Charles C. Margossian

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Starting in the summer of 2025, I will be an assistant professor at the University of British Columbia, Department of Statistics.

Education

Ph.D. Statistics, *Columbia University*, New York, NY.   **2017– 2022**
- Thesis: *Modernizing Markov chains Monte Carlo for scientific and Bayesian modeling*
- Advisor: Andrew Gelman

B.Sci. Physics, *Yale University*, New Haven, CT.   **2011–2015**

Baccalauréat Scientifique, *Ecole Jeannine Manuel (High school)*, Paris, France.   **2009–2011**

Experience

Research Fellow, *Flatiron Institute*, New York, NY.   **2022–**
Center for Computational Mathematics

Research Intern, *Google Research*, New York, NY.   **Sum. 2021**
TensorFlow Probability Team

Visiting Doctoral Student, *Aalto University*, Espoo, Finland.   **Sum. 2019**
Department of Computer Science

Visiting Scientist, *Metrum Research Group*, Tariffville, CT and Cambridge, MA.   **2015–2017**
Pharmacometrics Bootcamp

Research Assistant, *Yale University*, New Haven, CT.   **2013–2015**
Department of Astronomy

Patent Law Intern, *Leinweber & Zimmermann*, Munich, Germany.   **Sum. 2014**

Skills

Progamming: R, Python, C++, Stan, LaTeX, GitHub
Languages: English, French, German

Papers

Google Scholar: https://scholar.google.com/citations?user=nPtLsvIAAAAJ&hl=en

[1] C. C. Margossian and L. K. Saul. **Variational Inference in Location-Scale Families**: **Exact Recovery of the Mean and Correlation Matrix**. *Selected for oral presentation, Artificial Intelligence and Statistics*, PMLR (accepted), 2025.

[2] C. C. Margossian, L. Pillaud-Vivien, and L. K. Saul. **Variational Inference for Uncertainty Quantification: an Analysis of Trade-Offs**. *arXiv:2403.13748. (submitted)*, 2024.

[3] C. C. Margossian, M. D. Hoffman, P. Sountsov, L. Riou-Durand, A. Vehtari, and A. Gelman. **Nested $\widehat{R}$: Assessing the convergence of Markov chain Monte Carlo**

when running many short chains. *Bayesian Analysis*, Advance Publication:1–28, 2024.

[4] C. C. Margossian and A. Gelman. **For how many iterations should we run Markov chain Monte Carlo?** In *Handbook of Markov chain Monte Carlo*. Chapman & Hall/CRC, (in press) 2nd edition, 2024.

[5] C. C. Margossian and D. M. Blei. **Amortized Variational Inference: When and Why?** *Uncertainty in Artificial Intelligence*, PMLR 244:2434–2449, 2024.

[6] F. Heurtel-Depeiges, C. C. Margossian, R. Ohana, and B. Régaldo-Saint Blancard. **Listening to the noise: Blind Denoising with Gibbs Diffusion**. *International Conference on Machine Learning*, PMLR 235:18284–18304, 2024.

[7] D. Cai, C. Modi, C. C. Margossian, R. M. Gower, D. M. Blei, and L. K. Saul. **EigenVI: score-based variational inference with orthogonal function expansions**. *Selected for spotlight, Advances in Neural Information Processing Systems*, (in press), 2024.

[8] D. Cai, C. Modi, L. Pillaud-Vivien, C. C. Margossian, R. M. Gower, D. M. Blei, and L. K. Saul. **Batch and match: black-box variational inference with a score-based divergence**. *Selected for spotlight, International Conference on Machine Learning*, PMLR 235:5258–5297, 2024.

[9] C. C. Margossian and L. K. Saul. **The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference**. *Selected for oral presentation, Uncertainty in Artificial Intelligence*, PMLR 216:1358–1367, 2023.

[10] L. Riou-Durand, P. Sountsov, J. Vogrinc, C. C. Margossian, and S. Power. **Adaptive Tuning for Metropolis Adjusted Langevin Trajectories**. *Artificial Intelligence and Statistics*, PMLR 206:8102–8116, 2023.

[11] C. Modi, C. C. Margossian, Y. Yao, R. M. Gower, D. M. Blei, and L. K. Saul. **Variational Inference with Gaussian Score Matching**. *Advances in Neural Information Processing Systems*, 37, 2023.

[12] C. C. Margossian, Y. Zhang, and W. R. Gillespie. **Flexible and efficient Bayesian pharmacometrics modeling using Stan and Torsten, Part I**. *CPT: Pharmacometrics & Systems Pharmacology*, 11(9):1151–1169, 2022.

[13] P. Greengard, J. Hoskins, C. C. Margossian, J. Gabry, A. Gelman, and A. Vehtari. **Fast methods for posterior inference of two-group normal-normal models**. *Bayesian Analysis*, 18(3):889–907, 2022.

[14] L. L. Grinsztajn (supervised student), E. Semenova, C. C. Margossian, and J. Riou. **Bayesian workflow for disease transmission modeling in Stan**. *Statistics in Medicine*, 40(27):6209–6234, 2021.

[15] C. C. Margossian, A. Vehtari, D. Simpson, and R. Agrawal. **Hamiltonian Monte Carlo using an adjoint-differentiated Laplace approximation: Bayesian inference for latent Gaussian models and beyond**. *Advances in Neural Information Processing Systems*, 34, 2020.

[16] A. Hauser, M. J. Counotte, C. C. Margossian, G. Konstantinoudis, N. Low, C. L. Althaus, and J. Riou. **Estimation of SARS-CoV-2 mortality during the early stages of an epidemic: a modeling study in Hubei, China and six regions in Europe**. *PLOS Medicine*, 17(7), 2020.

[17] A. Gelman, A. Vehtari, D. Simpson, C. C. Margossian, B. Carpenter, Y. Yao, L. Kennedy, J. Gabry, P-C. Bürkner, and M. Modrák. **Bayesian Workflow**. *arXiv:2011.01808. (full book in preparation)*, 2020.

[18] C. C. Margossian. **Review of automatic differentiation and its efficient implementation**. *Awarded "Top WIRES articles in 2022", WIRES: Data Mining and Knowledge Discovery*, 9(4), 2019.

[19] J. R. Schmitt, E. Agol, K. M. Deck, L. A. Rogers, Z. J. Gazak, D. A. Fischer, J. Wang, M. J. Holman, K. J. Jek, C. Margossian, M. R. Omohundor, T. Winarski, J. M. Brewer, M. J. Giguere, C. Lintott, S. Lynn, M. Parrish, K. Schawinski, M. E. Schwamb, R. Simpson, and A. M. Smith. **Planet Hunters. VII. Discovery of a new low-mass, low-density planet (PH3 C) orbiting KEPLER-289 with mass measurements of two additional Planets (PH3 B and D)**. *Astrophysical Journal*, 795(2), 2014.

Posters and technical reports (selected)

*supervised student

[1] E. Mokel* and C. C. Margossian. **Monitoring Nonstationary Variance to Assess Convergence of MCMC**. *Best poster award, International Society of Bayesian Analysis (ISBA) world meeting*, 2024.

[2] C. C. Margossian. **General adjoint-differentiated Laplace approximation**. *arXiv:2306.14976.*, 2023.

[3] S. du Ché* and C. C. Margossian. **Parallelization for Markov chains Monte Carlo with heterogeneous runtimes**. *BayesComp*, 2023.

[4] C. C. Margossian and M. Betancourt. **Efficient Automatic Differentiation of Implicit Functions**. *arXiv:2112.14217.*, 2022.

[5] C. C. Margossian, L. Zhang, S. Weber, and A. Gelman. **Solving ODEs in a Bayesian context: challenges and opportunities**. *Population Approach Group in Europe*, 2021.

[6] A. Marc, M. Kerioui, C. Margossian, J. Bertrand, P. Maisonnasse, Y. Aldon, R. W. Sanders, M. Van Gils, R. Le Grand, and J. Guedj. **Developing a model of SARS-CoV-2 viral dynamics under monoclonal antibody treatment**. *Population Approach Group in Europe*, 2021.

[7] J. D. Gaebler* and C. C. Margossian. **Propagating Derivatives through Implicit Functions in Reverse Mode Autodiff**. *Stanford Institute for Computational & Mathematical Engineering*, 2021.

[8] C. C. Margossian and A. Gelman. **Bayesian model of planetary motion: exploring ideas for a modeling workflow when dealing with ordinary differential equations and multimodality**. In *Stan Case Studies*, volume 7, 2020.

[9] M. Betancourt, C. C. Margossian, and V. Leos-Barajas. **The Discrete Adjoint Method: Efficient Derivatives for Functions of Discrete Sequences**. *arXiv:2002.00326.*, 2020.

[10] C. C. Margossian. **Computing Steady States with Stan's Nonlinear Algebraic Solver**. *StanCon*, 2018.

[11] C. C. Margossian and W. R. Gillespie. **Gaining Efficiency by Combining Analytical and Numerical Methods to Solve ODEs: Implementation in Stan and Application to Bayesian PK/PD**. *American Conference on Pharmacometrics*, 2017.

[12] C. C. Margossian and W. R. Gillespie. **Differential Equation Based Models in Stan**. *StanCon*, 2017.

[13] C. C. Margossian and W. R. Gillespie. **Stan Functions for Pharmacometrics Modeling**. *American Conference on Pharmacometrics*, 2016.

Software

Core developer, *Stan: a probabilistic programming language*, mc-stan.org.

Co-creator, *Torsten: an extension of Stan for pharmacometrics modeling*, GitHub.

Contributor, *mrgSolve: Simulation from ODE-Based Population PK/PD and System Pharmacology Models*, GitHub.

Contributor, *bayesplot: Plotting for Bayesian Models in R*, Cran.

Awards and recognitions

AISTATS oral presentation, For *Variational Inference in Location-Scale Families: exact recovery of the mean and correlation matrix*, top ~2% of submitted papers at the conference on Artificial Intelligence and Statistics. **2025**

NeurIPS spotlight, For *EigenVI: score-based variational inference with orthogonal function expansions*, submitted to the conference on Neural Information Processing Systems . **2024**

ISBA best poster award, For *Monitoring Nonstationary Variance to Assess Convergence of MCMC*, presented at the International Society of Bayesian Analysis (ISBA): World Meeting. **2024**

ICML spotlight, For *Batch and Match: black box variational inference with a score-based divergence*, top ~13% articles accepted at the International Conference on Machine Learning. **2024**

UAI oral presentation, For *The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference*, top ~15% articles accepted at the conference on Uncertainty in Artificial Intelligence. **2023**

WIRES top article, For *A Review of Automatic Differentiation and its Efficient Implementation*, which was amongst the top 10 most cited articles in the 2021 Journal Citation Report for *WIRES: Data Mining and Knowledge Discovery*. **2022**

Minghui Yu teaching assistant award, *Department of Statistics, Columbia University*, Awarded by the Director of Graduated Studies based on student feedback. **2022**

AISTATS top reviewer, The top reviewers were selected based on the feedback received from the Area Chairs and comprise the top-10% of AISTATS reviewers. **2022**

Dean's fellowship, *Department of Statistics, Columbia University*, 5 years funding for PhD degree. **2017**

Yale book award, For "character and intellectual promise". **2010**

Academic services

Reviewer.
- *SIAM review* (2025)
- *Transactions of Machine Learning* (2025, 2024)
- *Handbook of Markov chain Monte Carlo*, 2nd edition (2024 (2)),
- *Bayesian Analysis* (2024)
- *Advances in Neural Information Processing Systems* (2024, 2020)
- *Statistics and Computing* (2024)
- *CPT: Pharmacometrics and Systems Pharmacology* (2024)
- *PeerJ* (2023)
- *Journal of Machine Learning Research* (2023 (2))
- *PMLR: Artificial Intelligence and Statistics* (2023, Top Reviewer Award 2021)
- *Journal of Pharmacokinetics and Pharmacodynamics* (2023, 2019)
- *Computational Statistics* (2022)
- *Nature Geoscience* (2021)
- *Methods in ecology* (2021)
- *Journal of data science* (2021)

Elected Member, *Stan Governing Body*, Two year term.   **2022-2024**

Organizer, *StanCon 2024*, Oxford, UK.   **2024**

Organizer, *StanCon 2023*, St Louis, MO.   **2023**

Student representative, *PhD program in statistics at Columbia University*.   **2019 - 2020**

Supervised students

Manny Mokel (undergraduate student), *Monitoring Nonstationary Variance to Assess Convergence of MCMC*, Flatiron Institute, New York, NY.   **2023**

Stanislas Du Ché (master student), *Parallelization for Markov chain Monte Carlo with heterogeneous runtimes*, Columbia University, New York, NY.   **2022**

Johann Gaebker (PhD student), *Propagating Derivatives through implicit functions in reverse mode automatic differentiation*, Columbia University, New York, NY.   **2020**

Léo Grinsztajn (master student), *Bayesian Workflow for disease transmission models*, Columbia University, New York, NY.   **2020**

Hyunji (Angie) Moon (undergraduate student), *Simulation-based Calibration for the embedded Laplace approximation*, Columbia University, New York, NY.   **2020**

Teaching

Instructor, *Monte Carlo Methods*, Half-a-day course, Nordic Summer School on Probabilistic AI, Copenhagen, Denmark.   **2024**

Instructor, *Bayesian Workflow for hierarchical and ODE-based models*, Three day workshop, Summer School on Advanced Bayesian Methods, Leuven, Belgium.   **2023**

Instructor, *Fundamentals of Stan*, Half-day workshop, StanCon 2023, Washington University in St Louis, St Louis, MO.   **2023**

Instructor, *Building, fitting, and criticizing Bayesian PK/PD models*, One day workshop, University of Buffalo, Buffalo, NY.   **2019–2023**

Lecturer, *Probability and Bayes*, Lecture for PHC 506: Biometry in Pharmaceutics, University of Buffalo, Buffalo, NY.   **2019–2023**

Instructor, *Stan for the people: an introductory workshop to Bayesian modeling*, Two day workshop, McGill University, Montreal, Canada.   **2019**, **2020**

Instructor, *Population and ODE-based models using Stan and Torsten*, Two day workshop, StanCon 2019, Cambridge University, Cambridge, UK.   **2019**

Guest Lecturer, *Introduction to Bayesian Data Analysis with Stan*, Lecture for STAT 2020: Bayesian Statistics, Harvard University, Cambridge, MA.   **2017**

Teaching Assistant, *Recipient of the Minghui Yu Teaching Assistant Award*, Courses at all levels (undergrad, masters and PhD), Columbia University, New York, NY.   **2017–2022**

Peer Tutor, *Science, Technology, and Research Scholars (STARS) program*, Yale University, New Haven, CT.   **2013–2015**

Invited talks (selected)

Chaired session, *Monte Carlo methods using modern hardware*, International Society of Bayesian Analysis (ISBA): World Meeting, Venice, Italy.   **2024**

Invited talk, *Variational Inference for Uncertainty Quantification: An Analysis of Trade-offs*, International Society of Bayesian Analysis (ISBA): World Meeting, Venice, Italy.   **2024**

Invited talk, *The Wisdom of Automatic Differentiation*, Applied and Computational Math Group Meeting, Courant Institute, New York University, New York, NY.   **2023**

Oral Presentation, *The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference*, Conference on Uncertainty in Artificial Intelligence, Pittsburgh, PA.   **2023**

Invited talk, *Making Bayesian Pharmacometrics modeling simpler (but not too simple) with Torsten*, Stan for Pharmacometrics Day, INSERM, Paris, France.   **2023**

Invited talk, *Amortized Variational Inference: when and why?*, Flatiron-wide Meeting on Machine Learning, Flatiron Institute, New York, NY.   **2023**

Lecture, *Solving ODEs in a Bayesian model*, Flatiron-Wide Algorithms and Mathematics ($F_\omega(\alpha + m)!$), Flatiron Institute, New York, NY.   **2022**

Invited talk, *Nested $\widehat{R}$: Assessing convergence for Markov chains Monte Carlo when running many short chains*, Center for Research in Economics and Statistics (CREST), École Polytechnique, Paris, France.   **2022**

Talk, *Bayesian inference for latent Gaussian models: MCMC, approximate methods, and hybrids*, Minghui Yu memorial conference, Columbia University, New York, NY.   **2021**

Invited talk, *Developing a Bayesian modeling workflow for population PBPK*, American Conference on Pharmacomertrics, Online.   **2020**

Invited talk, *Developing a Bayesian workflow to model the Covid-19 outbreak*, 12th Covid-19 symposium, Columbia University, New York, NY.   **2020**

Proposed talk, *Computing steady states with Stan's nonlinear algebraic solver*, StanCon, Pacific Grove, CA.   **2018**

Proposed talk, *Differential equations based models in Stan*, StanCon, Columbia University, New York, NY.   **2017**

Invited talk, *Differential equations based models in Stan*, Stan Meetup in Boston, Harvard University, Cambridge, MA.   **2016**

Lecture, *Practice (and malpractices!) of Bayesian analysis*, Metrum Journal Minute, Tariffville, CT.   **2016**

Talk, *How stars and planets interact: testing the effects of close-in giant planets on stellar magnetic activity*, Davenport Mellon Forum, Yale University, New Haven, CT.   **2015**