

EMILY B. FOX

THE WHARTON STATISTICS DEPARTMENT
UNIVERSITY OF PENNSYLVANIA

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RESEARCH INTERESTS

Bayesian Methods and Machine Learning Graphical & Hierarchical Models, Bayesian Nonparametric Methods, Sparse Modeling, Approximate Inference
Time Series Analysis Multivariate Time Series, Nonlinear Dynamical Systems, Heteroscedastic Models

EDUCATION

Doctorate of Philosophy, Massachusetts Institute of Technology September 2009
Electrical Engineering and Computer Science
Thesis: Bayesian Nonparametric Learning of Complex Dynamical Phenomena
Committee: Alan Willsky (advisor), John Fisher (advisor), Munzer Dahleh, David Blei

Electrical Engineer, Massachusetts Institute of Technology June 2008
Electrical Engineering and Computer Science

Master of Engineering, Massachusetts Institute of Technology June 2005
Electrical Engineering and Computer Science
Thesis: Detection and Localization of Aerosol Releases from Sparse Sensor Measurements
Advisors: Alan Willsky, John Fisher

Bachelor of Science, Massachusetts Institute of Technology June 2004
Electrical Science and Engineering

Cambridge MIT Institute (CMI) Exchange Program, Cambridge University, Cambridge, UK 2002-2003

FELLOWSHIPS & AWARDS

- Leonard J. Savage Award for best thesis in Applied Methodology 2009
- MIT EECS Jin-Au Kong Outstanding Doctoral Thesis Prize 2009
- National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship 2009
- Duke University Provost's Postdoctoral Fellowship (declined) 2009
- University of California President's Postdoctoral Fellowship (declined) 2009
- National Defense Science and Engineering Graduate (NDSEG) Fellowship 2005
- National Science Foundation Graduate Research Fellowship 2005
- Department of Homeland Security Graduate Fellowship (declined) 2005
- Bell Labs Graduate Research Fellowship (declined) 2005
- Chorafas Award for excellent academic performance and superior contributions in research 2005
- David Adler Memorial 2nd Place Thesis Prize for best MIT master's thesis in EE 2005

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PROFESSIONAL EXPERIENCE

Assistant Professor Department of Statistics, University of Pennsylvania, Philadelphia, PA	August 2011 – present
Postdoctoral Scholar Department of Statistical Science, Duke University, Durham, NC	August 2009 – July 2011
Research Assistant Stochastic Systems Group, MIT, Cambridge, MA	February 2004 – July 2009
Visiting Scholar Statistical Artificial Intelligence Lab, University of California, Berkeley, Berkeley, CA	Summers 2007, 2008
Research Assistant Lincoln Laboratory, MIT, Lexington, MA	Summers 2004, 2005, 2006
Undergraduate Research Assistant Signal Processing Laboratory, Cambridge University, Cambridge, UK	November 2002-June 2003
Undergraduate Student Research Program (USRP) Jet Propulsion Laboratory (JPL), Pasadena, CA	Summer 2002

TEACHING EXPERIENCE

Lecturer – Statistics 431 (Statistical Inference) The Wharton School Department of Statistics, Philadelphia, PA.	Fall 2011
Guest Lecturer – Nonparametric Bayesian Inference Doctoral Seminar Instituto de Matematica, Universidade Federal do Rio de Janeiro, Brazil.	Spring 2011
Teaching Assistant – 6.438 (Algorithms for Estimation and Inference) Massachusetts Institute of Technology, Cambridge, MA. Rating: 6.9/7.0.	Fall 2008
Teaching Assistant – 6.437 (Information and Inference) Massachusetts Institute of Technology, Cambridge, MA. Rating: 6.5/7.0.	Spring 2008
Guest Lecturer – COS597C (Bayesian Nonparametrics) Princeton University, Princeton, NJ	Fall 2007
Student Lecturer – Switch-Mode and Radio-Frequency Electronics Cambridge-MIT Institute, Cambridge, MA	Summers 2003, 2004, 2005

ADVISING AND THESIS COMMITTEES

Ph.D. Students

Raja Raja Ahmad (Wharton)
Khalid El-Arini (CMU)
Drausin Wulsin (UPenn)

Postdocs

Tauhid Zaman (Wharton)

Thesis Committees

Alex Kulesza (UPenn)
Sivan Aldor-Noiman (Wharton)
Yao Zhang (Wharton)

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PREPRINTS

Bayesian Nonparametric Covariance Regression.

Emily B. Fox and David B. Dunson,
arXiv 1101.2017, January 2011 (revised February 2011).

Autoregressive Models for Variance Matrices: Stationary Inverse Wishart Processes.

Emily B. Fox and Mike West,
arXiv 1107.5239, July 2011.

Joint Modeling of Multiple Related Time Series via the Beta Processes.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
arXiv 1111.4226, November 2011.

JOURNAL PUBLICATIONS

A Sticky HDP-HMM with Application to Speaker Diarization.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
Annals of Applied Statistics, vol. 5, no. 2A, pp. 1020-1056, June 2011.

Bayesian Nonparametric Inference of Switching Dynamic Linear Models.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
IEEE Transactions on Signal Processing, vol. 59, no. 4, pp. 1569-1585, April 2011.

Bayesian Nonparametric Learning of Markov Switching Processes.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
IEEE Signal Processing Magazine, vol. 27, no. 6, pp. 43-54, November 2010.

Detection and Localization of Material Releases with Sparse Sensor Configurations.

Emily B. Fox, John W. Fisher, & Alan S. Willsky,
IEEE Transactions on Signal Processing, vol. 55, no. 5, pp. 1886-1898, May 2007.

PEER REVIEWED CONFERENCE PUBLICATIONS

Hierarchical Latent Dictionary Learning for Word Classification using Brain Activation Patterns.

Alona M. Fyshe, Emily B. Fox, David B. Dunson, & Tom M. Mitchell,
International Conf. on Artificial Intelligence and Statistics (AISTATS), April 2012. (Acceptance Rate: <6%,
Oral Presentation)

Sharing Features among Dynamical Systems with Beta Processes.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
Neural Information Processing Systems (NIPS), 22, MIT Press, 2010. (Acceptance Rate: 2%, Oral Presentation)

Nonparametric Bayesian Learning of Switching Linear Dynamical Systems.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
Neural Information Processing Systems (NIPS), 21, MIT Press, 2009. (Acceptance Rate: 12%, Spotlight)

An HDP-HMM for Systems with State Persistence.

Emily B. Fox, Erik B. Sudderth, Michael I. Jordan, & Alan S. Willsky,
International Conf. on Machine Learning (ICML), July 2008. (Acceptance Rate: 26%)

Hierarchical Dirichlet Processes for Tracking Maneuvering Targets.

Emily B. Fox, Erik B. Sudderth, & Alan S. Willsky,
International Conf. on Information Fusion (FUSION), July 2007.

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Nonparametric Bayesian Methods for Large Scale Multi-Target Tracking.

Emily B. Fox, David S. Choi, & Alan S. Willsky,
Asilomar Conf. On Signals, Systems, and Computers, November 2006.

Detection and Localization of Material Releases with Sparse Sensor Configurations.

Emily B. Fox, Jason L. Williams, John W. Fisher, & Alan S. Willsky,
IEEE International Conf. on Acoustics, Speech, and Signal Processing (ICASSP), May 2006.

OTHER PUBLICATIONS

Information Fusion and Uncertainty Management for Biological Multisensor Systems.

Jerome J. Braun, Yan Glina, David W. Stein, Peter Skomoroch, & Emily B. Fox,
Proceedings of SPIE, vol. 5813, March 2005.

Multisensor Information Fusion for Biological Sensor Networks and CBRN Detection.

Jerome J. Braun, Yan Glina, David W. Stein, & Emily B. Fox,
Conference on Science and Technology Chem-Bio Information Systems, October 2004.

INVITED RESEARCH TALKS

Inverse Wishart AR Processes and Covariance Regression

Department of Statistics, Carnegie Mellon University, Pittsburgh, PA.	Jan. 2012
Department of Statistics, Stanford University, Stanford, CA.	Jan. 2012
Department of Statistics, Hebrew University, Jerusalem, Israel.	Nov. 2011
Department of Computer Science, Princeton University, Princeton, NJ.	Nov. 2011
Department of Statistics, The Wharton School, University of Pennsylvania, Philadelphia, PA.	Sept. 2011
Joint Statistical Meeting (JSM) IMS Invited Session, Miami Beach, FL.	Aug. 2011
5 th Brazilian Conference on Statistical Modeling in Insurance and Finance, Maresias, Brazil.	May 2011

Bayesian Nonparametric Covariance Regression

Bayesian Nonparametric Workshop, Veracruz, Mexico.	June 2011
Conference in Honour of Adrian F.M. Smith, Crete, Greece.	May 2011
ENAR, Miami, FL.	Mar. 2011

Bayesian Nonparametric Learning of Complex Dynamical Phenomena

Department of Statistics, University of Washington, Seattle, CA.	Jan. 2012
Department of Statistics, Stanford University, Stanford, CA.	Aug. 2011
Department of Statistics, Carnegie Mellon University, Pittsburgh, PA.	Nov. 2010
IPAM Machine Reasoning Workshop, Los Angeles, CA.	Sept. 2010
ISBA 2010 World Meeting, Benidorm, Spain.	June 2010
Department of Statistics, University of Chicago, Chicago, IL.	Feb. 2010
Department of Statistics, Columbia University, New York, NY.	Feb. 2010
Department of Statistical Science, Duke University, Durham, NC.	Jan. 2010
Department of Statistics, Harvard University, Cambridge, MA.	Jan. 2010
Department of Statistics, The Wharton School, University of Pennsylvania, Philadelphia, PA.	Jan. 2010
Information Sciences and Systems Seminar, Princeton University, Princeton, NJ.	Oct. 2009

Bayesian Nonparametric Markov Switching Processes

Bayesian Inference in Econometrics and Statistics (SBIES), Austin, TX.	May 2010
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Sharing Features among Dynamical Systems with Beta Processes

Penn Research in Machine Learning (PRIML) Kickoff Colloquium, Philadelphia, PA.	Oct. 2010
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- A Nonparametric Bayesian Approach to the Speaker Diarization Task*
MIT Spoken Language Systems Group Seminar, Cambridge, MA. April 2009
- Nonparametric Bayesian Learning of Switching Dynamical Processes*
MIT Lincoln Laboratory Decision Modeling Research Initiative Seminar, Lexington, MA. Feb. 2009
Information Processing Systems Seminar, The Ohio State University, Columbus, OH. Nov. 2008
Department of Statistical Science, Duke University, Durham, NC. Nov. 2008
Machine Learning Group Seminar, Cambridge University, Cambridge, England. July 2008
Joint ICML/UAI/COLT Nonparametric Bayesian Workshop, Helsinki, Finland. July 2008
- A Sticky HDP-HMM for Systems with State Persistence*
Harvard University Division of Engineering and Applied Sciences, Cambridge, MA. Feb. 2008
- Tracking a Non-Cooperative Maneuvering Target Using Hierarchical Dirichlet Processes*
Adaptive Sensor Array Processing Workshop, Lexington, MA. June 2007
- Nonparametric Bayesian Methods for Large-Scale Target Tracking*
MIT Lab. for Information and Decision Systems Student Conference, Cambridge, MA. Feb. 2007
Heterogeneous Sensor Networks (HSN) meeting, UC Berkeley, CA. Nov. 2006
- Presentation on Summer 2005 work*
MIT Lincoln Laboratory Decision Modeling Research Initiative Seminar, Lexington, MA. Jan. 2006
Annual program review meeting, Washington, D.C. Sept. 2005
MIT Lincoln Laboratory Advanced Concepts Group Seminar, Lexington, MA. Aug. 2005
- Wavelet Feature Extraction and a Recursive GLRT for Aerosol Detection and Localization*
MIT Lincoln Laboratory Biodefense Group Seminar, Lexington, MA. June 2005
- Detection and Localization of Aerosol Releases from Sparse Sensor Measurements*
MIT EECS Department Masterworks, Cambridge, MA. Apr. 2005
- Hybrid State Multiple Model Particle Filtering from Sparse Sensor Measurements*
MIT Stochastic Systems Group Seminar, Cambridge, MA. Oct. 2004
- Biomorphic Robot Arm Feedback Systems*
Caltech/JPL SURF Seminar, Pasadena, CA. June 2002

SERVICE & PROFESSIONAL ACTIVITIES

- Journal Reviewer* Journal of the Royal Statistical Society: Series B, Annals of Applied Statistics, Bayesian Analysis, Statistical Science, Statistics and Computing, IEEE Trans. Signal Processing, IEEE Trans. Pattern Analysis & Machine Intelligence, Journal of Machine Learning Research, IEEE Trans. Aerospace and Electronic Systems
- Organizing Committee* Bayesian Case Studies (2013), Bayesian Nonparametrics: Hope or Hype? (NIPS 2011)
- Senior Program Committee* Uncertainty in Artificial Intelligence (UAI 2012)
- Program Committee Member* AISTATS (2009, 2010, 2011, 2012), ICML (2010), FUSION (2009)
- Conference Reviewer* Neural Information Processing Systems (2008, 2009, 2010, 2011)
- Professional Societies* Institute of Mathematical Statistics (IMS), International Society for Bayesian Analysis (ISBA), Institute of Electrical & Electronics Engineers (IEEE), IEEE Women in Engineering
- Wharton Committees*
Statistics Department IT Committee (2011-2012) Postdoctoral Seminar Series Organizer (2011)

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MIT Committees

Student Life Programs Graduate Resident Tutor (2006-2009)	EECS Graduate Student Association Diversity Chair (2006-2007), Athletics Chair (2005-2006)
Course 6 Education Committee Student Representative (2005-2009)	GW6 – Graduate Women in Course 6 President (2006-2007)
Student on Graduate Curriculum Options (SGCO) Chair (2006-2008)	GSC Ski Trip Lead Organizer of 440 person trip (2006, 2007)
Associate Advisor (2006-2008)	

MEDIA ATTENTION

Patterns Emerge From Chaos.

SIGNAL Magazine, June 2009.

http://www.afcea.org/signal/articles/templates/Signal_Article_Template.asp?articleid=1963&zoneid=263

Bright Young Things.

The Improper Bostonian, April 29 – May 12, 2009.

Stock-market buzz: Bees and fingers point out trends.

Christian Science Monitor, January 21, 2009.

<http://features.csmonitor.com/innovation/2009/01/21/stock-market-buzz-bees-and-fingers-point-out-trends/>

Deciphering Honeybee Dances and Stock Market Swings: A graduate student's model brings order to complex systems through math.

MIT Tech Talk, vol. 53, no. 11, December 10, 2008.

<http://web.mit.edu/newsoffice/2008/dancing-bees-tt1210.html>

How Honey Bee Dances Relate to Stock Market Swings.

MIT Alumni Association Tech Connection, December 2008.

<http://alum.mit.edu/news/TechConnection/Archive/200812/>

GRANTS RECEIVED

Bayesian Tracking Within a Feedback Sensing Environment: Estimating Interacting, Spatially Constrained Complex Dynamical Systems from Multiple Sources of Controllable Devices

Emily B. Fox, PI

Air Force Office of Scientific Research (AFOSR), FA9550-10-1-0501.

September 1, 2010 – August 31, 2014, \$491,286.

Highly Multivariate Time Series Analysis From Sparse, Heterogeneous Data Sources

Emily B. Fox, PI

Bosch Corporation.

September 1, 2011 – June 30, 2012, gift.