# Dougal J. Sutherland

## Contact Information

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## Research interests

Machine learning, particularly kernel methods and their integration with deep learning. Problems including generative models, two-sample testing, density estimation, and distribution regression and classification. Active and human-in-the-loop learning. Nonparametric statistics, statistical learning theory.

## Academic Positions and Education

2020 – **Assistant Professor**, *Computer Science Department*, University of British Columbia.
*To begin July 2020.*

2019 – 2020 **Research Assistant Professor**, *Toyota Technological Institute at Chicago*.

2016 – 2019 **Research Associate**, *Gatsby Computational Neuroscience Unit, University College London*.
Postdoctoral position with Arthur Gretton.

2011 – 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.
Included an M.S. obtained in 2015. Unofficial GPA: 3.96 / 4.

2007 – 2011 **B.A., Computer Science**, *Swarthmore College*, with high honors.
Minors in Linguistics (with high honors) and Mathematics & Statistics. GPA: 3.93 / 4.
*Thesis Title*: Integrating Human Knowledge into a Relational Learning System.

## Publications

Below, ** denotes equal contribution.

### Preprints

Feng Liu**, Wenkai Xu**, Jie Lu, Guangquan Zhang, Arthur Gretton, and Dougal J. Sutherland. "Learning Deep Kernels for Non-Parametric Two-Sample Tests." 2020. arXiv: 2002.09116.

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

Li Wenliang**, Dougal J. Sutherland**, Heiko Strathmann, and Arthur Gretton. "Learning deep kernels for exponential family densities." *International Conference on Machine Learning (ICML)*. 2019. arXiv: 1811.08357.

Michael Arbel**, Dougal J. Sutherland**, Mikołaj Bińkowski, and Arthur Gretton. "On gradient regularizers for MMD GANs." *Neural Information Processing Systems (NeurIPS)*. 2018. arXiv: 1805.11565.

Mikołaj Bińkowski**, Dougal J. Sutherland**, Michael Arbel, and Arthur Gretton. "Demystifying MMD GANs." *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." *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." *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." *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." *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." *AAAI Conference on Artificial Intelligence (AAAI)*. 2016. arXiv: 1509.07553.

Dougal J. Sutherland and Jeff Schneider. "On the Error of Random Fourier Features." *Uncertainty in Artificial Intelligence (UAI)*. 2015. arXiv: 1506.02785.

Yifei Ma**, Dougal J. Sutherland**, Roman Garnett, and Jeff Schneider. "Active Pointillistic Pattern Search." *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." *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." *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." *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)." *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." *Learning on Distributions, Functions, Graphs and Groups (NeurIPS 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." *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." *Feature Extraction: Modern Questions and Challenges (NeurIPS workshop)*. 2015.

Yifei Ma**, Dougal J. Sutherland**, Roman Garnett, and Jeff Schneider. "Active Pointillistic Pattern Search." *Bayesian Optimization (NeurIPS workshop)*. 2014.

### Technical reports

Dougal J. Sutherland. "Unbiased estimators for the variance of MMD estimators." 2019. arXiv: 1906.02104.

Michelle Ntampaka, Camille Avestruz, Steven Boada, João Caldeira, Jessi Cisewski-Kehe, Rosanne Di Stefano, Cora Dvorkin, August E. Evrard, Arya Farahi, Doug Finkbeiner, Shy Genel, Alyssa Goodman, Andy Goulding, Shirley Ho, Arthur Kosowsky, Paul La Plante, François Lanusse, Michelle Lochner, Rachel Mandelbaum, Daisuke Nagai, Jeffrey A. Newman, Brian Nord, J. E. G. Peek, Austin Peel, Barnabás Póczos, Markus Michael Rau, Aneta Siemiginowska, Dougal J. Sutherland, Hy Trac, and Benjamin Wandelt. "The Role of Machine Learning in the Next Decade of Cosmology." 2019. arXiv: 1902.10159.

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." CMU 10-725 Optimization course project. 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 2019 *Tutorial: Interpretable Comparison of Distributions and Models*.
Neural Information Processing Systems (NeurIPS). With Arthur Gretton and Wittawat Jitkrittum.

Sep 2018 *Kernel Distances for Better Deep Generative Models*.
Advances in Kernel Methods (workshop at the Gaussian Process Summer School, GPSS).

Jun 2018 *Better GANs by using the MMD*.
Facebook AI Research New York.

Jun 2018 *Efficiently Estimating Densities and Scores with Kernel Exponential Families*.
Gatsby Tri-Center Meeting.

Jun 2018 *Better GANs by using the MMD*.
Machine Learning reading group, Google New York.

Jun 2018 *Better GANs by using the MMD*.
Machine Learning reading group, Columbia University.

May 2018 *Advances in GANs based on the MMD*.
Machine Learning Seminar, University of Sheffield.

Dec 2017 *Efficient and principled score estimation with kernel exponential families*.
Approximating high dimensional functions (workshop at the Alan Turing Institute).

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 (workshop at the International Conference on Machine Learning, ICML).

Apr 2017 *Two-Sample Tests, Integral Probability Metrics, and GAN Objectives*.
Theory of Generative Adversarial Networks (workshop at Data Analysis, Learning, and Inference, DALI).

Feb 2017 *Generative Models and Model Criticism via Optimized Maximum Mean Discrepancy*.
Computational Statistics and Machine Learning seminar, Oxford University.

## Teaching Experience

**Guest lectures**.

- "Learning With Positive Definite Kernels: Theory, Algorithms, and Applications." June 2019.
  With Bharath Sriperumbudur. Data Science Summer School, École Polytechnique, Paris.
- "Generative Adversarial Networks." June 2019.
  Machine Learning Crash Course, University of Genova, Italy.
- "New Kernel Distances for Better Deep Generative Models." December 2018.
  Advanced Topics in Machine Learning, University College London.
- "What Is Machine Learning?" April 2016.
  Capstone Course, Jackson Institute for Global Affairs, Yale University.
- "What Is Machine Learning?" December 2014.
  Capstone Course, Jackson Institute for Global Affairs, Yale University.

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`.
Intense five-week program for high schoolers from around the world, who learned programming, vector calculus, and astronomy to determine an asteroid's orbit from their own observations.

2009 – 2011 **Editor-in-Chief**, *The Daily Gazette*, Swarthmore.
Supervised staff in writing and editing news stories, as well as managing all newspaper operations.

## Service

2019 **Area Chair**, *AISTATS*.

2015 – **Program committee or equivalent**, *NeurIPS, ICML, ICLR, AISTATS, AAAI*.
NeurIPS 2018: top 216 (of 3,045) reviewers. NeurIPS 2019: Top Reviewer. ICML 2018: Outstanding Reviewer. ICML 2019: Best Reviewer.

2014 – **Reviewer**, *JMLR, IEEE TSP, IEEE T-PAMI, 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`.

2018 – **Core member**, `conda-forge.org`, scientific software packaging ecosystem.

## Other

Programming Expert: Python scientific/deep learning ecosystem. Experienced: C/C++, web languages.

Languages Native English; practical Nepali; coursework in Chinese, Arabic, ASL, and Latin.

Citizenship U.S.

*Last update: 24 February, 2020.*