

Charles C. Margossian

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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
 - Dissertation Committee: Aki Vehtari, Matthew Hoffman, Sumit Mukherjee, David Blei
- B.Sci. Physics**, *Yale University*, New Haven, CT. **2011–2015**
- Baccalauréat Scientifique**, *Ecole Jeannine Manuel (High school)*, Paris, France. **2009–2011**

Appointments

- Postdoctoral Research Fellow**, *Flatiron Institute*, Center for Computational Mathematics, New York, NY. **2022–**
- Research Intern**, *Google Research*, Bayesflow team, New York, NY. **Summer 2021**
- Visiting Doctoral Student**, *Aalto University*, Department of Computer Science, Probabilistic Machine Learning group, Espoo, Finland. **Summer 2019**
- Visiting Scientist**, *Metrum Research Group*, Tariffville, CT and Cambridge, MA. **2015–2017**
- Research Assistant**, *Yale University*, Department of Astronomy, New Haven, CT. **2013–2015**
- Patent Law Intern**, *Leinweber & Zimmermann*, Munich, Germany. **Summer 2014**

Academic service

- Reviewer**, *Journal of Machine Learning Research* (2023 (2)), *Journal of Pharmacokinetics and Pharmacodynamics* (2023, 2019), *Computational Statistics* (2022), *Nature Geoscience* (2021), *Artificial Intelligence and Statistics* (2023, *Top Reviewer* 2021), *Methods in ecology* (2021), *Journal of data science* (2021), *Neural Information Processing Systems* (2020).
- Elected Member**, *Stan Governing Body*, 1 year term. **2022–**
- Core developer**, *Stan: a probabilistic programming language*, mc-stan.org. **2016–**

Skills

- Programming:** R, Python, C++, Stan, TensorFlow Probability, PyTorch, L^AT_EX, GitHub
- Languages:** English, French, German

Preprints

- [1] **Charles C Margossian**, Matthew D Hoffman, Pavel Sountsov, Lionel Riou-Durand, Aki Vehtari, and Andrew Gelman. Nested \hat{R} : Assessing the convergence of Markov chain Monte Carlo when running many short chains. *arXiv:2110.13017*, 2024.
- [2] **Charles C Margossian** and David M Blei. Amortized Variational Inference: When and Why? *arXiv:2307.11018*, 2024.
- [3] David Heurtel-Depeiges, **Charles C Margossian**, Ruben Ohana, and Bruno Régalo-Saint Blancard. Listening to the noise: Blind Denoising with Gibbs Diffusion. *arXiv:2402.19455*, 2024.
- [4] Diana Cai, Chirag Modi, Loucas Pillaud-Vivien, **Charles C Margossian**, Robert M Gower, David M Blei, and Lawrence K Saul. Batch and match: black-box variational inference with a score-based divergence. *arXiv:2402.14758*, 2024.
- [5] **Charles C Margossian**. General adjoint-differentiated Laplace approximation. *arXiv:2306.14976*, 2023.
- [6] **Charles C Margossian** and Michael Betancourt. Efficient Automatic Differentiation of Implicit Functions. *arXiv:2112.14217*, 2022.
- [7] **Charles C Margossian** and Sumit Mukherjee. Simulating Ising and Potts models at critical and cold temperatures using auxiliary Gaussian variables. *arXiv:2110.10801*, 2021.
- [8] Andrew Gelman, Aki Vehtari, Daniel Simpson, **Charles C Margossian**, Bob Carpenter, Yuling Yao, Lauren Kennedy, Jonah Gabry, Paul-Christian Bürkner, and Martin Modrák. Bayesian Workflow. *arXiv:2011.01808*, 2020.
- [9] Michael Betancourt, **Charles C Margossian**, and Vianey Leos-Barajas. The Discrete Adjoint Method: Efficient Derivatives for Functions of Discrete Sequences. *arXiv:2002.00326*, 2020.

- [1] **Charles C Margossian** and Andrew Gelman. For how many iterations should we run Markov chain Monte Carlo? In *Handbook of Markov chain Monte Carlo (to appear)*. Chapman & Hall/CRC, 2nd edition, 2024+.
- [2] **Charles C Margossian** and Lawrence K Saul. The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference. *Selected for Oral Presentation, Uncertainty in Artificial Intelligence*, 2023.
- [3] Lionel Riou-Durand, Pavel Sountsov, Jure Vogrinc, **Charles C Margossian**, and Sam Power. Adaptive Tuning for Metropolis Adjusted Langevin Trajectories. *Artificial Intelligence and Statistics*, 2023.
- [4] Chirag Modi, **Charles C Margossian**, Yuling Yao, Robert Gower, David Blei, and Lawrence Saul. Variational Inference with Gaussian Score Matching. *Neural Information Processing Systems*, 2023.
- [5] **Charles C Margossian**, Yi Zhang, and William R Gillespie. Flexible and efficient Bayesian pharmacometrics modeling using Stan and Torsten, Part I. *CPT: Pharmacometrics & Systems Pharmacology*, 11:1151 – 1169, 2022.
- [6] Philip Greengard, Jeremy Hoskins, **Charles C Margossian**, Jonah Gabry, Andrew Gelman, and Aki Vehtari. Fast methods for posterior inference of two-group normal-normal models. *Bayesian Analysis*, 2022.
- [7] Léo Grinsztajn*, Elizaveta Semenova, **Charles C Margossian**, and Julien Riou. Bayesian workflow for disease transmission modeling in Stan. *Statistics in Medicine*, 40:6209 – 6234, 2021.
- [8] **Charles C Margossian**, Aki Vehtari, Daniel Simpson, and Raj Agrawal. Hamiltonian Monte Carlo using an adjoint-differentiated Laplace approximation: Bayesian inference for latent Gaussian models and beyond. *Neural Information Processing Systems*, 2020.
- [9] Anthony Hauser, Michel J Counotte, **Charles C Margossian**, Garyfallos Konstantinoudis, Nicola Low, Christian L Althaus, and Julien 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, 2020.
- [10] **Charles C Margossian**. A Review of automatic differentiation and its efficient implementation. *Awarded “Top WIREs articles in 2022”, WIREs: Data Mining and Knowledge Discovery*, 9, 2019.
- [11] Joseph R Schmitt, Eric Agol, Katherine M Deck, Leslie A Rogers, J Zachary Gazak, Debra A Fischer, Ji Wang, Matthew J Holman, Kian J Jek, **Charles Margossian**, Mark R Omo-hundor, Troy Winarski, John M Brewer, Matthew J Giguere, Chris Lintott, Stuart Lynn, Michael Parrish, Kevin Schawinski, Megan E Schwamb, Robert Simpson, and Arfon 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.

Conference contributions

*: Supervised student

- [1] **Charles C Margossian**, Matthew D Hoffman, Pavel Sountsov, Lionel Riou-Durand, Aki Vehtari, and Andrew Gelman. Assessing the convergence of Markov chains Monte Carlo when running many chains. *BayesComp*, 2023.
- [2] Stanislas du Ché* and **Charles C Margossian**. Parallelization for Markov chains Monte Carlo with heterogeneous runtimes. *BayesComp*, 2023.
- [3] **Charles C Margossian**, Lu Zhang, Sebastian Weber, and Andrew Gelman. Solving ODEs in a Bayesian context: challenges and opportunities. *Population Approach Group in Europe*, 2021.
- [4] Aurélien Marc, Marion Kerioui, **Charles Margossian**, Julie Bertrand, Pauline Maisonnasse, Yoan Aldon, Rogier W Sanders, Marit Van Gils, Roger Le Grand, and Jérémie Guedj. Developping a model of SARS-CoV-2 viral dynamics under monoclonal antibody treatment. *Population Approach Group in Europe*, 2021.
- [5] Johann D Gaebler* and **Charles C Margossian**. Propagating Derivatives through Implicit Functions in Reverse Mode Autodiff. *Stanford Institute for Computational & Mathematical Engineering*, 2021.
- [6] **Charles C Margossian**, Aki Vehtari, Daniel Simpson, and Raj Agrawal. Approximate Bayesian inference for latent Gaussian models in Stan. *StanCon*, 2020.
- [7] **Charles C Margossian** and Andrew 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.
- [8] **Charles C Margossian**. Computing Steady States with Stan’s Nonlinear Algebraic Solver. *StanCon*, 2018.
- [9] **Charles C Margossian** and William 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.
- [10] **Charles C Margossian** and William R Gillespie. Differential Equation Based Models in Stan. *StanCon*, 2017.
- [11] **Charles C Margossian** and William 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

UAI Oral presentation , For <i>The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference</i> , top ~15% articles accepted at the conference on Uncertainty in Artificial Intelligence.	2023
WIRES Top Article , For <i>A Review of Automatic Differentiation and its Efficient Implementation</i> , which was amongst the top 10 most cited articles in the 2021 Journal Citation Report for <i>WIRES, Data Mining and Knowledge Discovery</i> .	2022
Minghui Yu Teaching Assistant Award , <i>Department of Statistics, Columbia University</i> , 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 , <i>Department of Statistics, Columbia University</i> , 5 years funding for PhD degree.	2017
Yale Book Award , For “character and intellectual promise”.	2010

Supervised students

Manny Mokel (undergraduate student) , <i>Nested \hat{R}: pooled sampling and variance approximation</i> , Flatiron Institute, New York, NY.	2023
Stanislas Du Ché (master student) , <i>Parallelization for Markov chain Monte Carlo with heterogeneous runtimes</i> , Columbia University, New York, NY.	2022
Johann Gaebker (PhD student) , <i>Propagating Derivatives through implicit functions in reverse mode automatic differentiation</i> , Columbia University, New York, NY.	2020
Léo Grinsztajn (master student) , <i>Bayesian Workflow for disease transmission models</i> , Columbia University, New York, NY.	2020
Hyunjee Moon (undergraduate student) , <i>Simulation-based Calibration for the embedded Laplace approximation</i> , Columbia University, New York, NY.	2020

Teaching

Instructor , <i>Bayesian Workflow for hierarchical and ODE-based models</i> , Three day workshop, Summer School on Advanced Bayesian Methods, Leuven, Belgium.	2023
Instructor , <i>Fundamentals of Stan</i> , Half-day workshop, StanCon 2023, Washington University in St Louis, St Louis, MO.	2023
Instructor , <i>Building, fitting, and criticizing Bayesian PK/PD models</i> , One day workshop, University of Buffalo, Buffalo, NY.	2019–2023
Guest lecturer , <i>Probability and Bayes</i> , Lecture for PHC 506: Biometry in Pharmaceutics, University of Buffalo, Buffalo, NY.	2019–2023
Instructor , <i>Stan for the people: an introductory workshop to Bayesian modeling</i> , Two day workshop, McGill University, Montreal, Canada.	2019, 2020
Instructor , <i>Population and ODE-based models using Stan and Torsten</i> , Two day workshop, StanCon 2019, Cambridge University, Cambridge, UK.	2019
Guest Lecturer , <i>Introduction to Bayesian Data Analysis with Stan</i> , Lecture for STAT 2020: Bayesian Statistics, Harvard University, Cambridge, MA.	2017
Teaching Assistant , <i>Recipient of the Minghui Yu Teaching Assistant Award</i> , Courses at all levels (undergrad, masters and PhD), Columbia University, New York, NY.	2017–2022
Peer Tutor , <i>Science, Technology, and Research Scholars (STARS) program</i> , Yale University, New Haven, CT.	2013–2015

Presentations (selected)

The Wisdom of Automatic Differentiation , <i>Applied and Computational Math Group Meeting</i> , Courant Institute, New York University, New York, NY.	2023
The Shrinkage-Delinkage Trade-off: An Analysis of Factorized Gaussian Approximations for Variational Inference , Conference on Uncertainty in Artificial Intelligence, Pittsburgh, PA.	2023
Amortized Variational Inference: when and why? , Flatiron-wide Meeting on Machine Learning, Flatiron Institute, New York, NY.	2023
Solving ODEs in a Bayesian model , Flatiron-Wide Algorithms and Mathematics ($F_{\omega}(\alpha + m)!$), Flatiron Institute, New York, NY.	2022
Nested \hat{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
Bayesian inference for latent Gaussian models: MCMC, approximate methods, and hybrids , Minghui Yu memorial conference, Columbia University, New York, NY.	2021
Developing a Bayesian modeling workflow for population PBPK , American Conference on Pharmacometrics.	2020
Approximate Bayesian inference for latent Gaussian models in Stan , StanCon.	2020
Developing a Bayesian workflow to model the Covid-19 outbreak , 12 th Covid-19 symposium, Columbia University, New York, NY.	2020
Computing steady states with Stan's nonlinear algebraic solver , <i>StanCon</i> , Pacific Grove, CA.	2018
Differential equations based models in Stan , <i>StanCon</i> , Columbia University, New York, NY.	2017
Differential equations based models in Stan , <i>Stan Meetup in Boston</i> , Harvard University, Cambridge, MA.	November 2016
Practice (and malpractices!) of Bayesian analysis , <i>Metrum Journal Minute</i> , Tariffville, CT.	2016
How stars and planets Interact: testing the effects of close-in giant planets on stellar magnetic activity , <i>Davenport Mellon Forum</i> , Yale University, New Haven, CT.	2015

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