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 In addition to work represented by the publications below, I have done unpublished empirical work related to learning on distributions in the analysis of financial anomalies, fusion reactor behavior, web browsing traffic, shipping behavior,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.

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.

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.

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.

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.

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+

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.

Last update: 13 February, 2018.