approximate Likelihoods*. Seminar at Durham University (Department of Mathematical Sciences). Durham, UK.

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

Sep. 2023. *Inference in stochastic compartmental models: a Pharmacokinetics and Epidemiology perspective*. Seminar at the Università della Svizzera italiana (Faculty of Biomedical Sciences). Online.

Feb. 2022. *Inference on Extended-Spectrum Beta-Lactamase Escherichia coli and Klebsiella pneumoniae data through SMC*^{2}. Seminar for the Bayes4Health and CoSInES grants seminars series. Online.

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

Dec. 2021. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Seminar at the Postgraduate seminars series of Lancaster University (Department of Mathematics and Statistics). Online.

Apr. 2021. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Seminar for the Bayes4Health and CoSInES grants seminars series. Online.

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

Poster Presentations

Jul. 2024. *Simulation Based Composite Likelihood*. Poster presentation at ISBA 2024. Venice, IT.

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

Jul. 2023. *Exploiting locality in high-dimensional Factorial hidden Markov models*. Poster presentation at the ICML2023 conference. Online.

Mar. 2021. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Poster presentation at the AISTAT2021 conference. Online.

Reading group Presentations

Dec. 2024. *Categorical Approximate Likelihood for individual-based models*. Presentation for the CSML reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

Feb. 2024. *A State-Space Perspective on Modelling and Inference for Online Skill Rating*. Presentation for the CSML reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

Nov. 2023. *Simulation Based Composite Likelihood*. Presentation for the CSML reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

May 2023. *Localised filtering algorithm: the BPF and the Graph Filter*. Presentation for the CSML reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

Sept. 2022. *Inference in Stochastic Epidemic Models via Multinomial Approximations*. Presentation for the CSML reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

Nov. 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 (Department of Mathematics and Statistics). Lancaster, UK.

May 2021. *Dynamic Bayesian Neural Network*. Presentation for the CSML reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

Mar. 2021. *Build Bayesian Neural Network in Pytorch*. Presentation for the JAX reading group at Lancaster University (Department of Mathematics and Statistics). Lancaster, UK.

Teaching Experience

02/25 – 05/25	**Statistica**, Professore a contratto (72h)	*Bergamo, IT*
01/19 – 05/19	**Bayesian Modelling**, Teaching Assistant (49h)	*Bristol, UK*
09/18 – 12/18	**Statistics 2**, Teaching Assistant (55h)	*Bristol, UK*
01/18 – 05/18	**Statistics 1**, Teaching Assistant (55h)	*Bristol, UK*
03/18 – 05/18	**Calculus 1**, Exam Marking (10h)	*Bristol, UK*
09/16 – 01/17	**Probability and Statistics**, Tutor	*Torino, IT*

Mentoring

05/23-04/24	**Max Howell**, PhD student co-supervision with Prof. C. Sherlock and Prof. R. McCrea **Title:** Statistical Solutions for the Open Challenges of Integrated Population Models	*Lancaster University*
05/21-09/21	**Katie Law**, Master's thesis advisor **Title:** Modelling the COVID-19 Epidemic and Non-pharmaceutical Interventions in England with Approximate Bayesian Computation	*Lancaster University*

Services to profession

Events organiser

06/23 – 10/23	**Masterclass on Parallel computing organiser**, Lancaster University	*Lancaster, UK*
09/22 – 08/23	**CSML reading group organiser**, Lancaster University	*Lancaster, UK*
12/21 – 04/22	**Masterclass on Sequential Monte Carlo co-organiser**, University of Bristol	*Bristol, UK*
09/17 – 08/18	**Monte Carlo reading group organiser**, University of Bristol	*Bristol, UK*

Referee

I serve as a reviewer for the following journals:

- Axioms
- Biometrika
- Mathematics
- Journal of Machine Learning Research
- Journal of the Royal Statistical Society: Series B
- Journal of Statistical Planning and Inference
- Proceedings of Machine Learning Research
- Statistics and Computing
- Symmetry

Professional Profile

Research 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.

Machine Learning /Deep Learning, development and training of deep neural networks in both frequentist and Bayesian frameworks; development and training of machine learning algorithms in both supervised and unsupervised learning scenarios with a focus on engineering applications (e.g. tunneling).

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. individual-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 using scikit-learn; Deep Learning using PyTorch and TensorFlow; database management using pandas; graph operations using NetworkX; GPU computations and automatic 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.

Languages

- Italian (spoken and written)
- English (spoken and written)