Raphaël Morsomme

raphael.morsomme@duke.edu
https://rmorsomme.github.io/

Education

Research interests: statistics, Bayesian inference, Markov chain Monte Carlo, data augmentation, high-dimensional models, conformal prediction, contagious disease modeling, cancer natural history modeling, semi-Markov processes, multistate models.

2019 – present: **Ph.D. candidate in *Statistical Science*,**
Department of Statistical Science, Duke University.
Advisor: Prof. Jason Xu.
Thesis: Efficient Sampling Algorithms for High-Dimensional Latent-Data Models.

2019 – 2023: **M.S. degree in *Statistical Science*,**
Department of Statistical Science, Duke University.

2014 – 2018: **Double B.S. degree in *Liberal Arts and Sciences*,**
University College Maastricht, The Netherlands; University College Freiburg, Germany.
Honors program, *Summa cum Laude*.
Advisors: Dr. Patrick Lindsey; Prof. Dirk Neumann.
Theses: Embryonic and Mitochondrial Modeling in the Context of *In-Vitro* Fertilization;
Forecasting Financial Instability from Soft Content Anomalies.

Research Experience

2023 – current: Research assistant,
Biostatistics Research Branch, Division of Clinical Research, National Institute of Allergy and Infectious Diseases, National Institutes of Health.
- Develop a Monte-Carlo expectation-maximization algorithm for fitting multistate semi-Markov models fitted to panel data. Implement the algorithm in a Julia package.
- Study an event-driven design for clinical trials with time-to-event data.

2019 – current: Research assistant,
Department of Statistical Science, Duke University.
- Implement a uniformly ergodic block sampler for stochastic epidemic models in continuous time in R.
- Design a family of non-parametric temporal stochastic epidemic models and construct a scalable data-augmentation Markov chain Monte Carlo sampling algorithm in R.
- Design a semi-Markov multistate model for cancer natural history and construct an efficient data-augmentation Markov chain Monte Carlo sampling algorithm in C++.

2018 – 2019: Junior data scientist,
University College Maastricht.
- Construct a topic model of course content in a Liberal Arts college.
- Apply conformal prediction for student course grades.
- Develop a course recommender system for Liberal Arts students.

2017: Research assistant,
The Information System Research Institute, Freiburg.
- Develop a trading decision support system based on a sentiment analysis of financial news.

Manuscripts

Published

Huang, J., **Morsomme, R.**, Dunson, D., & Xu, J. (2022). Detecting Changes in the Transmission Rate of a Stochastic Epidemic Model. arXiv preprint arXiv:2211.14691. (Accepted for publication by Statistics in Medicine)

Morsomme, R., & Xu, J. (2022). Uniformly Ergodic Data-Augmented MCMC for Fitting the General Stochastic Epidemic Model to Incidence Data. arXiv preprint arXiv:2201.09722. (under Review)

Morsomme, R., & Smirnov, E. (2020). Valid Prediction Intervals for Course Grades with Conformal Prediction. In 2020 19th IEEE International Conference on Machine Learning and Applications (ICMLA) (pp. 936-941). IEEE.

Morsomme, R., & Smirnov, E. (2019). Conformal Prediction for Students' Grades in a Course Recommender System. *Conformal and Probabilistic Prediction and Applications* (pp. 196-213).

Morsomme, R., & Alferez, S. V. (2019). Content-based Course Recommender System for Liberal Arts Education. In *Proceedings of The 12th International Conference on Educational Data Mining (EDM 2019)* (Vol. 748, p. 753).

In progress

Morsomme, R., Holloway, S., Ryser, M., & Xu, J. (2023). A Bayesian Approach for Fitting Semi-Markov Mixture Models of Cancer Latency to Individual-level Screens.

Morsomme, R., Chen, M., & Xu, J. (2023). Scalable Non-Parametric Temporal Stochastic Epidemic Models.

Fintzi, J., Liang, J., **Morsomme, R.**, & Follman, D. (2023). A Data Assimilation Framework for Assessing Treatment Efficacy with Multistate Semi-Markov Models.

Morsomme, R., Liang, J., & Fintzi, J. (2023). MultistateModels: Fitting Semi-Markov Multistate Models to Panel Data.

Brittain, E., **Morsomme, R.**, & Proschan, M. (2023). BEDD: Binary-Event-Driven Design for Clinical Trials with Time-to-Event Data.

Invited Talks

2024:	A Data Assimilation Framework for Assessing Treatment Efficacy with Multistate Semi-Markov Models. Joint Statistical Meeting, American Statistical Association.
2023:	Exact inference for stochastic epidemic models via uniformly ergodic block sampling. 6th International Conference on Econometrics and Statistics.

Awards and grants

2023:	Travel award, Summer Institute in Statistics and Modeling in Infectious Diseases, University of Washington.
2022:	Outstanding Mentor of Undergraduate Research Award, Department of Statistical Science, Duke University.
2022:	Summer Course Development Grant, Duke University.
2022:	Full scholarship, Summer Institute in Statistics and Modeling in Infectious Diseases, University of Washington.

| 2021: | Young Investigator Award, |
| | ASA Section on Statistics in Epidemiology. |

Professional Experience

2022 – 2023:	Statistical consultant,
	MetLife Investment Management, New York.
	Task: implement a scalable dynamic Bayesian system for long-term forecasting of high-dimensional macroeconomic time series.
2020:	Programming consultant,
	Children's Environmental Health Initiative, Rice University.
	Task: review code for a spatial analysis of racial and political disparity.
2019:	Statistical consultant,
	Future Earth, Paris.
	Task: implement a topic model of open-ended survey questions.

Outreach

2023:	Data preparation for the DataFest 2024,
	American Statistical Association.
2023:	Peer reviewer,
	Statistics in Medicine.
2023:	Peer reviewer,
	IEEE Journal of Biomedical and Health Informatics.
2023:	Coordinator for the DataFest 2023,
	American Statistical Association.
2018 – 2022:	Semi-annual workshop: Introduction to *R*,
	University College Maastricht.
2021:	Judge for the DataFest 2021,
	American Statistical Association.
2016:	Organizer of the Global Order Project conference: Mobility & Identity in a Globalizing World,
	University College Freiburg.

Teaching and Mentoring

| 2021 – current: | Certificate in College Teaching, |
| | Duke University. |

Instructor of record

2022:	STA101 Data Analysis and Statistical Inference,
	Department of Statistical Science, Duke University.
2021:	STA101 Data Analysis and Statistical Inference,
	Department of Statistical Science, Duke University.

Teaching assistant

| 2024: | STA313 Advanced Data Visualization (undergraduate), |
| | Department of Statistical Science, Duke University. |

2023:	STA561 Probabilistic Machine Learning (masters), Department of Statistical Science, Duke University.
2022:	STA310 Generalized Linear Models (undergraduate), Department of Statistical Science, Duke University.
2021:	STA723 Case Studies in Bayesian Statistics (Ph.D.), Department of Statistical Science, Duke University.
2020:	STA540 Case Studies in Statistical and Data Science (masters), Department of Statistical Science, Duke University.
2019:	STA440 Case Studies in the Practice of Statistics (undergraduate), Department of Statistical Science, Duke University.
2017:	Introduction to Statistics and Data Analysis (undergraduate), University College Freiburg, Freiburg University.

Tutoring and mentoring

2023 – current:	Academic mentor of M. Chen, Masters in Statistical Science, Duke University.
2021 – current:	Academic tutor, SPIRE Fellows Program, Duke University.
2023 – current:	Thesis writer's mentoring workshop, Department of Statistical Science, Duke University.
2020 – current:	Private tutoring.
2021 – 2023:	Academic mentor of J. Huang, Major in Statistical Science and Computer Science, Duke University.
2020 – 2021:	Research mentor, Lumiere Research Scholar Program.

Programming skills

Proficiency in **R**, **Julia**, **MATLAB**, **LaTeX**, **Git**, **Quarto**, **STAN, Shiny**.

Working knowledge of Python, SAS, SQL, Tableau, Weka, C++.