

# Dougal J. Sutherland

## Contact Information

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## Academic Positions and Education

- 2016– **Research Associate**, *Gatsby Unit, University College London.*  
Postdoctoral position with Arthur Gretton.
- 2016 **Ph.D., Computer Science**, *Carnegie Mellon University.*  
*Thesis Title:* Scalable, Flexible, and Active Learning on Distributions.  
*Committee:* Jeff Schneider (chair), Barnabás Póczos, Maria-Florina Balcan, Arthur Gretton.
- 2015 **M.S., Computer Science**, *Carnegie Mellon University.*
- 2011 **B.A., Computer Science**, *Swarthmore College*, with high honors.  
Minors in Linguistics (with high honors) and Mathematics & Statistics. GPA: 3.92.

## Honors and Awards

- 2014 – 2016 Sandia Campus Executive Program fellowship. (Renewed in 2015.)
- March 2013 National Science Foundation Graduate Research Fellowship Program: Honorable Mention.
- May 2011 Ivy Award for “the senior man outstanding in leadership, scholarship, and contributions to the college community” by Swarthmore faculty vote.
- May 2011 Elected Phi Beta Kappa.
- May 2011 Drew Pearson Prize for excellence in journalism.

## Research and Academic Experience

- 2013 – 2016 **XDATA workshops, DARPA.**  
Addressed challenge problems about various datasets with teams from across academia and industry as a testbed for development of open-source data-analytic software libraries. Developed a Python library, `skl-groups`, for machine learning on distributions. Participated in development of a financial analysis application in use at a federal agency. Led a small team of CMU participants and managed collaborations, particularly with Casey King and Ben Johnson of Phronesis, LLC.
- 2011 – 2016 **Ph.D. research, Carnegie Mellon University.**  
Research in machine learning with Jeff Schneider; frequent collaboration with Barnabás Póczos. Particular focus on machine learning on samples from distributions and on active learning problems. In addition to work represented by the publications below, I have done unpublished empirical work related to learning on distributions in the analysis of financial anomalies, fusion reactor behavior, web browsing traffic, shipping behavior, terrorist activities, and Twitter language use.
- Spring 2011 **Linguistics senior honors study, Swarthmore College.**  
Analyzed the phonotactics of Chaha, including computational approaches, for Colleen Fitzgerald.
- Summer 2010 **REU in machine learning, University of Oklahoma.**  
Worked on a relational concept learning system with Andrew Fagg.
- Summer 2009 **Howard Hughes Medical Institute fellowship, Swarthmore College.**  
Worked on natural language processing and medical information extraction with Rich Wicentowski.

Spring 2009 **Directed independent study project**, *Pitzer in Nepal*.

Examined the interaction of language use and pedagogical techniques in rural Nepali schools.

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## Publications

Below, \* denotes equal contribution.

### Journal and low-acceptance-rate conference papers

- Mikołaj Bińkowski\*, Dougal J. Sutherland\*, Michael Arbel, and Arthur Gretton. "Demystifying MMD GANs." In: *International Conference on Learning Representations (ICLR)*. 2018. arXiv: 1801.01401.
- Dougal J. Sutherland\*, Heiko Strathmann\*, Michael Arbel, and Arthur Gretton. "Efficient and principled score estimation with Nyström kernel exponential families." In: *Artificial Intelligence and Statistics (AISTATS)*. 2018. arXiv: 1705.08360. Selected for oral presentation.
- Ho Chung Leon Law\*, Dougal J. Sutherland\*, Dino Sejdinovic, and Seth Flaxman. "Bayesian Approaches to Distribution Regression." In: *Artificial Intelligence and Statistics (AISTATS)*. 2018. arXiv: 1705.04293.
- Dougal J. Sutherland, Hsiao-Yu Tung, Heiko Strathmann, Soumyajit De, Aaditya Ramdas, Alex Smola, and Arthur Gretton. "Generative Models and Model Criticism via Optimized Maximum Mean Discrepancy." In: *International Conference on Learning Representations (ICLR)*. 2017. arXiv: 1611.04488.
- Michelle Ntampaka, Hy Trac, Dougal J. Sutherland, Sebastian Fromenteau, Barnabás Póczos, and Jeff Schneider. "Dynamical Mass Measurements of Contaminated Galaxy Clusters Using Machine Learning." In: *The Astrophysical Journal* 831.2 (2016), p. 135. arXiv: 1509.05409.
- Dougal J. Sutherland\*, Junier B. Oliva\*, Barnabás Póczos, and Jeff Schneider. "Linear-time Learning on Distributions with Approximate Kernel Embeddings." In: *AAAI Conference on Artificial Intelligence (AAAI)*. 2016. arXiv: 1509.07553.
- Dougal J. Sutherland and Jeff Schneider. "On the Error of Random Fourier Features." In: *Uncertainty in Artificial Intelligence (UAI)*. 2015. arXiv: 1506.02785.
- Yifei Ma\*, Dougal J. Sutherland\*, Roman Garnett, and Jeff Schneider. "Active Pointillistic Pattern Search." In: *Artificial Intelligence and Statistics (AISTATS)*. 2015.
- Michelle Ntampaka, Hy Trac, Dougal J. Sutherland, Nicholas Battaglia, Barnabás Póczos, and Jeff Schneider. "A Machine Learning Approach for Dynamical Mass Measurements of Galaxy Clusters." In: *The Astrophysical Journal* 803.2 (2015), p. 50. arXiv: 1410.0686.
- Dougal J. Sutherland, Barnabás Póczos, and Jeff Schneider. "Active learning and search on low-rank matrices." In: *Knowledge Discovery and Data Mining (KDD)*. 2013. Selected for oral presentation.
- Barnabás Póczos, Liang Xiong, Dougal J. Sutherland, and Jeff Schneider. "Nonparametric kernel estimators for image classification." In: *Computer Vision and Pattern Recognition (CVPR)*. 2012.
- Andrew Stromme, Dougal J. Sutherland, Alexander Burka, Benjamin Lipton, Nicholas Felt, Rebecca Roelofs, Daniel-Elia Feist-Alexandrov, Steve Dini, and Allen Welkie. "Managing User Requests with the Grand Unified Task System (GUTS)." In: *Large Installation System Administration (LISA)*. 2012.

### Peer-reviewed workshop and high-acceptance-rate conference contributions

- Ho Chung Leon Law\*, Dougal J. Sutherland\*, Dino Sejdinovic, and Seth Flaxman. "Bayesian Approaches to Distribution Regression." In: *Learning on Distributions, Functions, Graphs and Groups (NIPS workshop)*. 2017. Selected for oral presentation.
- Jay Jin, Kyle Miller, Dougal J. Sutherland, Simon Labov, Karl Nelson, and Artur Dubrawski. "List Mode Regression for Low Count Detection." In: *IEEE Nuclear Science Symposium (IEEE NSS/MIC)*. 2016.
- Dougal J. Sutherland\*, Junier B. Oliva\*, Barnabás Póczos, and Jeff Schneider. "Linear-time Learning on Distributions with Approximate Kernel Embeddings." In: *Feature Extraction: Modern Questions and Challenges (NIPS workshop)*. 2015.
- Yifei Ma\*, Dougal J. Sutherland\*, Roman Garnett, and Jeff Schneider. "Active Pointillistic Pattern Search." In: *Bayesian Optimization (NIPS workshop)*. 2014.

## Dissertations

- Dougal J. Sutherland. "Scalable, Flexible, and Active Learning on Distributions." Ph.D. thesis. Carnegie Mellon University, 2016.
- Dougal J. Sutherland. "Integrating Human Knowledge into a Relational Learning System." B.A. thesis. Swarthmore College, 2011.

## Technical reports

- Dougal J. Sutherland. *Fixing an error in Caponnetto and de Vito (2007)*. 2017. arXiv: 1702.02982.
- Seth Flaxman, Dougal J. Sutherland, Yu-Xiang Wang, and Yee Whye Teh. *Understanding the 2016 US Presidential Election using ecological inference and distribution regression with census microdata*. 2016. arXiv: 1611.03787.
- Junier B. Oliva\*, Dougal J. Sutherland\*, Barnabás Póczos, and Jeff Schneider. *Deep Mean Maps*. 2015. arXiv: 1511.04150.
- Dougal J. Sutherland, Liang Xiong, Barnabás Póczos, and Jeff Schneider. *Kernels on Sample Sets via Nonparametric Divergence Estimates*. 2012. arXiv: 1202.0302.
- Junier B. Oliva, Dougal J. Sutherland, and Yifei Ma. *Finding Representative Objects with Sparse Modeling*. 2012. Best poster award.
- Matthew Bodenhamer, Thomas Palmer, Dougal J. Sutherland, and Andrew H. Fagg. *Grounding Conceptual Knowledge with Spatio-Temporal Multi-Dimensional Relational Framework Trees*. 2012.

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## Invited Talks

- Dec 2017 *Efficient and principled score estimation with kernel exponential families*.  
Approximating high dimensional functions (Alan Turing Institute workshop).
- Dec 2017 *Efficient and principled score estimation with kernel exponential families*.  
Computational Statistics and Machine Learning seminar, University College London.
- Aug 2017 *Evaluating and Training Implicit Generative Models with Two-Sample Tests*.  
Implicit Models (ICML workshop).
- Apr 2017 *Two-Sample Tests, Integral Probability Metrics, and GAN Objectives*.  
The Theory of Generative Adversarial Networks (DALI workshop).
- Feb 2017 *Generative Models and Model Criticism via Optimized Maximum Mean Discrepancy*.  
Computational Statistics and Machine Learning seminar, Oxford University.

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## Teaching Experience

- Spring 2014 **Teaching Assistant**, *15-853 Algorithms in the Real World*, Carnegie Mellon University.  
Ph.D.-level course on algorithms with real-world applications. (Guy Blelloch and Anupam Gupta)
- Fall 2013 **Teaching Assistant**, *10-701 Machine Learning*, Carnegie Mellon University.  
Introductory Ph.D.-level course in machine learning. (Alex Smola and Geoff Gordon)
- Summer 2011 **Teaching Assistant and Residential Mentor**, *Summer Science Program*, ssp.org.  
Assisted rising high school seniors from around the world in an intense five-week residential program. Students determined the orbit of a near-Earth asteroid based on their own observations, as well as learning the necessary computer programming, vector calculus, and astronomy to do so.
- 2009 – 2011 **Editor-in-Chief**, *The Daily Gazette*, Swarthmore.  
Supervised staff in writing and editing news stories, as well as managing all newspaper operations.
- 2008 – 2011 **Lead Web Developer**, *The Daily Gazette*, Swarthmore.  
Led small teams in developing an award-winning newspaper site and a campus announcement site.

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## Service

- 2015 – **Program committee**, *NIPS, ICML, ICLR, AAAI*.
- 2014 – **Reviewer**, *JMLR, IEEE TSP, IEEE T-PAMI, Springer MLJ, COLT, SoCG, IJCAI, ECML-PKDD*.
- 2017 – **Session chair**, *ICML*.
- 2016 – **External seminar organizer**, *Gatsby*.
- 2013 **Immigration Course organizer**, *CMU*.
- 2015 – **Top 50 annual contributor**, *Cross Validated, stats.stackexchange.com*.
- 2017 – **Package review team**, *conda-forge.org, scientific software packaging ecosystem*.

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## Graduate Coursework

CMU	F2013	Deep Learning	B Raj	A
CMU	S2013	Optimizing Compilers for Modern Architectures	T Mowry	A
CMU	F2012	Optimization	G Gordon, R Tibshirani	A+
CMU	F2012	Intermediate Statistics	L Wasserman	A+
CMU	S2012	Graduate Algorithms	M Blum	A-
CMU	S2012	Semantics of Programming Languages	S Brookes	A
CMU	F2011	Machine Learning	E Xing	A+
CMU	F2011	Computational Models of Neural Systems	D Touretzky	A
UPenn	S2010	Software Foundations	B Pierce	A+

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## Other

- Programming** Thorough knowledge of standard Python scientific and deep learning libraries. Experienced with C/C++, Matlab, and web languages. Have extended scikit-learn, Caffe, Django, LLVM, Postgres, and others.
- Software** Standard Unix and Macintosh systems, Git, SVN,  $\LaTeX$ . System administration on Debian.
- Languages** Practical Nepali; coursework in Chinese, Arabic, ASL, and Latin.
- Citizenship** U.S.

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