

# Sergey Kirshner

## Curriculum Vitae

🏠 Sunnyvale, CA  
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## Summary

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I am a statistical machine learning expert with 20 years of experience 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, modeling, prediction, and ranking to diverse areas including e-commerce, ad tech, hydrology, and large scale network analysis.

## Education

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### University of California, Irvine

*Ph.D., Information and Computer Science*

Mar 2005

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

Advisor: Padhraic Smyth

### University of California, Irvine

*M.S., Information and Computer Science*

Dec 2001

### University of California, Berkeley

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

May 1998

## Professional Experience

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### Facebook

*Research Scientist (Engineering Tech Lead)/Data Scientist*

Responsible for opportunity analysis, goal setting, and guiding experimentation to improve search ranking and retrieval for Facebook Marketplace, the leading C2C commerce platform. Trained and deployed ranking models from TBs of search traffic and user actions data; implemented features under strict latency and capacity constraints; analyzed query and user activity traffic to find improvement opportunities and set team's goals; developed metrics to assess the improvements in MP Search.

Menlo Park, CA, USA

Sep 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

Jan 2016 – Sep 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; leading customer projects and POCs; development of IP.

San Jose, CA, USA

Nov 2014 – Dec 2015

### Vicarious

*Senior Machine Learning Researcher*

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

Union City, CA, USA

Aug 2014 – Oct 2014

### a9.com (Amazon)

*SDE/Machine Learning Scientist*

Palo Alto, CA, USA

Aug 2013 – Aug 2014

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.

## **Purdue University, Statistics**

*Assistant Professor*

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.

**West Lafayette, IN, USA**

*Aug 2008 – Aug 2013*

## **Alberta Ingenuity Centre for Machine Learning, University of Alberta**

*Postdoctoral Fellow*

**Edmonton, Canada**

*Jun 2006 – Jul 2008*

## **Donald Bren School of Information and Computer Sciences, UC Irvine**

*Postdoctoral Scholar*

**Irvine, CA, USA**

*Apr 2005 – May 2006*

## **Donald Bren School of Information and Computer Sciences, UC Irvine**

*Research Assistant*

**Irvine, CA, USA**

*Sep 1999 – Mar 2005*

## **RIACS/NASA Ames Research Center**

*Student Research Scientist*

**Moffett Field, CA, USA**

*summer 2000*

## **NASA Ames Research Center**

*Systems Analyst*

**Moffett Field, CA, USA**

*Jun 1998 – Aug 1999*

## **HNC Software (acquired by Fair Isaac)**

*Intern*

**San Diego, CA, USA**

*summer 1997*

## **Honors and Awards**

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

## **Teaching Experience**

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

## Funding

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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

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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/TheWebConf (WWW):** 2017, 2019

**Conference on Information and Knowledge Management (CIKM):** 2016  
**Artificial Intelligence and Statistics (AISTATS):** 2009, 2011-2013, 2015-2016  
**Neural Information Processing Systems (NIPS/NeurIPS):** 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


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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>Bunyanin 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	


## Patent Applications

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- [P1] P. Yang, **S. Kirshner**, J. Korlimarla, 'Systems and methods for automated audiences set identification', U.S. Patent Application №16/163,294, filed on October 17, 2018.
- [P2] 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. 
- [P3] **S. Kirshner**, A. Gray, L. Kite, 'Modeling of geospatial location over time', U.S. Patent Application №15/254,958,

filed September 1, 2016. 


[P4] **S. Kirshner**, 'Constructing additive trees monotonic in selected sets of variables', U.S. Patent Application №15/178,549, filed June 9, 2016. 


[P5] 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


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Journal Papers.....


[J1] S. Moreno, J. Neville, and **S. Kirshner**, 'Tied Kronecker product graph model to capture variance in network populations,' *ACM Transactions on Knowledge and Discovery from Data*, volume 12, issue 3, April 2018. doi:10.1145/3161885 


[J2] 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 


[J3] 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 


[J4] 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 

[J5] 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 


[J6] 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 














[J7] 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 



[J8] 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 






[J9] 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] Y. Tang, F. Borisyuk, S. Malreddy, Y. Li, Y. Liu, **S. Kirshner**, 'MSURU: Large Scale E-commerce Image Classification with Weakly Supervised Search Data', in *Proceedings of the Twenty Fifth ACM Conference on Knowledge Discovery and Data Mining*, pp. 2518-2526, August 2019 (KDD-2019 accepted/submitted 321/1808), 
  - [C2] 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) 
  - [C3] 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) 
  - [C4] **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) 
  - [C5] 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) 
  - [C6] **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) 
  - [C7] **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) 
  - [C8] **S. Kirshner**, P. Smyth, 'Infinite mixtures of trees', in *Proceedings of the Twenty-Fourth International Conference on Machine Learning*, pp. 417-424, Z. Gharhamani (editor), June 2007 (ICML-2007) (accepted/submitted 152/522) 
  - [C9] **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) 
  - [C10] **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) 
  - [C11] **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) 
  - [C12] **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) 
  - [C13] 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. Lunga, **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

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- 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

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**Programming Languages**: Python, C/C++

**Computing/Statistical Software**: NumPy, SciPy, pandas, scikit-learn, R, Matlab

**Data Manipulation:** Hive/Presto/SQL

**Document Preparation:** L<sup>A</sup>T<sub>E</sub>X