Chris J. Maddison

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Education

DPhil, Department of Statistics, University of Oxford Supervisors: Prof. Yee Whye Teh and Prof. Arnaud Doucet	expected Summer 2019
MSc, Department of Computer Science, University of Toronto Supervisor: Prof. Geoffrey Hinton FRS FRSC	conferred Nov. 2014
BSc, Hons, Department of Computer Science, University of Toronto	conferred June 2012

Industry Positions

DeepMind, Senior Research Scientist	2018–present
DeepMind, Research Scientist	2016–2018
DeepMind, Intern	2014–2015
Google, Inc., Brain Team, Intern	2014
Microsoft Research, Intern	2013

Research Positions

University of Toronto, Research Assistant with Prof. Geoffrey Hinton FRS FRSC	2011
University of California San Diego, Research Assistant with Prof. Timothy Gentner	2010
University of British Columbia, Research Assistant with Prof. Kiran Soma	2009

Awards and Honors

IJCAI Marvin Minsky Medal for Outstanding Achievements in AI (AlphaGo Team)	2018
Best Reviewer Award, Neural Information Processing Systems (NeurIPS)	2017
Cannes Lions International Festival of Creativity, Grand Prix (AlphaGo Team)	2016
Best Paper Award, Neural Information Processing Systems (NeurIPS)	2014

The Prince Phillip Silver Medal, University of Toronto	2012
Dean's List Scholar, University of Toronto	2012
Dean's List Scholar, University of Toronto	2011
University of Toronto Scholar, University of Toronto	2011
University of Toronto Scholar, University of Toronto	2010
Ron Wilson Student Achievement Award, University of Toronto	2010
The Dr. John Knowles Colling Memorial Scholarship, University of Toronto	2008

Grants and Fellowships

Open Philanthropy Project AI Fellow, University of Oxford	2018–present
Google DeepMind Scholarship, University of Oxford	2016–present
NSERC Postgraduate Scholarship – Doctoral, University of Toronto	2014–2017
NSERC Canada Graduate Scholarship – Masters, University of Toronto	2012–2013
NSERC Undergraduate Student Research Award, University of Toronto	2011
Milne Research Award, University of California San Diego	2010
NSERC Undergraduate Student Research Award, University of British Columbia	2009
Canada Millennium Scholarship Foundation's National In-course Excellence Award, University of Toronto	2009

Invited Talks

"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", Princeton University	April 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", New York University	April 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", Carnegie Mellon University	March 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", University of Toronto	March 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", EECS, Massachusetts Institute of Technology	March 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", ETH Zürich	March 2019

"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", Stanford Computer Science	Feb. 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", Gatsby Computational Neuroscience Unit, UCL	Feb. 2019
"AlphaGo, Hamiltonian descent, and the computational challenges of machine learning", Stanford Statistics	Jan. 2019
"Hamiltonian Descent Methods", University College London	Jan. 2019
"Hamiltonian Descent Methods", SIERRA, Centre de Recherche INRIA de Paris	Nov. 2018
"Hamiltonian Descent Methods", LIDS, Massachusetts Institute of Technology	Nov. 2018
"Hamiltonian Descent Methods", CSML Colloquium, Princeton University	Nov. 2018
"Hamiltonian Descent Methods", Qualcomm-UvA Seminar, Universiteit van Amsterdam	Sept. 2018
"Relaxed Gradient Estimators", Machine Learning Series, The Fields Institute, Toronto	March 2018
"Relaxations of Discrete Random Variables for Gradient Estimation", McGill University	July 2017
"Filtering Variational Objectives", Imperial College London	June 2017
"Particle Value Functions", Edinburgh Deep Learning Workshop	March 2017
"The Concrete Distribution: A Continuous Relaxation of Discrete Random Variables", NeurIPS Bayesian Deep Learning Workshop	Dec. 2016
"Concrete Relaxations for Discrete Stochastic Units", Imperial College London	Nov. 2016
"A Poisson process model for Monte Carlo", Columbia University	June 2016
"Mimicking Expert Policies in Go", University of Cambridge	March 2015
"A* Sampling", ANC Seminar, University of Edinburgh	May 2014
"A* Sampling", ML @ CUED Seminar, University of Cambridge	Feb. 2014
"A* Sampling", NeurIPS Conference Track Oral	Dec. 2014
"Annealing Between Distributions by Averaging Moments", ML @ CUED Seminar, University of Cambridge	Aug. 2013

Teaching Experience

Teaching Assistant

CSC321 - Introduction to Neural Networks, University of Toronto 2014
CSC108 - Introduction to Computer Programming, University of Toronto 2013
CSC148 - Introduction to Computer Science, University of Toronto 2012

Academic Service

Committees

University of Toronto Undergraduate Curriculum Reorg. 2010

Conference Reviewer

Neural Information Processing Systems (NeurIPS)
International Conference on Machine Learning (ICML)
International Conference on Learning Representations (ICLR)
International Conference on Artificial Intelligence and Statistics (AISTATS)
Uncertainty in Artificial Intelligence (UAI)

Professional Service

Consulting

iTechLaw White Paper on Ethics for AI 2018–2019

Outreach

Talks

"Other Minds", Oxford University Nov. 2018
"The Past and Future of Intelligence", Future of Humanity Institute April 2018
"Other Minds", DeepMind April 2018
"Harold, his purple crayon, and our work", Oxford University Feb. 2018
"A Mathematical Voyage with Harold and His Purple Crayon", Massey College Nov. 2012

Affiliations

Junior Fellow – Massey College, Toronto 2012–2015

Refereed Journal Publications

[1] D. Silver, A. Huang, C. J. Maddison, A. Guez, L. Sifre, G. van den Driessche, J. Schrittwieser, I. Antonoglou, V. Panneershelvam, M. Lanctot, S. Dieleman, D. Grewe, J. Nham, N. Kalchbrenner, I. Sutskever, T. Lillicrap, M. Leach, K. Kavukcuoglu, T. Graepel, and D. Hassabis. Mastering the game of Go with deep neural networks and tree search. *Nature*, 529(7587):484 – 489, 2016.

[2] C. J. Maddison, R. C. Anderson, N. H. Prior, M. D. Taves, and K. K. Soma. Soft song during aggressive interactions: Seasonal changes and endocrine correlates in song sparrows. *Hormones and Behavior*, 62(4):455 – 463, 2012.

[3] S. A. Heimovics, N. H. Prior, C. J. Maddison, and K. K. Soma. Rapid and Widespread Effects of 17-beta-estradiol on Intracellular Signaling in the Male Songbird Brain: A Seasonal Comparison. *Endocrinology*, 153(3):1364–1376, 2012.

Refereed Conference Publications

[1] G. Tucker, D. Lawson, S. Gu, and C. J. Maddison. Doubly Reparameterized Gradient Estimators for Monte Carlo Objectives. In *International Conference on Learning Representations*, 2019.

[2] T. Rainforth, A. R. Kosiorek, T. A. Le, C. J. Maddison, M. Igl, F. Wood, and Y. W. Teh. Tighter variational bounds are not necessarily better. In *Proceedings of the 35th International Conference on Machine Learning*, 2018.

[3] M. Garnelo, D. Rosenbaum, C. J. Maddison, T. Ramalho, D. Saxton, M. Shanahan, Y. W. Teh, D. J. Rezende, and S. Eslami. Conditional Neural Processes. In *Proceedings of the 35th International Conference on Machine Learning*, 2018.

[4] G. Tucker, A. Mnih, C. J. Maddison, D. Lawson, and J. Sohl-Dickstein. REBAR: Low-variance, unbiased gradient estimates for discrete latent variable models. In *Advances in Neural Information Processing Systems 31*, 2017.

[5] C. J. Maddison, A. Mnih, and Y. W. Teh. The Concrete Distribution: A Continuous Relaxation of Discrete Random Variables. In *International Conference on Learning Representations*, 2017.

[6] C. J. Maddison, D. Lawson, G. Tucker, N. Heess, M. Norouzi, A. Mnih, A. Doucet, and Y. W. Teh. Filtering Variational Objectives. In *Advances in Neural Information Processing Systems 31*, 2017.

[7] C. J. Maddison, A. Huang, I. Sutskever, and D. Silver. Move Evaluation in Go Using Deep Convolutional Neural Networks. In *International Conference on Learning Representations*, 2015.

[8] C. J. Maddison, D. Tarlow, and T. Minka. A* Sampling. In *Advances in Neural Information Processing Systems 27*, 2014.

[9] C. J. Maddison and D. Tarlow. Structured Generative Models of Natural Source Code. In *Proceedings of the 31st International Conference on Machine Learning*, 2014.

[10] R. Grosse, C. J. Maddison, and R. Salakhutdinov. Annealing Between Distributions by Averaging Moments. In *Advances in Neural Information Processing Systems 26*, 2013.

Refereed Workshop Publications

[1] D. Lawson, G. Tucker, C. Naesseth, C. J. Maddison, R. Adams, and Y. W. Teh. Twisted Variational Sequential Monte Carlo. In *Bayesian Deep Learning Workshop, NeurIPS*, 2018.

[2] C. J. Maddison, D. Lawson, G. Tucker, N. Heess, A. Doucet, A. Mnih, and Y. W. Teh. Particle Value Functions. In *International Conference on Learning Representations Workshop*, 2017.

Book Chapters

[1] C. J. Maddison. Current Interpretability/Explainability Techniques in AI. In C. Morgan, editor, *Responsible AI: A Global Policy Framework*. The International Technology Law Association, 2019.

[2] C. J. Maddison. A Poisson process model for Monte Carlo. In T. Hazan, G. Papandreou, and D. Tarlow, editors, *Perturbation, Optimization, and Statistics*. MIT Press, 2016.

Preprints

[1] B. O'Donoghue and C. J. Maddison. Hamiltonian descent for composite objectives. *arXiv e-prints*, page arXiv:1906.02608, June 2019, 1906.02608.

[2] E. Mathieu, C. Le Lan, C. J. Maddison, R. Tomioka, and Y. Whye Teh. Hierarchical Representations with Poincaré Variational Auto-Encoders. *arXiv e-prints*, page arXiv:1901.06033, Jan. 2019, 1901.06033.

[3] C. J. Maddison, D. Paulin, Y. Whye Teh, and A. Doucet. Dual Space Preconditioning for Gradient Descent. *arXiv e-prints*, page arXiv:1902.02257, Feb. 2019, 1902.02257.

[4] G. Lorberbom, C. J. Maddison, N. Heess, T. Hazan, and D. Tarlow. Direct Policy Gradients: Direct Optimization of Policies in Discrete Action Spaces. *arXiv e-prints*, page arXiv:1906.06062, June 2019, 1906.06062.

[5] C. J. Maddison, D. Paulin, Y. Whye Teh, B. O'Donoghue, and A. Doucet. Hamiltonian Descent Methods. *ArXiv e-prints*, Sept. 2018, 1809.05042.