

# Kim Stachenfeld

DeepMind  
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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

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## 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

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## Awards

- 2019 MIT Technology Review 35 Under 35. [Link](#).
- 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.

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## 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](#).

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## Press + Outreach

- [EmTech](#) by MIT Technology Review. 18 September 2019.
- [What is AI Anyway?](#) AI panel at Cheltenham Science Festival. 8 June 2019.
- [Mind over Matter](#). GSN Munich podcast with Ekaterina Sytnik. 22 April 2019.
- [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.

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## Talks

- September 2019 – Tutorial on “Representing states and spaces”, CCN, Berlin, Germany.
- September 2019 – Invited Talk at Magdeburg DZNE.
- August 2019 – Invited Talk at Boston University, Boston, MA.
- August 2019 – Methods in Neuroscience Dartmouth (MIND) Summer School, Hanover NH.
- June 2019 – Machine learning in Neuroscience, SfN Virtual Conference.
- May 2019 – Symposium on the Biology of Decision Making (SBDM), Oxford, UK.
- 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.

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## Posters

Jesse Geerts, [Kimberly Stachenfeld](#), Neil Burgess. **Probabilistic Successor Representations with Kalman Temporal Differences**. Computational Cognitive Neuroscience (CCN), Berlin, Germany (2019).

Jesse Geerts, Fabian Chershi, [Kimberly Stachenfeld](#), Neil Burgess. **Hippocampal and striatal localisation and navigation strategies**. HBP Neural SLAM Workshop, Paris, France (2019).

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 (2018).

Jesse Geerts, Fabian Chershi, [Kimberly Stachenfeld](#), Neil Burgess. **Modelling hippocampal and striatal contributions to reward-based navigation**. iNav Symposium, Mont Tremblant, Canada (2018).

[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 (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 (2016).

[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 (2015).

[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 (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. (2014).

Jeremy R. Manning, [Kimberly L. Stachenfeld](#), Rajesh Ranganath, 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, D.C. (2014).

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 (2013).

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## Ad hoc Reviewer

**Journals** Nature Communications, Scientific Reports, eLife, PLOS Computational Biology, Hippocampus, IEEE Transactions on Neural Networks and Learning Systems

**Conferences** ICML, NeurIPS, ICLR, UAI

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## Workshops

March 2020 **Organizer** / Structure learning: graphs, manifolds, and geometries / COSYNE Workshop  
August 2019 **Pop-up PI** / Methods in Neuroscience at Dartmouth ([MIND](#)) Summer School  
June 2019 **Organizer** / [Generative Modeling & Model-Based reasoning for Robotics and AI](#) / ICML  
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](#) / COSYNE Workshop  
May 2015 **Organizer** / Princeton Neuroscience Department Retreat

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## Teaching

August 2019    **Tutorial + Lab** / Methods in Neuroscience at Dartmouth (MIND) Summer School  
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  
In an NJ university? [Get involved!](#)  
Fall 2012      **Senior Mentor** / Chemical & Biological Engineering / Tufts University  
2010 – 2012    **Tutor** / Physics, Chemistry, & Calculus, Academic Resource Center / Tufts University

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## Beyond Science

- **Martial Arts.** Blackbelts in Tae Kwon Do (2009—15, 1<sup>st</sup> dan) & Isshinryu Karate (1998—2009, 3<sup>rd</sup> dan)
- **Painting & drawing.** Especially like life drawing.
- **Going outside.** I like running, hiking, trekking, canyoning, and skiing, particularly with friends.