

Citizenship: Canada, Netherlands

CONTACT
INFORMATION

Work address:
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EDUCATION AND
ACADEMIC POSITIONS

UNIVERSITY OF BRITISH COLUMBIA
Assistant Professor
Department of Statistics

2018-Present

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Postdoctoral Associate
Computer Science and Artificial Intelligence Laboratory (CSAIL)
Institute for Data, Systems, and Society (IDSS)
Supervisor: Professor Tamara Broderick
Research Focus: automated, scalable Bayesian inference; Bayesian nonparametrics; exchangeability; streaming data

2016-2018

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Doctor of Philosophy (Ph.D.), Machine Learning and Statistics
Laboratory for Information and Decision Systems (LIDS)
Supervisor: Professor Jonathan P. How
Thesis Title: Truncated Bayesian Nonparametrics
Cumulative GPA: 5.0/5.0

2013-2016

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Master of Science (S.M.), Aeronautics and Astronautics
Laboratory for Information and Decision Systems (LIDS)
Supervisor: Professor Jonathan P. How
Thesis Title: Multiagent Planning with Bayesian Nonparametric Asymptotics
Cumulative GPA: 5.0/5.0

2011-2013

UNIVERSITY OF TORONTO
Bachelor of Applied Science (B.A.Sc.), Engineering Science, Honours with High Distinction
Major in Aerospace Engineering
Cumulative GPA: 3.93/4.0

2007-2011

PUBLICATIONS

SUBMITTED FOR REVIEW

- J. Huggins, M.Kasprzak, **T. Campbell**, T. Broderick. “Practical bounds on the error of Bayesian posterior approximations: a nonasymptotic approach.” Available at arXiv:1809.09505.
- **T. Campbell**, T. Broderick. “Automated scalable Bayesian inference via Hilbert coresets.” Available at arXiv:1710.05053.
- J. Huggins, **T. Campbell**, M. Kasprzak, T. Broderick. “Scalable Gaussian process inference with finite-data mean and variance guarantees.” Available at arXiv:1806.10234.
- R. Agrawal, **T. Campbell**, J. Huggins, T. Broderick. “Data-dependent compression of random features for large-scale kernel approximation.” Available at arXiv:1810.04249.

REFEREED PAPERS

- **T. Campbell**, T. Broderick. “Bayesian coreset construction via greedy iterative geodesic ascent.” International Conference on Machine Learning, 2018. (**long oral, 9%**)
- **T. Campbell**, D. Cai, T. Broderick. “Exchangeable trait allocations.” Electronic Journal of Statistics 12(2), 2018.
- **T. Campbell***, J. Huggins*, J. How, T. Broderick. “Truncated random measures.” Bernoulli (accepted). Available at arXiv:1603.00861.
- **T. Campbell**, B. Kulis and J. P. How. “Dynamic clustering algorithms via small-variance analysis of Markov chain mixture models.” IEEE Transactions on Pattern Analysis and Machine Intelligence (accepted). Available at arXiv:1707.08493.
- J. Straub*, **T. Campbell***, J. P. How, J. W. Fisher III. “Efficient global point cloud alignment using Bayesian nonparametric mixtures.” IEEE Conference on Computer Vision and Pattern Recognition, 2017. (**spotlight, 8% acceptance**)
- D. Cai, **T. Campbell**, T. Broderick. “Finite mixture models are typically inconsistent for the number of components.” NIPS Workshop on Advances in Approximate Bayesian Inference, 2017.
- M. Shiffman, W. Stephenson, G. Schiebinger, **T. Campbell**, J. Huggins, A. Regev, T. Broderick. “Probabilistic reconstruction of cellular differentiation trees from single-cell RNA-seq data.” NIPS Workshops on Advances in Approximate Bayesian Inference and Machine Learning in Computational Biology, 2017.

- J. Huggins, **T. Campbell**, T. Broderick. “Coresets for scalable Bayesian logistic regression.” Advances in Neural Information Processing Systems, 2016 (**22% acceptance**).
- **T. Campbell**, D. Cai, T. Broderick. “A paintbox representation of exchangeable trait allocations.” NIPS Workshop on Practical Bayesian Nonparametrics, 2016.
- D. Cai, **T. Campbell**, T. Broderick. “Paintboxes and probability functions for edge-exchangeable graphs.” NIPS Workshop on Adaptive and Scalable Nonparametric Methods in Machine Learning, 2016.
- D. Cai, **T. Campbell**, T. Broderick. “Edge-exchangeable graphs and sparsity.” Advances in Neural Information Processing Systems, 2016 (**22% acceptance**).
- **T. Campbell**, J. Straub, J. W. Fisher III, and J. P. How. “Streaming, massively parallel variational inference for Bayesian nonparametrics.” Advances in Neural Information Processing Systems, 2015 (**22% acceptance**).
- J. Straub, **T. Campbell**, J. P. How and J. W. Fisher III. “Small-variance nonparametric clustering on the hypersphere.” IEEE Conference on Computer Vision and Pattern Recognition, 2015. (**oral, 3% acceptance**)
- **T. Campbell** and J. P. How. “Bayesian nonparametric set construction for robust optimization.” American Control Conference, 2015.
- **T. Campbell** and J. P. How. “Approximate decentralized Bayesian inference.” Uncertainty in Artificial Intelligence, 2014. (**32% acceptance**)
- **T. Campbell**, M. Liu, B. Kulis, J. P. How, and L. Carin. “Dynamic clustering via asymptotics of the dependent Dirichlet process mixture.” Advances in Neural Information Processing Systems, 2013. (**25% acceptance**)
- **T. Campbell**, L. Johnson and J. P. How. “Multiagent allocation of Markov decision process tasks.” American Control Conference, 2013.
- **T. Campbell**, R. H. Klein, A. Geramifard and J. P. How. “Simultaneous clustering on representation expansion for learning multimodel MDPs.” Reinforcement Learning and Decision Making, 2013.

BOOK REVIEWS AND DISCUSSIONS

- **T. Campbell**, T. Broderick. Discussion of “Sparse graphs using exchangeable random measures.” Journal of the Royal Statistical Society B, 79:5, 1295–1366, 2017.
- **T. Campbell**, T. Broderick. Review of “Handbook of mixed membership models and their applications.” Book Reviews, Journal of the American Statistical Association, 111:516, 1840–1851, 2016.

IN THE NEWS

- MIT front page, July 2014. “Collaborative Learning – for Robots.”
Online: <http://newsoffice.mit.edu/2014/collaborative-learning-for-robots-0625>
- Popular Science, July 2014: “Collaborative Algorithm Lets Autonomous Robots Team Up and Learn From Each Other.” Online: <http://www.popsoci.com/blog-network/zero-moment/collaborative-algorithm-lets-autonomous-robots-team-and-learn-each-other>

AWARDS & TALKS

AWARDS

- 2016 SBSS Student Paper Award
- 2012 GNC Best Presentation in Session
- 2011 Natural Science and Engineering Research Council of Canada CGS-M Research Fellowship
- 2011 James D. Todd Memorial Scholarship
- 2010 Kenneth Sullivan / Pratt Whitney Canada Scholarship
- 2009 Natural Science and Engineering Research Council of Canada Undergraduate Summer Research Award
- 2008 Engineering Science Research Opportunity Program Scholarship
- 2007 Faculty of Applied Science and Engineering Admissions Scholarship

INVITED TALKS

- 2018 Allerton Conference on Communication, Control, and Computing
- 2018 Joint Statistical Meetings: Bayesian Coresets
- 2018 Boston Bayesians: Bayesian Coresets
- 2017 Banff International Research Station: Bayesian Coresets
- 2017 Conference on Bayesian Nonparametrics: Exchangeable Trait Allocations

CONTRIBUTED TALKS

- 2018 International Conference on Machine Learning: Bayesian Coresets
- 2018 International Society for Bayesian Analysis: Bayesian Coresets
- 2017 International School and Conference on Network Science: Edge-exchangeable Networks
- 2017 Computer Vision and Pattern Recognition: Global Point Cloud Alignment
- 2016 Joint Statistical Meetings: Truncated Random Measures
- 2012 AIAA Guidance, Navigation and Control: Bayesian Nonparametrics

ORGANIZING COMMITTEE

- NIPS 2016 Workshop: Practical Bayesian Nonparametrics
- NIPS 2018 Workshop: All of Bayesian Nonparametrics (Especially the Useful Bits)
- JSM 2019 Invited Session: Scaling up Bayesian inference for massive datasets

SENIOR PROGRAM COMMITTEE

- Artificial Intelligence and Statistics (AISTATS)

REVIEWER

- Neural Information Processing Systems (NIPS)
- Artificial Intelligence and Statistics (AISTATS)
- International Conference on Machine Learning (ICML)
- International Conference on Learning Representations (ICLR)
- Journal of Neurocomputing
- Journal of Aerospace Information Systems (JAIS)
- American Controls Conference (ACC)
- AIAA Conference on Guidance, Navigation and Control (GNC)
- International Conference on Intelligent Robots and Systems (IROS)
- Computational Statistics and Data Analysis (CSDA)
- Journal of Machine Learning Research (JMLR)
- NIPS 2018 Workshop for Women in Machine Learning (WiML)
- NIPS 2017 Workshop on Advances in Approximate Bayesian Inference
- NIPS 2016 Workshop on Advances in Approximate Bayesian Inference
- NIPS 2015 Workshop on Advances in Approximate Bayesian Inference
- NIPS 2015 Workshop on Bayesian Nonparametrics: The Next Generation

AWARD COMMITTEE

- 2017 SBSS Student Paper Award

 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

2011-2016

Doctoral Research

Supervisor: Professor Jonathan P. How

Research focused on statistical inference and approximations for Bayesian nonparametric models with streaming, distributed data. Major research contributions include truncated approximations for normalized and unnormalized completely random measures, approximate variational techniques for both parametric and nonparametric streaming, distributed inference, fast low-variance asymptotic Bayesian nonparametric clustering algorithms, and statistically-designed uncertainty sets for robust linear optimization.

UNIVERSITY OF TORONTO INSTITUTE FOR AEROSPACE STUDIES

Spring 2011

Undergraduate Thesis Research

Supervisor: Professor Phillippe Lavoie

Research focused on dielectric barrier discharge plasma actuators for flow control over airfoils. Created computational engine for simulating the creation, absorption and transport processes of the plasma that occurs around the actuators. Developed a new initial condition for plasma actuator simulations based on solutions of the Laplace equation on a rectangular domain, with a focus on optimizing the relaxation time of such simulations.

UNIVERSITY OF TORONTO INSTITUTE FOR AEROSPACE STUDIES

Summer 2009

Summer Research Project

Supervisor: Professor Timothy Barfoot

Research focused on the use of LiDAR intensity images for lighting-invariant vision-based localization in mobile robotics. Created a 3D odometry package for the research group using data from wheel odometry sensors and an inertial measurement unit. Ran experiments in decentralized state estimation of groups of robots, laser ranger point cloud stitching, and optimization of next viewpoint for environment mapping.

UNIVERSITY OF TORONTO DEPARTMENT OF PHYSICS

Summer 2008

Summer Research Project

Supervisor: Professor Henry van Driel

Research focused on surface plasmon polaritons on gold and silver surface gratings. Programmed a finite difference time domain computational simulation engine for Maxwell's equations in 2D environments.

TEACHING
EXPERIENCE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

- Spring 2017 – 6.882 Bayesian Modeling and Inference (6.7/7 overall rating)
- Spring 2017 – A Whirlwind Tour of ML: Bayesian Methods

UNIVERSITY OF TORONTO

- 2009-2010 – Facilitated Study Group Leader for Circuit Analysis (ECE150) and Computer Programming (CSC192)

OTHER RELEVANT
EXPERIENCE

PDT PARTNERS, LLC

Summer 2015

Summer Research Associate

Conducted quantitative market research.

HILL & SCHUMACHER PATENT & TRADEMARK AGENTS

Summers 2010-2011

Assistant Patent Agent

Supervisors: Lynn Schumacher, Ph.D. and Nancy Hill, LL.B.

Performed all aspects of patent prosecution. Under the supervision of two patent agents, met with clients to discuss their inventions, drafted full patent applications, provisionals, divisionals, continuations-in-part, and Patent Cooperation Treaty (PCT) applications for those inventions, and responded to office actions from the government. Performed these duties for Canadian, American, European, and Japanese jurisdictions.

UNIVERSITY OF TORONTO BLUE SKY SOLAR CAR RACING TEAM

2009-2010

Mechanical Systems Co-Director

Designed the suspension system and supervised the design of the braking system, roll cage, wheel rims, and steering system for the solar car.

AER201: ENGINEERING DESIGN

2009

Electrical Systems Designer

Designed and built the electrical system of a candy vending machine robot. The system contained a microprocessor, display, dispenser motors, infrared sensor circuits, and fail-safe battery backup. The system dispensed 4 types of candy and sensed when the correct number had been dispensed.