

JASON R. MORTON

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Education

- **University of California, Berkeley CA**
Ph.D. Mathematics, December 2007
Advisor: Bernd Sturmfels
Thesis title: Geometry of conditional independence
Qualifying Exam: Algebraic Statistics, Algebraic Geometry, Stochastic Analysis
- **University of Michigan, Ann Arbor MI**
M.A. Economics 2003
- **Harvard University, Cambridge MA**
A.B. Psychology 1998

Employment

- Assistant Professor, Department of Mathematics and Department of Statistics, Pennsylvania State University, 8/2009-.
- Postdoctoral Scholar, Department of Mathematics, Stanford University 1/2008-8/2009.
- Graduate Student Instructor/ Research Assistant, University of California, Berkeley 2003–2007.
- Graduate Student Instructor/ IGERT Fellow, University of Michigan 2001–2003.
- Investment Banking Associate, Credit Suisse 2000–2001.
- Mergers and Acquisitions Analyst, Credit Suisse 1998–2000.

Research interests

The geometry of statistical models and algorithms.

Publications

In print/press/submitted

- J.M. Landsberg, J. Morton, and S. Norine, Holographic algorithms without matchgates, <http://arxiv.org/abs/0904.0471>.
- J. Morton and L.-H. Lim, Principal cumulant component analysis. Submitted.
- J. Morton, Relations among conditional probabilities. Revising per reviewer for *Combinatorics, Probability, and Computing*. <http://arxiv.org/abs/0808.1149>.
- J. Morton, L. Pachter, A. Shiu, B. Sturmfels and O. Wienand, Convex rank tests and semigraphoids. To appear in *SIAM J. Discrete Math*. <http://arxiv.org/abs/math/0702564>.
- I.O. Feliz, X. Guo, J. Morton, and B. Sturmfels, Graphical models for correlated default. Submitted to *Mathematical Finance*. <http://arxiv.org/abs/0809.1393>.

- M. Dequéant, S. Ahnert, H. Edelsbrunner, T. Fink, E.F. Glynn, G. Hattem, A. Kudlicki, Y. Mileyko, J. Morton, AR. Mushegian, L. Pachter, M. Rowicka, A. Shiu, B. Sturmfels, and O. Pourquié, Comparison of Pattern Detection Methods in Microarray Time Series of the Segmentation Clock. *PLoS ONE* 3(8): e2856 (2008). <http://www.plosone.org/ambra-doi-resolver/10.1371/journal.pone.0002856>.
- J. Morton, L. Pachter, A. Shiu, and B. Sturmfels, The Cyclohedron test for finding periodic genes. *Statistical Applications in Genetics and Molecular Biology* 6 (2007) 1–21. <http://www.bepress.com/sagmb/vol6/iss1/art21/>
- R. Hemmecke, J. Morton, A. Shiu, B. Sturmfels and O. Wienand, Three counter-examples on semi-graphoids. *Combinatorics, Probability and Computing* 17 (2008) 239-257. <http://journals.cambridge.org/action/displayAbstract?aid=1737396>.
- J. Morton, L. Pachter, A. Shiu, B. Sturmfels, and O. Wienand, Geometry of rank tests. In *Proceedings of the Third European Workshop on Probabilistic Graphical Models*, Prague, Czech Republic, September 2006, pp. 207–214.
- N. Bray and J. Morton, Equations defining hidden Markov models. Chapter 11 in *Algebraic Statistics for Computational Biology*, L. Pachter and B. Sturmfels, eds., Cambridge University Press, 2005.

Preprints/working papers

- *The Geometry of Tensors: Applications to complexity, statistics, and engineering*, a draft book with J.M. Landsberg.

Seminar and Conference Talks

- Scalable implicit tensor approximation (invited talk), Computational Methods for Tensors minisymposium, SIAM Conference on Applied Linear Algebra, 10/26-29/2009, Monterey Bay-Seaside, CA.
- Forecasting higher-order portfolio statistics (invited talk), Practitioner’s Financial Mathematics Seminar, School of Mathematics, University of Minnesota, 10/9/2009.
- Distributions representable by restricted Boltzmann machines (poster), ICML 2009 Workshop on Learning Feature Hierarchies, Montreal, Canada, 6/18/09.
- A visualization is a hypothesis (invited talk), San Francisco Data Visualization Salon, 5/5/09.
- Holographic algorithms without matchgates, Stanford CS Theory Lunch, 4/23/09.
- Holographic algorithms without matchgates, U.C. Berkeley Discrete Math Seminar, 4/20/09.
- Algebraic models for multilinear dependence (invited talk), Sandia National Laboratory, 4/16/09.
- Algebraic models for multilinear dependence (invited talk), Penn State Department of Mathematics, State College, PA 4/8/09.
- Tools for higher-order portfolio optimization (invited talk), MSCI Barra, Berkeley, CA 3/31/09.
- Tools for higher-order portfolio optimization, U.C. Berkeley IEOR Seminar, 2/23/09.
- Algebraic models for multilinear dependence (invited talk), NSF Workshop: Future Directions in Tensor-Based Computation and Modeling, Arlington, VA 2/21/09.

- Mapping the geometry of heart rate data, DARPA Topological Data Analysis meeting, Santa Barbara, CA 1/23/09.
- Algebraic models for multilinear dependence (invited talk), Duke Statistical Science Seminar, 1/19/09.
- Algebraic models for multilinear dependence (invited talk), Algebraic Statistical Models Workshop, SAMSI, Research Triangle Park, North Carolina, 1/15-1/17, 2009.
- Algebraic models for multilinear dependence, U.C. Berkeley Special Algebraic Statistics Seminar, 1/13/09.
- Tools for higher-order portfolio optimization, QWAFAFEW, San Francisco, 1/12/09.
- Algebraic models for multilinear dependence, Algebraic methods in machine learning minisymposium, part of NIPS, Vancouver and Whistler, 12/11/08.
- Tensor geometry and cumulants (invited talk). Texas A&M Geometry Seminar, 11/14/08.
- Mapping the geometry of heart rate data, DARPA FunBio meeting, San Francisco, 8/21/08.
- Tensors and statistics, AIM Geometry and representation theory of tensors for computer science, statistics and other areas workshop, 7/23/08.
- A series of lectures at the MSRI Geometry and representation theory of tensors for computer science, statistics and other areas workshop.
- Graphical models for correlated default (invited talk), Practitioner's Financial Mathematics Seminar, School of Mathematics, University of Minnesota, April 2008.
- Relations among conditional probabilities (invited talk), "Geometric Aspects of Conditional Independence and Information," a conference at the Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany, 3/14/08.
- Topological regularization of large graphical models, TMSCHS Seminar, Stanford University 3/12/08.
- Relations among conditional probabilities, Computational Genomics and Algebraic Statistics Seminar, U.C. Berkeley, 11/13/07.
- Relations among conditional probabilities (invited talk), AMS Special Session on Combinatorial Enumeration, Optimization, Geometry, and Statistics at the Murfreesboro, Tennessee meeting, 11/3/07.
- Schur modules in algebraic statistics, U.C. Berkeley Special Algebraic Statistics Seminar, 7/2/07.
- How to write down polynomials I and II (invited talk on using Schur-Weyl Duality to decompose ideals), Special Geometry Seminar at Texas A&M, 6/4/07 and 6/6/07.
- Geometry of rank tests, poster at IMA session on Applications of Algebraic Geometry (Applications in Biology, Dynamics, and Statistics), 3/5/07.
- Toric geometry of conditional probability, U. C. Berkeley Student Algebraic Statistics Seminar, 11/13/06.
- Semigraphoids and the permutohedron, MIT Combinatorics Seminar, 10/6/06.
- Geometry of rank tests (invited talk), Texas A&M Algebra and Combinatorics Seminar, 9/29/06.

- Geometry of rank tests, Third European Workshop on Probabilistic Graphical Models, Prague 9/14/06.
- Rank tests for microarray data, Duke Systems Biology Seminar, 8/31/06.
- Geometry of rank tests, MSRI Summer Graduate Workshop on Mathematical aspects of computational biology, 6/27/06.

Conferences and Workshops: Participant

- Invited Participant, Data Analysis using Computational Topology & Geometric Statistics workshop, Banff International Research Centre, Banff, Alberta, Canada, 3/8-3/13, 2009.
- Invited Talk, “Future Directions in Tensor-Based Computation and Modeling,” National Science Foundation Workshop, Arlington, VA 2/20-2/21, 2008.
- Invited Talk, DARPA Topological Data Analysis Meeting, Santa Barbara, CA 1/21-1/23, 2009.
- Invited Talk, Algebraic Statistical Models Workshop, SAMSI, Research Triangle Park, North Carolina, 1/15-1/17, 2009.
- MSRI Algebraic Statistics workshop, Berkeley, CA 12/15-12/18, 2008.
- Minisymposium speaker, Neural Information Processing Systems 2008, in Vancouver and Whistler, 12/8-12/13, 2008.
- Berkeley Finance Conference 2008, Berkeley CA, 11/21/08.
- Invited Participant, DARPA Funbio meeting San Francisco, CA, August 2008.
- MMDS 2008: Workshop on Algorithms for Modern Massive Data Sets, Stanford University, June 2008.
- Invited Talk, “Geometric Aspects of Conditional Independence and Information,” at the Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany March, 2008.
- Invited Participant, DARPA Funbio annual meeting San Francisco, CA, January 2008.
- Invited Talk, AMS Special Session on Combinatorial Enumeration, Optimization, Geometry, and Statistics at the Murfreesboro, TN meeting, November 2007.
- NSF Cyber-enabled Discovery and Innovation: Knowledge Extraction workshop, IPAM, Los Angeles, CA, October 2007.
- NSF Cyber-enabled Discovery and Innovation: Computation and Complex Systems workshop, MSRI, Berkeley, CA October 2007.
- Invited Participant, European Science Foundation (ESF) Exploratory Workshop: Multivariate Interpolation - Its Relation To Algebraic Statistics, Classical Algebraic Geometry And Computational Complexity Theory, Sestri Levante, Italy, October 2007.
- Applications of Algebraic Geometry: Complexity, coding, and communications, Institute for Mathematics and Its Applications, IMA, Minneapolis, MN, April 2007.
- Applications of Algebraic Geometry: Biology, Dynamics, and Statistics, Institute for Mathematics and Its Applications, IMA, Minneapolis, MN, March 2007.

- Invited Participant, DARPA Funbio annual meeting Durham, NC, March 2007.
- Speaker, Third European Workshop on Probabilistic Graphical Models, Prague, Czech Republic, September 2006.
- Speaker, MSRI Summer Graduate Workshop: Mathematical aspects of computational biology, MSRI, Berkeley, CA, June, 2006.
- Invited Participant, DARPA Funbio annual meeting Santa Barbara, CA, May, 2006.
- DARPA Ocean Biocomplexity: Metagenomics and Ecology Workshop, Berkeley, CA, March 2006.
- DARPA Funbio Fitness Landscapes workshop, Berkeley, CA, February, 2006.

Conferences and Workshops: Organizer

- Co-organizer (with Lek-Heng Lim) of Applied Multilinear Algebra minisymposium, SIAM Conference on Applied Linear Algebra, 10/26-29/2009, Monterey Bay-Seaside, CA.
- Co-organizer (with Risi Kondor and Guy Lebanon) of *Algebraic methods in machine learning*, a workshop and symposium at NIPS 2008.
- Co-organizer (with J.M. Landsberg and Lek-Heng Lim) of an MSRI Graduate Workshop (July 7-19, 2008) entitled *Geometry and representation theory of tensors for computer science, statistics and other areas*. The workshop was based on my draft book with J.M. Landsberg, *The Geometry of Tensors: Applications to complexity, statistics, and engineering*, and provided a ramp-up for the AIM conference.
- Co-organizer (with J.M. Landsberg, Lek-Heng Lim, and Jerzy Weyman) of an AIM Conference (July 21-26, 2008) entitled *Geometry and representation theory of tensors for computer science, statistics and other areas*. The goal of this workshop is to implement advanced techniques from geometry and representation theory to problems in several areas of research. Each of the problems relates to varieties in spaces of tensors. The areas include: computational complexity, statistical learning theory, signal processing, and scientific data analysis. The main goal of the workshop is getting researchers in very different areas, working on problems with similar underlying mathematics, to share knowledge and work together to advance projects.

Teaching Experience

- Co-taught a summer graduate workshop: Geometry and Representation Theory of Tensors for Computer Science, Statistics, and other areas, at MSRI.
- Sole Instructor: Analytic Geometry and Calculus (Berkeley Math 16A).
- Graduate Student Instructor (graduate classes): Algebraic Geometry (Berkeley Math 256A), Commutative Algebra (Berkeley Math 250B).
- Graduate Student Instructor (undergraduate classes): Calculus (Berkeley Math 1B), Mathematics of Computational Biology (Berkeley Math 127), Principles of Economics (U. Michigan Econ 101).

Finance

- Worked in Mergers and Acquisitions and Technology Investment Banking at Credit Suisse (then CSFB), completing over \$45 billion in transactions for dozens of clients.

- Managed the endowment of an educational nonprofit, including serving as the chair of the investment board. The focus there was on prudent, long-term investing to serve the institution's spending needs.
- Director of Research at a small seed investor in hedge funds, where I provided a quantitative perspective on contracts, asset flows, and portfolios.
- Current finance-related research interests include portfolio optimization, non-multivariate-Gaussian models of asset returns, and hedge fund replication.