

# Sergey Kirshner

## Curriculum Vitae

🏠 Santa Clara, CA  
✉ [email.me@sergeykirshner.com](mailto:email.me@sergeykirshner.com)  
🌐 [sergeykirshner.com](http://sergeykirshner.com)  
in [sergeykirshner](https://www.linkedin.com/in/sergeykirshner)



## Summary

---

I am a statistical machine learning expert with 17+ years of experience (12+ years post-Ph.D.) in modeling and understanding of large-scale noisy data in high-impact applications. My previous work spans applications of probabilistic approaches (including graphical and time series models) and Bayesian techniques to high-dimensional data understanding, with applications including relevance modeling for e-commerce and ad tech, rainfall and atmospheric data modeling, understanding of statistical properties of graph/networks.

## Education

---

### University of California, Irvine

*Ph.D., Information and Computer Science*

2005

Thesis: *Modeling of Multivariate Time Series Using Hidden Markov Models*

Advisor: Padhraic Smyth

### University of California, Irvine

*M.S., Information and Computer Science*

2001

### University of California, Berkeley

*B.A., Mathematics & Computer Science (double)*

1998

## Professional Experience

---

### Facebook

*Research Scientist*

**Menlo Park, CA, USA**

2017 – present

### @WalmartLabs

*Director of Modeling/Principal Architect*

Driving modeling and analytics projects for the Walmart Advertisement Platform for partnership marketing, including measurement, optimized audience segment construction, and real-time bidding on demand side platforms; building a team of scientists and engineers to convert Walmart's transaction and other data into ad tech products generating revenue for the company.

**Sunnyvale, CA, USA**

2016 – 2017

### Skytree (acquired by Infosys)

*Principal Member of Technical Staff*

Research and prototyping of machine learning approaches for classification and anomaly detection and for automation of the data science process including feature generation and selection, hyperparameter selection, and model estimation; participation (including lead) in customer projects and POCs; development of IP.

**San Jose, CA, USA**

2014 – 2015

### Vicarious

*Senior Machine Learning Researcher*

Research of brain-inspired machine learning approaches to computer vision.

**Union City, CA, USA**

2014

### a9.com (Amazon)

*SDE/Machine Learning Scientist*

Product search ranking by relevance: development and implementation of ranking approaches in a massive data setting with strict latency requirements, A/B hypothesis testing, deployment of ranking functions into production with impact to millions of customers daily, communication with business teams for decision making and planning.

**Palo Alto, CA, USA**

2013 – 2014

**Purdue University, Statistics** **West Lafayette, IN, USA**  
*Assistant Professor* *2008 – 2013*  
Research: original statistical machine learning research with applications to modeling of multivariate atmospheric data and to understanding of large scale network behavior; funded collaborations with scientists from other disciplines.  
Training: mentorship and supervision of graduate and undergraduate students, teaching and development of graduate and undergraduate courses in statistics and machine learning.

**Alberta Ingenuity Centre for Machine Learning, University of Alberta** **Edmonton, Canada**  
*Postdoctoral Fellow* *2006 – 2008*

**Donald Bren School of Information and Computer Sciences, UC Irvine** **Irvine, CA, USA**  
*Postdoctoral Scholar* *2005 – 2006*

**Donald Bren School of Information and Computer Sciences, UC Irvine** **Irvine, CA, USA**  
*Research Assistant* *1999 – 2005*

**RIACS/NASA Ames Research Center** **Moffett Field, CA, USA**  
*Student Research Scientist* *summer 2000*

**NASA Ames Research Center** **Moffett Field, CA, USA**  
*Systems Analyst* *1998 – 1999*

**HNC Software (acquired by Fair Isaac)** **San Diego, CA, USA**  
*Intern* *summer 1997*

## Honors and Awards

---

**Interdisciplinary Award**: Purdue University, College of Science *2011*  
**Travel Award**: Uncertainty in Artificial Intelligence (UAI) Conference *2004*  
**Travel Award**: International Conference on Machine Learning (ICML) *2003*  
**Student Research Program Grant**: Research Institute for Advanced Computer Science *2000*  
**Honorable mention (top 2%)**: 56th William Lowell Putnam Mathematical Competition *1995*  
**First degree diploma**: Ukrainian Mathematics Olympiad *1992*

## Teaching Experience

---

**Probabilistic Graphical Models**: Sp13, F10, F09 semester, Purdue University *graduate*  
**Introduction to Computational Statistics**: F12, F11, Sp11 semester, Purdue University *graduate*  
**Probability**: F12, Sp12, F09, Sp09 semester, Purdue University *undergraduate*  
**Probability**: Sp10 semester, Purdue University *masters*  
**Machine Learning Reading Group**: F11 semester, Purdue University *graduate*  
**Introduction to Artificial Intelligence**: Su02 quarter, UC Irvine *undergraduate*

## Funding

---

Research Grants, Contracts, and Gifts.....

[RG1] *A Copula-based Probabilistic Approach for Space-Time Characterization of Droughts*, National Science Foundation, Award number AGS-1025430, \$346,552, SK portion: \$158,731, 09/01/10-08/31/14, PI (co-PI: Rao S. Govindaraju, transferred to co-PI on 08/09/13)

[RG2] *Algorithms for Sampling Similar Graphs Using Subgraph Signatures*, National Science Foundation, Award number IIS-0916686, \$494,538.00, SK portion: \$140,115, 09/01/09-08/31/13, co-investigator (PI: S.V.N. Vishwanathan, co-I: Jennifer Neville)

Educational Grants.....

[EG1] *The 2011 Machine Learning Summer School at Purdue University*, National Science Foundation, Award number IIS-1115185 \$33,600, 03/01/2011-02/29/2012, co-investigator (PI: S.V.N. Vishwanathan)

## Professional Academic Activities

---

Professional Affiliations.....

**International Society for Bayesian Analysis:** member 2009–2014

**American Statistical Association:** member 2008–2013

Events Organizer.....

*Statistical Issues with Modeling of Networks, West Lafayette, IN, USA, June 22, 2012*, a session at the 8th International Purdue Symposium on Statistics (organizer)

*The 2011 Machine Learning Summer School at Purdue University, West Lafayette, IN, USA, June 13-24, 2011* (130 students, co-organizer)

Journals: Reviewer.....

**Journal of Artificial Intelligence Research:** 2011, 2012, 2013

**Statistics and Computing:** 2008, 2013

**Computational Statistics and Data Analysis:** 2009, 2010, 2013

**Journal of Machine Learning Research:** 2009, 2010

**IEEE Transactions on Neural Networks:** 2008, 2010

**Quarterly Journal of Royal Meteorological Society:** 2009

**Data Mining and Knowledge Discovery:** 2006, 2008

**Physics and Chemistry of the Earth:** 2008

**International Journal of Climatology:** 2008

**IEEE Transactions on Pattern Analysis and Machine Intelligence:** 2008

**Machine Learning Journal:** 2007, 2008

**ACM Computing Surveys:** 2007

**Journal of Computational and Graphical Statistics:** 2006

**Journal of Applied Meteorology and Climatology:** 2006

Conferences: Reviewer and Member of Program Committee.....

**World Wide Web (WWW):** 2017

**Conference on Information and Knowledge Management (CIKM):** 2016  
**Artificial Intelligence and Statistics (AISTATS):** 2009, 2011-2013, 2015-2016  
**Neural Information Processing Systems (NIPS):** 2007-2010, 2012, 2013, 2015  
**Uncertainty in Artificial Intelligence (UAI):** 2008 (ad hoc), 2010-2013  
**International Conference on Machine Learning (ICML):** 2008, 2011, 2012  
**SIGKDD Conference on Knowledge and Data Mining (KDD):** 2004 (ad hoc), 2011  
**Conference on Artificial Intelligence (AAAI):** 2007, 2011, 2012  
**International Joint Conference on Artificial Intelligence (IJCAI):** 2007, 2009, 2013

## Mentoring



---


Former Students.....

<b>Lin Yuan:</b> graduate (with Bob Givan), Purdue ECE	2011-2013
<b>Guy Feldman:</b> graduate, Purdue Statistics	2011-2013
<b>April Harry:</b> graduate (with Rebecca Doerge), Purdue Statistics	2013
<b>Baron Law:</b> graduate (with Frederi Viens), Purdue Statistics	2012
<b>Qiming Huang:</b> graduate, Purdue Statistics	2011-2012
<b>Gyeongcheol Lee:</b> graduate, Purdue ECE	2011-2012
<b>Wadzanai Dauton Lunga:</b> graduate (with Okan Ersoy), Purdue ECE	2010-2011
<b>Jeremiah Rounds:</b> graduate, Purdue Statistics	2010
<b>Di Xu:</b> undergraduate, Purdue CS	2012-2013
<b>Xin Lu Tan:</b> undergraduate, Purdue Statistics	2010-2011
<b>Nik Datsenka:</b> undergraduate, Purdue Statistics	2010-2011
<b>Kicho Yu:</b> undergraduate, Purdue Statistics	2010
<b>Jiayin Wang:</b> undergraduate, Purdue Statistics	2010
Thesis Committee.....	
<b>Sebastian Moreno:</b> Ph.D., Purdue CS, 2014	
<b>Bunyamin Sisman:</b> Ph.D., Purdue ECE, 2013	
<b>Ildus Ahmadullin:</b> Ph.D., Purdue ECE, 2012	
<b>Rongjing Xiang:</b> Ph.D., Purdue CS, 2012	
<b>Feng Yan:</b> Ph.D., Purdue CS, 2012	
<b>Matthew Bowers:</b> M.S., Purdue Earth and Atmospheric Sciences, 2012	

## Patents

---









- [P1] A. Aditya, A. Gupta, A. Gray, B. Simmons, M. Gibiansky, N. Ball, S. Mehta, **S. Kirshner**, T. Gregory, 'Interoperability of transforms under a unified platform and extensible transformation library of those interoperable transforms', U.S. Patent Application №15/279,868, filed September 29, 2016. 
- [P2] **S. Kirshner**, A. Gray, L. Kite, 'Modeling of geospatial location over time', U.S. Patent Application №15/254,958, filed September 1, 2016. 
- [P3] **S. Kirshner**, 'Constructing additive trees monotonic in selected sets of variables', U.S. Patent Application

- [P4] A. Gray, **S. Kirshner**, 'System and method for using machine learning to generate a model from audited data', U.S. Patent Application №15/065,534, filed March 9, 2016. 


## Publications

---



### Journal Papers.....











- [J1] G. Feldman, A. Bhadra, and **S. Kirshner**, 'Bayesian feature selection in high-dimensional regression in presence of correlated noise,' *Stat*, volume 3, issue 1, pp. 258-272, August 2014. doi:10.1002/sta4.60 
- [J2] G. Fu, S.P. Charles, **S. Kirshner**, 'Daily rainfall projections from General Circulation Models with a downscaling Nonhomogeneous Hidden Markov Model (NHMM) for southeastern Australia', *Hydrological Processes*, volume 27, Issue 25, pp. 3663-3673, December 2013. doi:10.1016/j.jhydro1.2013.03.041 
- [J3] G. Mallya, S. Tripathi, **S. Kirshner**, R.S. Govindaraju, 'Probabilistic Assessment of Drought Characterization using a Hidden Markov Model', *Journal of Hydrologic Engineering*, volume 18, pp. 834-845, July 2013. doi:10.1061/(ASCE)HE.1943-5584.0000699 
- [J4] G. Fu, S.P. Charles, F.H.S. Chiew, J. Teng, H. Zheng, A.J. Frost, W. Liu, **S. Kirshner**, 'Modelling Runoff with Statistically Downscaled Daily Site, Gridded and Catchment Rainfall Series', *Journal of Hydrology*, volume 492, pp. 254-265, June 2013. doi:10.1002/hyp.9483 
- [J5] A.M. Green, A.W. Robertson, **S. Kirshner**, 'Analysis of Indian monsoon daily rainfall on subseasonal to multidecadal time scales using a hidden Markov model', *The Quarterly Journal of Royal Meteorological Society*, volume 134, number 633, pp. 875-887, April 2008. doi:10.1002/qj.254 
- [J6] A.T. Ihler, **S. Kirshner**, M. Ghil, A.W. Robertson, P. Smyth, 'Graphical models for statistical inference and data assimilation.' *Physica D*, special issue on *Data Assimilation*, volume 230, issue 1-2, pp. 72-87, June 2007. doi:10.1016/j.physd.2006.08.023 
- [J7] A.W. Robertson, **S. Kirshner**, P. Smyth, S.P. Charles, and B.C. Bates, 'Subseasonal-to-interdecadal variability of the Australian monsoon over North Queensland.' *The Quarterly Journal of Royal Meteorological Society*, volume 132, number 615, pp. 519-542, January 2006. doi:10.1256/qj.05.75 
- [J8] A.W. Robertson, **S. Kirshner**, and P. Smyth, 'Daily rainfall occurrence over Northeast Brazil and its downscalability using a hidden Markov model.' *Journal of Climate*, volume 17, issue 22, pp. 4407-4424, November 2004. doi:10.1175/JCLI-3216.1 

### Journal Editorials and Commentaries.....


- [E1] P. Smyth, **S. Kirshner**, Comments on the article 'EM versus Markov chain Monte Carlo for estimation of hidden Markov models: a computational perspective,' by T. Ryden, *Bayesian Analysis*, volume 3, number 4, pp. 699-706, December 2008. doi:10.1214/08-BA326B 


### Conference Papers, Peer-reviewed.....

- [C1] S. Moreno, J. Pfeiffer, J. Neville, **S. Kirshner**, 'A scalable method for exact sampling from Kronecker family models', in *Proceedings of the Fourteenth IEEE International Conference on Data Mining*, pp. 440-449, December 2014 (ICDM-2014, accepted/submitted 143/727) 
- [C2] S. Moreno, J. Neville, **S. Kirshner**, 'Learning mixed Kronecker product graph models with simulated method of moments', in *Proceedings of the Nineteenth ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, pp. 1052-1060, August 2013 (KDD-2013, accepted/submitted 126/726) 






- [C3] **S. Kirshner**, 'Latent copula trees', in *Proceedings of the Sixth European Workshop on Probabilistic Graphical Models*, pp. 155-162, September 2012 (PGM-2012, accepted/submitted 47/63) 
- [C4] B. Póczos, **S. Kirshner**, Cs. Szepesvári, 'REGO: Rank-based estimation of Rényi information using Euclidean graph optimization', in *Proceedings of the Thirteenth International Conference on Artificial Intelligence and Statistics*, pp. 605-612, Y. W. Teh and M. Titterton (editors), July 2010, Journal of Machine Learning Research Workshop and Conference Proceedings, volume 9 (AISTATS-2010) (plenary session, plenary/accepted/submitted 24/125/308) 
- [C5] **S. Kirshner**, B. Póczos, 'ICA and ISA using Schweizer-Wolff dependence measure', in *Proceedings of the Twenty-Fifth International Conference on Machine Learning*, pp. 464-471, A. McCallum and S. Roweis (eds.), July 2008 (ICML-2008) (accepted/submitted 155/583) 
- [C6] **S. Kirshner**, 'Learning with tree-averaged densities and distributions', in *Advances in Neural Information Processing Systems 20*, pp. 761-768, J.C. Platt and D. Koller and Y. Singer and S. Roweis (eds.), MIT Press, Cambridge, MA, 2008 (NIPS-2007) (plenary session, plenary/accepted/submitted 26/217/975) 
- [C7] **S. Kirshner**, P. Smyth, 'Infinite mixtures of trees', in *Proceedings of the Twenty-Fourth International Conference on Machine Learning*, pp. 417-424, Z. Ghahramani (editor), June 2007 (ICML-2007) (accepted/submitted 152/522) 
- [C8] **S. Kirshner**, P. Smyth, A.W. Robertson, 'Conditional Chow-Liu tree structures for modeling discrete-valued vector time series,' in *Proceedings of the Twentieth Conference on Uncertainty in Artificial Intelligence*, pp. 317-324, M. Chickering, J. Halpern (eds.), AUAI Press, July 2004 (UAI-2004) (plenary session, plenary/accepted/submitted 27/75/253) 
- [C9] **S. Kirshner**, S. Parise, and P. Smyth, 'Unsupervised learning from permuted data,' in *Proceedings of the Twentieth International Conference on Machine Learning*, AAAI Press, pp. 345-352, Menlo Park, CA, August 2003 (ICML-2003) (accepted/submitted 117/371) 
- [C10] **S. Kirshner**, I.V. Cadez, P. Smyth, and C. Kamath, 'Learning to classify galaxy shapes using the EM algorithm,' in *Advances in Neural Information Processing Systems 15*, pp. 1497-1504, S. Becker, S. Thrun and K. Obermayer (eds.), MIT Press, Cambridge, MA, 2003 (NIPS-2002) (accepted/submitted 207/694) 
- [C11] **S. Kirshner**, I.V. Cadez, P. Smyth, C. Kamath, and E. Cantú-Paz, 'Probabilistic model-based detection of bent-double radio galaxies,' in *Proceedings of the Sixteenth International Conference on Pattern Recognition*, IEEE Comput. Soc. 2002, vol.2, pp. 499-502. Los Alamitos, CA (ICPR-2002) (accepted/submitted 805/1240) 
- [C12] D. Wolpert, **S. Kirshner**, C. Merz, and K. Tumer, 'Adaptivity in agent-based routing for data networks,' in *Proceedings of the Fourth International Conference on Autonomous Agents*, ACM. 2000, pp. 396-403. New York, NY (Agents-2000) (plenary session, plenary/accepted/submitted 48/123/??) 

Non-refereed Conference and Workshop Papers.....

- [WP1] L. Yuan, **S. Kirshner**, R. Givan, 'Estimating Densities with Non-Parametric Exponential Families', in *NIPS 2012 Workshop on Modern Nonparametric Methods in Machine Learning*, Lake Tahoe, NV, USA, December 2012
- [WP2] L. Yuan, **S. Kirshner**, R. Givan, 'Mass Preserving Exponential Random Graph Model', in *NIPS 2012 Workshop on Algorithmic and Statistical Approaches for Large Social Networks*, Lake Tahoe, NV, USA, December 2012
- [WP3] D. Lungu, **S. Kirshner**, 'Generating Similar Graphs with Spherical Features', in *Ninth Workshop on Mining and Learning with Graphs (MLG 2011)*, San Diego, USA, August 2011 




- [WP4] S. Moreno, J. Neville, **S. Kirshner**, and S.V.N. Vishwanathan, 'Modeling the Variance of Network Populations with Mixed Kronecker Product Graph Models', in *NIPS 2010 Workshop on Networks Across Disciplines: Theory and Applications*, Whistler, Canada, December 2010
- [WP5] S. Moreno, **S. Kirshner**, J. Neville, and S.V.N. Vishwanathan, 'Tied Kronecker product graph models to capture variance in network populations', in *Proceedings of the 48th Annual Allerton Conference on Communications, Control, and Computing*, Allerton, IL, October 2010 
- [WP6] S. Parise, **S. Kirshner**, and P. Smyth, 'Multivariate density estimation with permuted variable-values,' in *Proceedings of the 2003 Conference on the Interface between Computer Science and Statistics*, Salt Lake City, UT, March 2003

Technical Reports.....

- [TR1] S. Moreno, J. Neville, **S. Kirshner**, Tied Kronecker product graph models to capture variance in network populations, Technical Report, Purdue Computer Science 12-012, December 2012. 
- [TR2] L. Yuan, **S. Kirshner**, R. Givan, 'Estimating densities with non-parametric exponential families', Technical Report, Purdue Statistics 12-02, June 2012. 
- [TR3] D. Lunga, **S. Kirshner**, 'Generating similar graphs with spherical features', Technical Report, Purdue Statistics 11-01, May 2011. 
- [TR4] **S. Kirshner**, P. Smyth, A.W. Robertson, 'Conditional Chow-Liu tree structures for modeling discrete-valued vector time series,' Technical Report UCI-ICS 04-04, March 2004. 
- [TR5] A.W. Robertson, **S. Kirshner**, P. Smyth, 'Hidden Markov models for modeling daily rainfall occurrence over Brazil,' Technical Report UCI-ICS 03-27, November 2003. 

## Software

---

- LTC**: Matlab latent tree copula toolbox.  2012
- SWICA**: Matlab independent component analysis copula-based methods toolbox.  2008-2012
- MVNHMM**: C/C++ toolbox for modeling multivariate time-series with hidden Markov models.  2003-2008

## Technical Skills

---

- Programming Languages**: Python, C/C++
- Computing/Statistical Software**: NumPy, SciPy, pandas, scikit-learn, R, Matlab
- Data Manipulation**: Hive/SQL, Spark
- Document Preparation**:  $\text{\LaTeX}$