Michael Betancourt, Ph. D.

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Work Experience

2014 -	**University of Warwick** **Department of Statistics** Postdoctoral Research Associate	Coventry, UK
2013 - 2014	**University College London** **Department of Statistical Science** Postdoctoral Research Associate	London, UK
2012 - 2013	**Columbia University** **Applied Statistics Center** Adjunct Associate Research Scholar	New York, NY
2011 - 2012	**Adaptly** Data Scientist	New York, NY

Education

2006 - 2011	**Massachusetts Institute of Technology** Ph.D., Physics *Thesis:* The Radiance of the Proton Spin: Constraining the Proton Spin Structure with the Direct Photon Double Helicity Asymmetry	Cambridge, MA
2002 - 2006	**California Institute of Technology** B.S. with Honor, Physics	Pasadena, CA

Misc

2012 -	**Stan Core Development Team** http://www.mc-stan.org

Teaching Experience

January 2009	**Massachusetts Institute of Technology** Teaching Assistant (Special Relativity) - Prepared solutions, recitation sessions, and office hours.	Cambridge, MA
2007-2010	**Massachusetts Institute of Technology** Seminar XL Facilitator (Mechanics and Electrodynamics) - Lead small groups through course material, focusing on problem solving skills.	Cambridge, MA
March 2006- June 2006	**California Institute of Technology** Teaching Assistant (Sophomore Physics Laboratory) - Assisted a graduate teaching assistant in the guidance of a small group of students, focusing on laboratory techniques and data analysis.	Pasadena, CA

Peer-Reviewed Publications

"The Geometric Foundations of Hamiltonian Monte Carlo", M. J. Betancourt, Simon Byrne, Samuel Livingstone, and Mark Girolami, (*in submission*) `arXiv:1410.5110`

"Towards Characterization of the Type IIP Supernova Progenitor Population: a Statistical Sample of Light Curves from Pan-STARRS1", N. E. Sanders et al., ApJ, 799, 208 (2015) `arXiv:1404.2004`

"Unsupervised Transient Light Curve Analysis Via Hierarchical Bayesian Inference ", N. Sanders, M. J. Betancourt, and A. Soderberg, ApJ, 800, 36 (2015) `arXiv:1404.3619`

"Stan: A Probabilistic Programming Language", Bob Carpenter et al., (*in submission*)

"Hamiltonian Monte Carlo for Hierarchical Models", M. Betancourt and M. Girolami, to be published in *Current Trends in Bayesian Methodology with Applications*, edited by Dipak K. Dey, Umesh Singh and A. Loganathan (Chapman & Hall/CRC Press) `arXiv:1312.0906`

"A General Metric for Riemannian Manifold Hamiltonian Monte Carlo", M. J. Betancourt, In Geometric Science of Information (ed. F. Nielsen. and F. Barbaresco). Lecture Notes in Computer Science, Vol. 8085. Springer (2013) `arXiv:1212.4693`

"Does quantum uncertainty have a place in everyday applied statistics?", A. Gelman and M. J. Betancourt, **The Behavioral and brain sciences** 36.3 (2013): 285-285.

"Cruising The Simplex: Hamiltonian Monte Carlo and the Dirichlet Distribution", M. J. Betancourt, In Maximum Entropy and Bayesian methods in science and engineering. AIP Conf. Proc., 1443: 157-164 (2012) `arXiv:1010.3436`

"Nested Sampling with Constrained Hamiltonian Monte Carlo", M. J. Betancourt, In Maximum Entropy and Bayesian methods in science and engineering (ed. A. Mohammad-Djafari, J.F. Bercher, P. Bessiere). AIP Conf. Proc., 1305: 162-172 (2011) `arXiv:1005.0157`

"New measurements and quantitative analysis of electron backscattering in the energy range of neutron beta-decay", J.W. Martin et al., **Phys. Rev. C. 73, 015501** (2006)

Manuscripts

"The Fundamental Incompatibility of Hamiltonian Monte Carlo and Data Subsampling", M. J. Betancourt, `arXiv:1502.01510`

"Optimizing The Integrator Step Size for Hamiltonian Monte Carlo", M. J. Betancourt, Simon Byrne, and Mark Girolami, `arXiv:1410.5110`

"Adiabatic Monte Carlo", M. J. Betancourt, `arXiv:1405.3489`

"Generalizing the No-U-Turn Sampler to Riemannian Manifolds", M. J. Betancourt, `arXiv:1304.1920`

"The Geometry of Hamiltonian Monte Carlo", M. J. Betancourt and L. C. Stein, `arXiv:1112.4118`

"A Bayesian Approach To Histogram Comparison", M. J. Betancourt, `arXiv:1009.5604`

"2009 BEMC Tower Calibration Report", M. H. Walker, et al., STAR Technical Document (2010)

"Targeted Monte Carlo: Filtered Simulatations at STAR", M. J. Betancourt, et al., STAR Note SN0253 (2010)

"2006 BEMC Tower Calibration Report", M. J. Betancourt, et al., STAR Technical Document (2009)

Contributed Presentations

"Optimal Tuning of Numerical Integrators for Hamiltonian Monte Carlo". MCMSki 4, Chamonix, France. January 7, 2014.

"A General Metric for Riemannian Hamiltonian Monte Carlo". First International Conference on the Geometric Science of Information 2013, Paris, France. August 30, 2013.

"Illuminating the Proton Spin" (Poster). The 19th Particles and Nuclei International Conference, Cambridge, MA. July 26, 2011.

"Cruising the Simplex: Sampling the Dirichlet Distribution With Hamiltonian Monte Carlo". The 31th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, Waterloo, Canada. July 14, 2011.

"Prompt Photon Longitudinal Double Spin Asymmetry in Polarized Proton-Proton Collisions at 200 GeV at STAR". American Physical Society April Meeting, Anaheim, CA. May 2, 2011.

"Nested Sampling with Constrained Hamiltonian Monte Carlo". The 30th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, Chamonix, France. July 6, 2010.

"Adiabatic Monte Carlo". Oxford CSML Reading Group, University of Oxford. Oxford, United Kingdom. March 26, 2015.

"Bayesian Epidemiological Modeling With Stan". One-day workshop for the Department of Infectious Disease Epidemiology, Imperial College London, St. Mary's Campus. London, United Kingdom. March 6, 2015.

"Hamiltonian Monte Carlo with Stan". Warwick-Oxford Centre for Doctoral Training, University of Oxford. Oxford, United Kingdom. February 16, 2015.

"Hamiltonian Monte Carlo with Stan". UCL Clinical Pharmacology Meeting, University College London. London, United Kingdom. January 19, 2015.

"The Geometrical Foundations of Hamiltonian Monte Carlo". Riemannian Geometry in Machine Learning, Statistics and Computer Vision Workshop, Neural Information Processing Systems 2014, Montreal, Quebec, Canada. December 13, 2014.

"Hamiltonian Monte Carlo with Stan". Statistics Seminar, Imperial College London. London, United Kingdom. November 28, 2014.

"Hamiltonian Monte Carlo with Stan". Statistics Seminar, Newcastle University. Newcastle, United Kingdom. November 7, 2014.

"Stan: A Platform for Efficient Bayesian Inference". Interdisciplinary Workshop on Statistical and Analysis Methods in Nuclear, Particle and Astrophysics, European Centre for Theoretical Studies in Nuclear Physics and Related Areas. Trento, Italy. November 4, 2014.

"Applied Bayesian Data Analysis Using Stan". Two-day workshop hosted with Daniel Lee, Swiss Ornithological Institute. Sempach, Switerzland. October 24-25, 2014.

"Hamiltonian Monte Carlo with Stan". Bayes Talk, Novartis Basel Campus. Basel, Switzerland. October 22, 2014.

"Hamiltonian Monte Carlo with Stan". Astrophysics Seminar, University of Sussex. Sussex, United Kingdom. October 10, 2014.

"The Geometry of Hamiltonian Monte Carlo". One-day Conference in Geometry and Statistics, University of Bath. Bath, United Kingdom. June 23, 2014.

"Stan: Practical Bayesian Inference with Hamiltonian Monte Carlo". Open Data Science Meetup, University of Sheffield. Sheffield, United Kingdom. June 12, 2014.

"Efficient Bayesian Inference with Hamiltonian Monte Carlo". Machine Learning Summer School 2014, Reykjavik University. Reykjavik, Iceland. April 29, 2014.

"Bayes'd and Confused: An Introduction to Bayesian Inference". Cosmology Seminar, University College London. London, United Kingdom. April 9, 2014.

"Stan: A Platform for Efficient Bayesian Inference". Computer Science Seminar, Princeton University. Princeton, NJ. December 12, 2013.

"Stan: Practical Bayesian Inference with Hamiltonian Monte Carlo". Monte Carlo Methods in Advanced Statistics Applications and Data Analysis, Max Plank Institute for Physics. Munich, Germany. November 20, 2013.

"An Introduction to Hamiltonian Monte Carlo". Disordered Systems Seminar, King's College London. London, United Kingdom. November 13, 2013.

"Stan". One-day workshop for the Imperial Medical Research Centre. Imperial College London, St. Mary's Campus, London, United Kingdom. November 11, 2013.

"A General Metric for Riemannian Hamiltonian Monte Carlo". RSS 2013 International Conference. Newcastle, United Kingdom. September 4, 2013.

"A Brief Introduction to Hamiltonian Monte Carlo". Astrophysics Seminar, Birmingham University. Birmingham, United Kingdom. August 15, 2013.

"Stan: Practical Bayesian Inference with Hamiltonian Monte Carlo". Statistics Special Seminar, University of California Berkeley. Berkeley, CA. March 22, 2013.

"Stan: Practical Bayesian Inference with Hamiltonian Monte Carlo" Google Tech Talk. Mountain View, CA. March 21, 2013.

"Stan: Practical Bayesian Inference with Hamiltonian Monte Carlo". Biostatistics Special Seminar, University of California Los Angeles. Westwood, CA. March 6, 2013.

Awards

RSS Statistical Analytics Challenge 2014 Overall Winner (Beate Franke, Sam Livingstone, Alfredo Kalaitzis, and Michael Betancourt), August 4, 2014

2014 EPRSC NCSML Award for PDRA Collaboration (Michael Betancourt and Simon Byrne), 2014

Open Source Software World Challenge award for Stan: an R and C++ package for Bayesian sampling (Andrew Gelman, Bob Carpenter, Matt Hoffman, Daniel Lee, Michael Malecki, Ben Goodrich, Michael Betancourt, Marcus Brubaker, and Jiqiang Guo), 2012

1st Prize, Poster Competition. The 19th Particles and Nuclei International Conference in Cambridge, MA. July 26, 2011.

California Institute of Technology President's Scholarship, September 2002 - June 2006.

Nominee, Marcella and Joel Bonsall SURF Prize for Technical Writing. California Institute of Technology. September, 2004.

Activities

Founder and administrator (2010-2011) of the MIT Lab for Nuclear Science Student Seminar Series.
Founder and administrator (2010-2011) of the MIT Lab for Nuclear Science Student/Faculty Social Hour.

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