

Kim Stachenfeld

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Education

- Princeton University June 2018
Ph.D. Quantitative & Computational Neuroscience
Dissertation: Learning Neural Representations that Support Efficient Reinforcement Learning ([link](#))
Advisor: Dr. Matthew Botvinick
- Princeton University January 2015
M.A. Quantitative & Computational Neuroscience
Advisors: Drs. Matthew Botvinick, Kenneth Norman
- Tufts University May 2013
B.S. Chemical & Biological Engineering
B.S. Mathematics

Positions

- 2016 – present **Research Scientist** / Neuroscience / DeepMind
- 2013 – 2018 **Ph.D. Candidate** / Quantitative & Computational Neuroscience / Princeton University
- Summer 2015 **Research Intern** / Navigation / DeepMind
- Summer 2012 **Research Assistant** / Computational Neurobiology Lab / Yale School of Medicine
- Summer 2011 **Intern** / Analytical Research & Development / Pfizer, Inc.
- 2010 – 2011 **Research Assistant** / Tissue & Metabolic Engineering Lab / Tufts University

Awards

- 2014 WiML (Women in Machine Learning) Travel Grant to attend NIPS 2014 WiML Workshop.
- 2014 Google Travel Grant to attend NIPS 2014.
- 2014 NSF Graduate Research Fellowship Program (GRFP) Honorable Mention.
- 2012 Tau Beta Pi (Engineering Honor Society).
- 2012 Meritorious Award in COMAP International Mathematical Contest in Modeling (2/2).
- 2011 Meritorious Award in COMAP International Mathematical Contest in Modeling (1/2).
- 2010 Karno Dean's Award for Academic Excellence and Leadership. Tufts University.

Press

- [A Hexagonal Theory of Memory](#). *The Atlantic* (reprint of the Quanta article). 18 January 2019.
- [The Brain Maps Out Ideas and Memories Like Spaces](#). *Quanta Magazine*. 14 January 2019.

- [The Surprising Relativism of the Brain's GPS](#). *Nautilus*. 22 March 2018.
- [The hippocampus as a 'predictive map'](#). *DeepMind Blog*. 2 October 2017.
- [DeepMind's New Way to Think About the Brain Could Improve How AI Makes Plans](#). *MIT Technology Review*. 3 October 2017.
- [The hippocampus: a predictive map?](#) *Sainsbury Wellcome Centre Blog*. 8 October 2018.
- [Recommendation for Stachenfeld et al \(2017\)](#). By Gily Ginosaur and Nachum Ulanovsky. F1000 *Prime* (paper recommendation site for researchers). November 2017.

Peer-reviewed Publications

Victor Bapst, Alvaro Sanchez-Gonzalez, Carl Doersch, [Kimberly L. Stachenfeld](#), Pushmeet Kohli, Peter W. Battaglia, Jessica B. Hamrick. (2019). **Structured Agents for Physical Construction**. In *International Conference on Machine Learning (ICML)*. [arXiv](#).

David Pfau, Stig Petersen, Ashish Agarwal, David G. T. Barrett, [Kimberly L. Stachenfeld](#). (2019). **Spectral Inference Networks: Unifying Deep and Spectral Learning**. In *International Conference on Learning Representations (ICLR)*. [article](#).

Timothy E. J. Behrens, Timothy H. Muller, James C.R. Whittington, Shirley Mark, Alon B. Baram, [Kimberly L. Stachenfeld](#), Zeb Kurth-Nelson. (2018). **What is a cognitive map? Organising knowledge for flexible behavior**. *Neuron* **100**(2): 490–509. [article](#), [preprint](#).

Jeremy Manning, Xia Zhu, Theodore L. Willke, Rajesh Ranganath, [Kimberly L. Stachenfeld](#), Uri Hasson, David M. Blei, Kenneth A. Norman. (2018). **A probabilistic approach to discovering dynamic full-brain functional connectivity patterns**. *NeuroImage* **180**(A):243–252. [article](#), [preprint](#).

[Kimberly L. Stachenfeld](#), Matthew M. Botvinick, & Samuel J. Gershman. (2017). **The hippocampus as a predictive map**. *Nature Neuroscience* **20**: 1643–165. [article](#), [preprint](#).

[Kimberly L. Stachenfeld](#), Matthew M. Botvinick, & Samuel J. Gershman. (2014). **Design principles of the hippocampal cognitive map**. In *Advances in Neural Information Processing Systems (NIPS)* **27**: 2528–2536. [paper](#). **Selected for spotlight presentation**.

Marcelo S. Caetano, Lu E. Jin, Linda Harenberg, [Kimberly L. Stachenfeld](#), Amy F.T. Arnsten, & Mark Laubach. (2012). **Noradrenergic control of error perseveration in medial prefrontal cortex**. *Frontiers in Integrative Neuroscience* **6**: 125. [article](#).

Talks

- September 2019 – Tutorial learning in Neuroscience, SfN Virtual Conference.
- June 2019 – Machine learning in Neuroscience, SfN Virtual Conference.
- April 2019 – Grid cells beyond self-location. BNA2019 Festival of Neuroscience, Dublin, Ireland.
- March 2019 – Beyond trial-based choice: decision-making in naturalistic and temporally extended environments, COSYNE Workshop, Lisbon, Portugal.
- November 2018 – Nanosymposium: 111 - Decision Making: Circuits and Computations, SfN 2018, San Diego, CA.

- November 2018 – Nanosymposium 633 - Animal Cognition and Behavior: Learning and Memory: Cortical-Hippocampal Interactions II, SfN 2018, San Diego, CA.
- October 2018 – Alergic Seminar, University of Sussex Wellcome Center, London, UK.
- September 2018 – Data Club, Sainsbury Wellcome Center, London, UK.
- August 2018 – Invited Seminar Talk, Janelia Research Campus, Ashburn, VA.
- May 2018 – London Grid Cell Meeting, Sainsbury Wellcome Center, London, UK.
- May 2018 – Symposium on Hippocampal Network and Memory Across the Lifespan: Circuit, Code, Cognition, Hungarian Academy of Sciences & Max Planck Institute for Human Development, Budapest, Hungary.
- February 2018 – Behrens Lab Retreat, Computational Neuroscience Lab @ Oxford University, UK.
- March 2018 – Hippocampal computations and interactions supporting statistical learning and decision-making, COSYNE Workshop, Breckenridge, CO.
- February 2018 – London Judgment and Decision Making Seminar, University College London, UK.
- May 2016 – EADS Computer Science Talk, University of Copenhagen, Copenhagen, DK.
- April 2016 – Invited Talk, Max Planck Centre, University College London, London, UK.
- January 2016 – PNI In-House Seminar, Princeton Neuroscience Institute, Princeton, NJ.
- June 2015 – Reinforcement Learning Decision Making (RLDM), Edmonton, AB, Canada
- March 2015 – Memory in action: The role(s) of the hippocampus in decisions for reward, COSYNE Workshop, Snowbird, UT.
- December 2014 – NIPS Spotlight presentation, Neural Information Processing Systems (NIPS), Montreal, QC.

Posters

October 2018 – Daniel McNamee, [Kimberly Stachenfeld](#), Matthew Botvinick, Samuel Gershman. **Factoring space and time in the hippocampal-entorhinal system.** 47th Meeting of the Society for Neuroscience (SfN), San Diego, CA.

October 2016 – [Kimberly L. Stachenfeld](#), Matthew M. Botvinick, Samuel J. Gershman. **The hippocampus as a predictive map.** Collaborative Research in Computational Neuroscience (CRCNS) Conference 2016, Paris, France.

October 2016 – [Kimberly L. Stachenfeld](#), Jeremy R. Manning, Xia Zhu, Jeremy M. Cohen, Rajesh Ranganath, Erez Simony, Janice Chen, Uri Hasson, Ted Willke, David M. Blei, and Kenneth A. Norman. **A probabilistic approach for exploring functional brain networks in fMRI during story-telling and at rest.** 45th Meeting of the Society for Neuroscience (SfN), Chicago, IL.

June 2015 – [Kimberly L. Stachenfeld](#), Matthew M. Botvinick, Samuel J. Gershman. **Reinforcement learning objectives constrain the cognitive map.** Reinforcement Learning Decision Making (RLDM) 2015, Edmonton, AB, Canada.

December 2014 – [Kimberly L. Stachenfeld](#), Matthew M. Botvinick, Samuel J. Gershman. **Design Principles of the Hippocampal Cognitive Map.** Neural Information Processing Systems (NIPS) 27, Montreal, QC, Canada.

November 2014 – [Kimberly L. Stachenfeld](#), Matthew M. Botvinick, Samuel J. Gershman. **Representations in Place Fields Facilitate Navigation and Reinforcement Learning.** 44th Meeting of the Society for Neuroscience (SfN), Washington, D.C.

November 2014 – Jeremy R. Manning, [Kimberly L. Stachenfeld](#), Rajesh Ranganeth, Kenneth A. Norman, David M. Blei. **Efficient Discovery of Functional Brain Networks in Large Multi-Subject fMRI Datasets**. 44th Meeting of the Society for Neuroscience (SfN), Washington, DC.

October 2013 – Michael C. Yi, Gautham V. Sridharan, Katherine K. Carson, [Kimberly L. Stachenfeld](#), Kyongbum Lee. **Targeted Metabolomics of Cofactors in Altered Liver Metabolism**. Annual American Institute of Chemical Engineering Meeting, Minneapolis, MN.

Ad hoc Reviewer

Nature Communications, Scientific Reports, eLife, PLOS Computational Biology, Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), IEEE Transactions on Neural Networks and Learning Systems

Workshops

August 2019 **Pop-up PI** / Dartmouth Methods in Neuroscience Summer ([MIND](#)) School
June 2019 **Organizer** / Generative modeling and model-based reasoning for robotics and AI / ICML Workshop
April 2019 **Session Chair** / S1 Grid cells beyond self-localization / BNA2019 Festival of Neuroscience
Nov 2018 **Nanosymposium Chair** / 111. Decision Making: Circuits and Computations / SfN
May 2018 **Session Chair** / [Grid Cells and Cognitive Maps Meeting](#) / Sainsbury-Wellcome Centre
March 2018 **Organizer** / [Model-Based Cognition](#): Hierarchical Reasoning and Sequential Planning / COSYNE Workshop
May 2015 **Organizer** / Princeton Neuroscience Department Retreat

Teaching

Spring 2015 **Teaching Assistant** / NEU259: Intro to Cognitive Neuroscience / Princeton University
Fall 2014 **Teaching Assistant** / NEU258: Fundamentals of Neuroscience / Princeton University
Fall 2014 **Instructor** / Math 135 & 37, Prison Teaching Initiative / Princeton University
Taught mathematics in New Jersey correctional facilities. [Get involved!](#)
Fall 2012 **Senior Mentor** / Chemical & Biological Engineering / Tufts University
Advised freshman group on engineering research project.
2010 – 2012 **Tutor** / Physics, Chemistry, & Calculus, Academic Resource Center / Tufts University

Beyond Science

- **Martial Arts.**
 - **1st degree blackbelt, Tae Kwon Do.** Trained 2009 – 2013 with the [Tufts Tae Kwon Do Team](#) and 2013 – 2015 with the [Princeton Tae Kwon Do Team](#). Multiple medals in sparring and forms in inter-collegiate [ECTC](#) tournaments.

- **3rd degree blackbelt, Isshinryu Karate.** Trained 1998 – 2009 at [Isshinryu Karate of Madison and Bernardsville](#) (since age 6). Multiple medals in sparring and forms in local competitions.
- **Now:** I don't have a team in London, but I like boxing classes. As a scientist, I highly recommend it for staying sane in a high-pressure industry. As a neuroscientist, I kind of recommend against because of the risk of traumatic brain injury.
- **Painting, drawing, sketching, & doodling.** Recently I got especially interested in life drawing (drawing people). I feel like I like drawing what people look like for the same reasons I like studying how people think. But then I also like studying how rats think and I don't think I would be that excited about drawing rats.
- **Running.** I ran varsity track and cross country throughout high school. Before that, I used to go on long runs with my dad, who was training for long distance triathlons. I completed my [first half-marathon](#) during middle school. I have recently gotten back into running and am training for the [Hackney Half](#) in May 2019.
- **Going outside.** I like hiking, trekking, canyoning, and skiing, particularly with friends.