

CURRICULUM VITAE

MATTHEW M. BOTVINICK, M.D., J.D., PH.D.

Updated: May 27, 2026

Current Positions:

Member of the Technical Staff, Anthropic

Leading work on AI and the rule of law

Senior Fellow, Yale Law School

Peter Gruber Rule of Law Clinic and the Information Society Project

Honorary Professor, University College London

Gatsby Computational Neuroscience Unit

Office Address:

500 Howard St.

San Francisco, CA 94105

United States

Education:

1985-89 B.A., Stanford University (With Distinction)

1989-90 M.A., Columbia University (Art History)

1990-94 M.D., Cornell University Medical College (With Honors)

1996-2001	Ph.D., Carnegie Mellon University (Psychology/Cognitive and Computational Neuroscience, specialization in deep learning)
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2023-2026 J.D., Yale Law School

Postgraduate Training, Fellowship Appointments and Clinical Practice:

1994-95 Intern in Medicine/Psychiatry, University Health Center, Pittsburgh

1996-1999 Resident in Psychiatry, University Health Center, Pittsburgh

1999-2002 NIMH Clinical Research Fellow, Department of Psychiatry,
University of Pittsburgh School of Medicine

2001-2002 Postgraduate Fellow, Center for the Neural Basis of Cognition,
Pittsburgh, Pennsylvania

2000-2002 Private Practice in General Psychiatry, Mill Valley, California

2024 Legal Fellow, Google DeepMind Legal Team, Mountain View, California

2025- ISP Resident Fellow, Yale Law School

2025- Peter Gruber Rule of Law Clinic, Yale Law School

Faculty Appointments / Positions Held:

2002-2007 Assistant professor, Department of Psychiatry, University of Pennsylvania School of Medicine

2005-2007	Assistant professor (secondary appointment), Department of Psychology, University of Pennsylvania
2002-2007	Core faculty member, University of Pennsylvania Center for Cognitive Neuroscience
2004-2007	Affiliated faculty, Institute of Neurological Sciences, University of Pennsylvania
2007-2009	Assistant professor, Department of Psychology, Princeton University
2007-2009	Assistant professor, Princeton Neuroscience Institute, Princeton University
2009-2013	Associate professor, Department of Psychology, Princeton University
2009-2013	Associate professor, Princeton Neuroscience Institute, Princeton University
2013-2016	Full Professor with Continuing Tenure, Princeton Neuroscience Institute and Department of Psychology, Princeton University
2013-2016	Associated Faculty, Programs in Cognitive Science and Linguistics, Princeton University
2015-2016	Visiting Scientist, Google DeepMind
2016-2026	Google DeepMind, Senior Director of AI Research (2018-2026), Senior Technology and Policy Advisor (2023-2026), Director of Neuroscience Research (2016-2023)
2016-	Honorary Professor, Gatsby Computational Neuroscience Unit, University College London
2019-	Affiliate Member, Sainsbury Wellcome Center for Neural Circuits and Behaviour, University College London
2025-	Resident Fellow, Information Society Project, Yale Law School
2025-	Senior Technical Fellow, Episteme
2026-	Member of the Technical Staff, Anthropic (Team Lead for AI and the Rule of Law)
2026-	Senior Fellow, Peter Gruber Rule of Law Clinic, Yale Law School

Administrative / Managerial Appointments, Board Memberships:

2012-15	Director of Graduate Admissions, Princeton Neuroscience Institute
2014-15	Executive Committee for the Princeton Program in Linguistics
2016-23	Team lead for DeepMind Natural Intelligence Team (approx. 50 members as of 2022)
2019-	Advisory Board, Cold Spring Harbor Laboratory, Program for AI and Neuroscience
2019-	Advisory Board, Janelia Research Campus, Mechanistic Cognitive Neuroscience program
2019-	Scientific Advisory Board, Carney Institute for Brain Science, Brown University
2020-23	DeepMind Research Board
2025-	Member, Board of Directors, iCivics
2025-	Advisory Board, Institute for Neural Computation, University of California, San Diego
2026-	Science Advisory Board, Polaris Labs
2026-	Scientific Advisory Board, XHomini
2026-	Senior Research Fellow, Cosmos
2026-	Member, Board of Directors, HowWeDecide

Medical Licensure: Pennsylvania, USA, 2000 (currently inactive)

Specialty Certification:

2000 National Board of Psychiatry and Neurology (Psychiatry)

Grants

2002-2007	Mentored Research Career Development Award (K01), National Institute of Mental Health. Understanding Normal and Disordered Routine Sequential Behavior. Principal Investigator
2005-2010	Conte Center Award, National Institute of Mental Health. Cognitive and Neural Mechanisms of Decision and Control. Project Co-Leader
2007-2012	R01, National Institute of Neurological Disorders and Stroke. Investigating phonological representations with multi-voxel pattern analysis. Principal Investigator

2009-2012	James S. McDonnell Foundation Collaborative Activity Award. Prospective control of action: Computational principles, neural substrates, and clinical implications. Co-Principal Investigator
2012-2015	National Institutes of Health, Research Award (R01). The intrinsic cost of cognitive control: Neural foundations and implications for decision making
2012-2015	National Science Foundation, Collaborative Research in Computational Neuroscience (CRCNS) Award. Neural Correlates of Hierarchical Reinforcement Learning.
2012-2015	John Templeton Foundation Multi-Investigator Research Award. Toward a Scientific Understanding of the Human Capacity for Cognitive Control. Project Leader.
2014-2017	IARPA, Knowledge Representation in Neural Systems (KRNS). Co-Investigator.
2014-2017	Office of Naval Research. Identifying the Neural Mechanisms allowing Compression (Chunking) of Working Memory Contents. Co-investigator.
2015-2018	National Science Foundation, Collaborative Research in Computational Neuroscience (CRCNS) Award. Representational foundations of adaptive behavior in natural and artificial agents.
2015-2020	National Institutes of Health, Research Award (R01). Anterior cingulate cortex and the expected value of control. Co-investigator.
2018-	Medical Research Council, Programme Grant, Organising knowledge for flexible behaviour in the prefrontal-hippocampal circuitry. PI: Timothy Behrens. Consultant / collaborator.
2018-2023	National Institutes of Health, Research Award (R01). Mechanisms of rapid, flexible cognitive control in human prefrontal cortex. PI: Sameer Sheth. Consultant / collaborator.
2019-	Fellow, European Laboratory for Learning and Intelligent Systems (ELLIS) Fellowship Program Natural Intelligence. PIs: Peter Dayan, Matthias Bethge, Y-Lan Boureau.
2020-	Wellcome Trust Investigator Award. PI: Steven Kennerley. Consultant / collaborator.
2021- (pending)	Champalimaud Research, inFACT Fellowship Program. Consultant / Advisory Board member.
2021-	University College London, UKRI Innovations Scholars Data Science training program (PI: Geraint Thomas). Steering committee member.
2021- (pending)	Olveczky, Bence (PI), The virtual rodent: a platform for studying artificial and biological control of natural behavior, NSF. Consultant.

2022- (pending) MIT/Harvard multi-center NSF Institutes for Natural and Artificial Intelligence.
DiCarlo (PI), Kreiman (PI)

Awards, Honors, and Memberships in Honorary Societies:

- 1993 Alpha Omega Alpha Honor Medical Society
- 1993 Coryell Prize in Medicine, Cornell Medical School
- 1995 Trustees Fellowship, Fetzer Foundation
- 1999 Organon Excellence in Psychiatry Award
- 1999 APA / Lilly Psychiatric Research Fellowship Award
- 1999 Laughlin Fellowship Award, American College of Psychiatrists
- 2002 Nominee, Cattell Dissertation Award, Carnegie Mellon University
- 2005 Emory University Future Leader in Psychiatry
- 2005 McCabe Pilot Award, University of Pennsylvania School of Medicine
- 2009 Best Paper Award, Psychonomic Society (for Botvinick, Huffstetler and McGuire, *Cognitive, Affective and Behavioral Neuroscience*, 2009)
- 2012 Distinguished Paper Award, Sociedade Portuguesa de Neurociências / Bayer HealthCare (for Ribas-Fernandes et al., *Neuron*, 2011).
- 2017 Computational Modeling Prize in Applied Cognition, Cognitive Science Society.
- 2019 Best Paper Award, Conference on Reinforcement and Decision Making (RLDM).
- 2020 Best Review of 2019, *Trends in Cognitive Science*. For Botvinick, et al., Reinforcement learning, fast and slow, *TICS*, 23, 408-422.
- 2020 Clarivate Web of Science, Highly Cited Researcher designee (renewed annually through the present)
- 2022 *Nature Communications*, Top 25 of 2021, for Higgins, et al., Unsupervised deep learning identifies semantic disentanglement in single inferotemporal neurons.
- 2023 Invited Member, Sigma Xi Society
- 2023 Fellow, Cognitive Science Society
- 2024 ScholarGPS Highly Ranked Scholar (renewed annually through the present)
- 2025 Experimental Psychology Society, Sir Frederick Bartlett Lecture Prize

Memberships in Professional and Scientific Societies:

Association for Psychological Science
Cognitive Neuroscience Society
Cognitive Science Society
Psychonomic Society
Society for Human Brain Mapping
Society for Mathematical Psychology
Society for Neuroscience
ELLIS Society

Editorial Positions:

2007-20	Consulting editor, <i>Cognitive, Affective and Behavioral Neuroscience</i>
2009-14	Editorial board, <i>Cognitive Neuroscience</i>
2012	Co-Editor, Special Issue on Neurocognitive Models of Sensemaking, <i>Computational Intelligence and Neuroscience</i>
2014-16	Editorial board, <i>Motivation Science</i>
2018	Co-Editor, Special Issue on Artificial Intelligence, <i>Current Opinion in Human Behavior</i> (October, 2019)g
2020-	Advisory board, <i>Neuron</i>

Ad hoc reviewer for: *Brain, Cognitive, Behavioral and Affective Neuroscience, Cognitive Psychology, Cognitive Science, Cognitive Neuropsychology, European Journal of Neuroscience, Journal of Abnormal Psychology, Journal of Computational Neuroscience, Journal of Experimental Psychology: General, Journal of Neurophysiology, Memory and Cognition, Neural Information Processing Systems, Nature Reviews Neuroscience, Neural Networks, NeuroImage, Neuropsychologia, PloS Computational Biology, Psychological Review, Psychological Science, Science, Trends in Cognitive Sciences, Trends in Neurosciences, Network: Computation in Neural Systems*

Grant and Program Review:

2009	Review panel member, National Science Foundation, Collaborative Research in Computational Neuroscience (CRCNS) program.
2009-	Ad-hoc reviewer, National Science Foundation
2011	NIH IBSC Review Panel, University of Colorado at Boulder.
2012	NIH (CSR) Review Panel IFCN (Integrative, Functional and Cognitive Neuroscience)
2013	NIH (CSR) Review Panel NSD-C
2013	Review panel member, National Science Foundation, Collaborative Research in Computational Neuroscience (CRCNS) program.
2014	Review panel member, National Science Foundation, Cognitive Neuroscience program.
2016-	Area Lead for Computational Neuroscience, Google Faculty Research Awards

Consulting:

2012-2014	IARPA Integrated Cognitive-Neuroscience Architectures for Understanding Sensemaking (ICArUS) Program
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- 2016- International scientific advisory board, European Commission FET-OPEN multi-investigator project: Goal-based Open-ended Autonomous Learning Robots
- 2019- Faculty advisor, BrainMind (brain-mind.org)

Teaching Responsibilities:

Co-instructor, Seminar on Attention, Psyc751-302, University of Pennsylvania, Fall 2003
 Instructor, Individual Scholarly Research, Psyc299, University of Pennsylvania, Fall 2004-2007
 Graduate student rotation supervisor, Neuroscience Department, University of Pennsylvania, Fall 2004
 Course Director, Cognitive Neuroscience, University of Pennsylvania Department of Psychiatry Residency Program, 2005-2007

Princeton University Department of Psychology and Program in Neuroscience:

Spring 2007	Neural basis of goal-directed behavior (undergraduate seminar, PSY 417)
Fall 2007	Neural basis of goal-directed behavior (graduate seminar, PSY 516)
Spring 2009	Graduate Proseminar: Cognitive Psychology (PSY 501)
Spring 2010	Graduate Core Course in Neuroscience (NEU 502)
Spring 2010	Introduction to Cognitive Neuroscience (PSY/NEU 259)
Fall 2011	Neural basis of goal-directed behavior (undergraduate seminar, PSY 417)
Spring 2012	Introduction to Cognitive Neuroscience (PSY/NEU 259)
Spring 2012	Graduate Core Course in Neuroscience (NEU 502)
Fall 2013	Junior Paper (JP) Lab: Mental Effort
Spring 2013	Graduate Core Course in Neuroscience (NEU 502)
Fall 2013	Neural basis of goal-directed behavior (undergraduate seminar, PSY/NEU 417)
Fall 2013	Grant-Writing Workshop, Princeton Neuroscience Graduate Program
Spring 2014	Introduction to Cognitive Neuroscience (PSY/NEU 259)

Contributing lecturer: Computational Models of Neocortex (CS379C), Stanford University Department of Computer Science, 2018

Coordinator: DeepMind internal training module, Topics in Neuroscience (2017-present)

Trainees

- 2005-10 Joseph McGuire (graduate student, University of Pennsylvania and Princeton University). Currently Assistant Professor, Boston University.
- 2007-10 Kachina Allen (post-doctoral fellow, Princeton University), Currently Lecturer in Psychology, Southern Cross University, New Zealand

2007-11	Francisco Pereira (post-doctoral fellow, Princeton University)
2007-10	Wouter Kool (graduate student, Leiden University, rotation. Work completed during visit resulted in Best Thesis prize from the University of Leiden, 2009)
2008-13	Jose Ribas-Fernandes (graduate student, Champalimaud Neuroscience Program), Currently Data Scientist, Régie de l'énergie du Canada
2009-14	Anna Schapiro (graduate student, Princeton University, Psychology; NSF Predoctoral Fellowship awardee, 2010). Currently Assistant Professor of Psychology, University of Pennsylvania.
2009-14	Carlos Diuk (post-doctoral fellow, Princeton Neuroscience Institute). Currently Research Scientist, Meta
2010-15	Wouter Kool (graduate student, Princeton University, Psychology). Princeton Dodds Honorific Fellowship awardee, 2013. Currently Assistant Professor, Washington University.
2010-14	Alec Solway (graduate student, Princeton University, Neuroscience). Currently Assistant Professor of Psychology, University of Maryland.
2010-11	Jordan Wolf (graduate student, Princeton University, Neuroscience; co-advisor Dr. Carlos Brody)
2011-17	Kevin Miller (graduate student, Princeton University, Neuroscience; co-advisor Dr. Carlos Brody). Princeton Dodds Honorific Fellowship awardee, 2015.
2012-16	Amitai Shenhav (C.V. Starr Post-Doctoral Fellow, Princeton Neuroscience Institute). Currently Associate Professor of Cognitive, Linguistic and Psychological Sciences, Brown University.
2012-16	Pavlos Kollias (graduate student, Princeton University, Psychology; co-advisor Dr. Jonathan Cohen)
2013-16	Jonathan Berliner (graduate student, Princeton University, Psychology; co-advisor Dr. Jordan Taylor)
2013-18	Kim Stachenfeld (graduate student, Princeton University, Neuroscience). Currently Research Scientist, DeepMind
2013-21	Luis Piloto (graduate student, Princeton University, Neuroscience) Currently Research Scientist, DeepMind
2013-16	Gecia Hermdorff (graduate student, Princeton University, Neuroscience, secondary advisor). Currently AI Resident, Google Research
2013-18	Sam Ritter (graduate student, Princeton University, Neuroscience, NSF Predoctoral Fellowship awardee, 2015). Currently Research Scientist, DeepMind
2014-16	Laura Bustamante (graduate student, Princeton University, Neuroscience, NSF Predoctoral Fellowship awardee, 2014)
2014-16	Daniel Rasmussen (post-doctoral fellow, Princeton University, Neuroscience)
2014-16	Ari Weinstein (post-doctoral fellow, Princeton University, Neuroscience). Currently Research Scientist, DeepMind.
2018-	Kevin Miller (post-doctoral fellow, University College London)
2020-	Jascha Achterberg (graduate student, Oxford University, Neuroscience). Secondary advisor.
2021-	Erwann Le Lannou (graduate student, Max Planck UCL, Neuroscience). Secondary supervisor.
2021-	Theodore Moskoviz (graduate student, Gatsby Computational Neuroscience Unit, UCL). Secondary supervisor.

Undergraduate advising

At Princeton University:

2007-8	Lauren Wang (senior thesis)
2007-8	James An (senior independent work, concentration: Computer Science)
2007-8	Undergraduate advising: Krista Ford, Elizabeth Williams, Julia Hernandez, Shelby Rudd, Daisy Wood, Susannah Aboff, Benjamin Shechet, Jonathan Schubert, William Trudell (junior papers)
2008	Amy Seymour (Summer research supervision)
2008-9	Undergraduate advising: Sheena Donahue, Christopher Thompson, Amy Seymour (junior papers); Benjamin Shechet (senior thesis); Dana Weinstein, Jeremy Caplan (independent study)
2009	Jason Kaplan, summer research supervision (Program in Quantitative and Computational Neuroscience)
2009-10	Undergraduate advising: Gary Wang (independent research); Sarah Hoffman, Erin Tochiara, Hudson Andrews (junior papers)
2010-2011	Gary Wang, summer research supervision
2010-11	Undergraduate advising: Gary Wang, Gregory Kirschen, Daniel Yawitz, Emma Varnatian (junior papers); Percy Julian (senior thesis, secondary advisor).
2011	Summer advisee, Partnership for Minority Science Education: Monchette Gonda (Stanford University)
2011-12	Undergraduate advising: Gary Wang (senior thesis); Victoria Cody, Shannon Wu, Melissa Zajdel, Bryna Tsai (junior papers); Kaitlin Stouffer, Peter Grabowski (Independent work in Computer Science). Peter Grabowski, Matthew Vengalil (Summer research)
2012-13	Undergraduate advising: Madeline Stecy (junior papers Fall and Spring; winner of Princeton Neuroscience Institute Newman/Biousse award). Cezanne Simon (Spring Junior paper). Fall Junior Paper Lab (four participants). Senior thesis: Victoria Cody, Erin Guty (co-advisor). Madeline Stecy (Summer research, PNI Newman/Biousse Award), Cezanne Simon (Summer research).
2013-14	Undergraduate advising: Nicholas Hoang (Fall and Spring junior papers); Felicia Ng (Spring junior paper); Madeline Stecy, Cezanne Simon (senior theses).
2014-15	Undergraduate advising: Lisa Kim (Independent work in Computer Science), Cynthia Steinhardt, Peter Johnson, Rachel Klebanov, Sahiba Singh (Fall junior papers), Felicia Ng (senior thesis)

Thesis Committees

2005	Per Sederberg (University of Pennsylvania, Neuroscience)
2005-8	Marieke van Vugt (University of Pennsylvania, Neuroscience)
2007	Paula Croxson (Oxford University, Experimental Psychology)
2008	Ehren Newman (Princeton University, Psychology)
2008	Agatha Lenartowicz (Princeton University, Psychology)
2008-10	Mina Cikara (Princeton University, Psychology)
2009	Susan Robinson McDuff (Princeton University, Psychology)
2009	Matthew Weber (Princeton University, Psychology)
2010-13	Sam Gershman (Princeton University, Psychology)

2011-14	Eran Eldar (Princeton University, Neuroscience)
2012	Hilary Bergsieker (Princeton University, Psychology, Oral Committee)
2012	Bingni Brunton (Princeton University, Molecular Biology, Oral Committee)
2012	Shane Blackman (Princeton University, Psychology, Reading Committee)
2012	Tyson Aflalo (Princeton University, Psychology, Reading Committee)
2013	John White (Princeton University, Psychology, Reading Committee)
2013	Stephanie Chan (Princeton University, Neuroscience, Thesis Committee Chair)
2014	Ritwik Niyogi (University College London, Gatsby Computat Neuroscience Unit)
2016	Sara Constantino (New York University, Oral Committee)
2016	Steven Hansen (Stanford University, Thesis Committee)
2017	Philipp Schwartenbeck (University of Salzburg)
2017	Joanna Aldhous (Edinburgh Napier University)
2017	Sebastiaan van Opheusden (New York University, Center for Neural Science, Thesis Committee)
2018	Dane Corniel (Ecole Polytechnique Federale de Lausanne)
2018	Pavlos Kollias (Princeton University, Neuroscience)
2019	Gecia Hermsdorff (Princeton University, Neuroscience)
2020	Andrea Banino (University College London, Neuroscience)
2021	Akshay Jagadish (Max Planck, Tuebingen)
2026	Brian Christian (Oxford University, Experimental Psychology)

Administrative committees

2007-12	Director, Program in Quantitative and Computational Neuroscience, Princeton
2007-15	Executive Committee, Princeton Neuroscience Institute and Program in Neuroscience
2007-15	Curriculum Committee, Princeton Neuroscience Institute
2008-09	Graduate Curriculum Committee, Princeton Department of Psychology
2009-10	Princeton University Committee on Examinations and Standing
2009-12	Princeton Neuroscience Institute, Graduate Admissions Committee
2010-11	<i>Ad hoc</i> Committee on Graduate Student Recruitment, Princeton Psychology Department
2012-13	Personally Identifiable Data (PID) Working Group, Princeton University

Lectures by Invitation:

5/2001	Colloquium on the Control of Cognitive Processing, Royal Netherlands Academy of Arts and Sciences, Amsterdam, Netherlands, "The control of naturalistic action: A computational model."
6/2001	Department of Psychology, University of California, Berkeley: "Routine sequential action: a recurrent neural network model."
6/2001	Department of Psychology, Stanford University: "Anterior cingulate cortex and conflict monitoring."
6/2001	Department of Cognitive and Linguistic Sciences, Brown University: "Action sequencing in everyday sequential routines."

- 1/2002 Department of Psychiatry, University of Pennsylvania: "Anterior cingulate cortex and performance monitoring."
- 1/2002 Department of Psychology, University of Wisconsin, Madison: "Routine sequential action: A recurrent neural network model."
- 1/2002 Department of Psychology, University of California, San Diego: "A connectionist approach to routine sequential action."
- 2/2002 Department of Psychology, University of California, Santa Barbara: "Routine sequential action: a computational approach."
- 2/2002 Department of Psychology, University of Maryland, College Park: "Routine sequential behavior: a computational approach."
- 2/2002 Department of Brain and Cognitive Sciences, MIT: "Doing without schema hierarchies: an emergentist approach to routine sequential behavior."
- 2/2002 Department of Psychology, Harvard University: "Conflict monitoring and cognitive control."
- 2/2002 Max-Planck-Institut Workshop on the Cognitive Neuroscience of Action, Munich, Germany: "Computational mechanisms underlying routine sequential action."
- 3/2002 Department of Psychiatry, University of California, San Francisco: "Conflict monitoring and anterior cingulate cortex."
- 3/2002 Department of Psychology, University of California, Berkeley: "The problem of serial order in behavior: a computational approach."
- 3/2002 Department of Psychology, University of Oregon, Eugene: "Routine sequential behavior: a computational approach."
- 4/2002 Department of Psychology, Yale University: "Conflict monitoring and cognitive control: computational and neuroimaging data."
- 10/2003 Cambridge University, MRC Cognition and Brain Sciences Unit: "Immediate serial recall: A neural network model."
- 10/2003 Institute for Cognitive Neuroscience, University College London: "The problem of serial order in short- and long-term memory."
- 10/2003 Modelling Prefrontal Functions workshop, International Centre for Theoretical Physics, Trieste, Italy: "Modeling the role of prefrontal cortex in sequential behavior."
- 11/2003 Society for Neuroscience Satellite Symposium on Episodic Memory, New Orleans: "Immediate serial recall: a neural network model."
- 1/2004 Treatment Research Center, University of Pennsylvania: "Conflict monitoring and anterior cingulate cortex: recent data."
- 5/2004 Center for Complex Systems, Brandeis University, Boston, "Short-term memory for serial order: a computational account."

- 11/2004 Center for Functional Neuroimaging, University of Pennsylvania: "Using multi-voxel pattern analysis to uncover cortical representations of language."
- 3/2005 Symposium on Context and Episodic Memory, University of Pennsylvania, "Short-term memory for serial order: Should it be taken 'out of context?'"
- 6/2005 Theoretical and Experimental Neuropsychology meeting, University of Quebec at Montreal, "Knowing what to do: A computational account of routine sequential action."
- 6/2005 Undergraduate Summer Workshop in Cognitive Science and Cognitive Neuroscience, Institute for Research in Cognitive Science, University of Pennsylvania, "Conflict monitoring and cognitive control."
- 9/2005 Cognitive Neuroscience Section, National Institute of Neurological Disorders and Stroke: "Routine sequential action and action slips: a computational approach."
- 10/2005 Department of Cognitive Science, Johns Hopkins University. "Short-term memory for serial order."
- 3/2006 Department of Psychology, Princeton University. "Short-term memory for serial order: Computational and empirical investigations."
- 6/2006 Undergraduate Summer Workshop in Cognitive Science and Cognitive Neuroscience, Institute for Research in Cognitive Science, University of Pennsylvania, "What happened? Recall from memory as a form of decision making."
- 11/2006 Computational Cognitive Neuroscience Conference, Houston, Texas, "Why does thinking make your head hurt?: Conflict monitoring, decision making and reward processing."
- 4/2007 Workshop on Conflicts as Signals in Cognitive Systems, Humboldt University, Berlin, Germany, "Conflict monitoring, decision making and reward processing."
- 7/2007 Deutsche Forschungsgemeinschaft Symposium: Executive Functions, Leiden, Netherlands, "Hierarchical structure in behavior and the brain: a computational perspective."
- 11/2007 Society for Neuroscience Annual Meeting, Mini-symposium on *Brain Mechanisms of Sequential Behavior*, "The Computational and Neural Basis of Working Memory for Serial Order."
- 12/2007 Columbia University Department of Psychology, "Conflict Monitoring."
- 1/2008 Center for the Neural Basis of Cognition, Pittsburgh, Pennsylvania. Distinguished Alumnus Lecture. "Conflict monitoring."

- 2/2008 Oxford University, Department of Experimental Psychology, “Computational perspectives on reward-based decision making: Beyond reinforcement learning.”
- 3/2008 Workshop on “Characterizing and Decoding Distributed Brain Representations,” Cosyne (Computational and Systems Neuroscience), “Representational similarity structure and the neural basis of decision making.”
- 3/2008 Columbia University Center for Theoretical Neuroscience, “A computational substrate for goal-directed behavior.”
- 4/2008 Gatsby Computational Neuroscience Unit, University College London. “A computational substrate for goal directed behavior.”
- 4/2008 Functional Imaging Laboratory, University College London. “Conflict monitoring and anterior cingulate cortex.”
- 6/2008 European Society for Cognitive Psychology, Summer School on Cognitive Neuroscience of Attention, Ouranopouli-Chalkidiki, Greece “Computational models of cognitive control.”
- 5/2008 Association for Psychological Science, Annual Meeting. Symposium on *The Role of Functional Neuroimaging in Advancing Psychological Science*. “Pattern analytic fMRI.”
- 7/2008 International Congress of Psychology, Berlin, Germany. “Active memory for serial order.”
- 8/2008 Workshop on *Connecting Probabilistic Models of Cognition and Neural Networks*, University of California, Berkeley. “Control of sequential action: A tale of two models.”
- 10/2008 Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany. “Prefrontal cortex and cognitive control: The whole story.”
- 10/2008 Technische Universität Berlin, Machine Learning and Intelligent Data Analysis Group. “Goal-directed decision making as structured probabilistic inference.”
- 11/2008 Columbia University Department of Psychology, “Goal-directed decision making: Toward a formal account.”
- 12/2008 Workshop on “Machine Learning and Human Learning,” Neural Information Processing Systems annual meeting. “Goal-directed decision making as structured probabilistic inference.”
- 12/2008 Institute for Empirical Research in Economics, University of Zurich. “Anterior cingulate cortex, conflict monitoring, and the law of least mental effort.”

- 12/2008 Neuroscience & Cognition workshop (Neurocog '08), Ghent University. Keynote address. "A computational substrate for goal-directed decision making."
- 4/2009 New York University, Department of Psychology (Cognition and Perception Seminar Series). "A computational substrate for goal-directed decision-making."
- 4/2009 Workshop on Reinforcement Learning, Bellairs Research Institute (McGill University), Barbados. "Neurocomputational mechanisms for goal-directed (read: model-based) decision making."
- 5/2009 Department of Neurobiology and Swartz Center, Yale University School of Medicine, Theoretical/Systems Neuroscience Seminar Series. "A computational substrate for goal-directed decision-making."
- 9/2009 Delta Center, University of Iowa.. "Hierarchically structured behavior and its neural foundations: a reinforcement learning perspective."
- 11/2009 Workshop on Intrinsic Motivation and Machine Learning. Venice, Italy. "Hierarchical structure in brain and behavior."
- 12/2009 Department of Cognitive Science, Rensselaer Polytechnic Institute. "Computational mechanisms underlying goal-directed decision making."
- 3/2010 California Insitute of Technology, "Prefrontal cortex and the evaluation of decision costs: Anatomy of a cognitive miser," and "A computational framework for goal-directed decision making."
- 6/2010 Symposium on Motivation and Executive Function, Oxford University. "Hierarchical reinforcement learning as framework for cognitive control."
- 8/2010 International Conference on Cognitive Modeling (ICCM), Philadelphia, PA, Invited symposium on Cognitive Control. "Hierarchical reinforcement learning and cognitive control."
- 8/2010 Invited Symposium, "Machine Learning: Quo Vadis," Annual meeting of the Americal Psychological Association.
- 9/2010 Cognition, Brain and Technology Summer School, Universitat Pompeu Fabra, Barcelona, Spain. "Goal-directed decision making as probabilistic inference."
- 10/2010 Department of Psychology, University of Wisconsin, Madison. "Hierarchical Reinforcement Learning."
- 11/2010 Department of Psychology, Carnegie Mellon University. "Hierarchical Reinforcement Learning."
- 1/2011 Department of Psychology, Johns Hopkins University. "Potential Neural Correlates of Hierarchical Reinforcement Learning."

- 5/2011 National Institute of Drug Abuse (NIDA), Division of Clinical Neuroscience and Behavioral Research. “Progress in Understanding Impulsivity and Control: Intertemporal Choice and the Costs of Control.”
- 6/2011 Summer Institute in Cognitive Neuroscience, University of California, Santa Barbara. “Recent Advances in Cognitive Control Research.”
- 7/2011 Summer School in Computational and Cognitive Neuroscience, Institute of Neuroscience, Shanghai, People’s Republic of China. “Computational foundations of sequential decision making.”
- 9/2011 Workshop on Neuroscience and Decision Making, Army Research Office. Evanston, IL. “Hierarchical reinforcement learning: The blessing (and burden) of temporal abstraction in learning and decision making.”
- 1/2012 Center for Cognitive Science, University at Buffalo, State University of New York. “Hierarchical reinforcement learning.”
- 3/2012 Brown University, Department of Cognitive, Linguistic, and Psychological Sciences. Cognition Seminar: “Hierarchical reinforcement learning.”
- 4/2012 Rutgers University, Department of Psychology. “Neural correlates of hierarchical reinforcement learning.”
- 5/2012 Workshop on Conflicts as Signals in Cognitive Systems, Humboldt University, Berlin, Germany, “Control costs.”
- 7/2012 University of Massachusetts, Amherst. Workshop honoring Andrew Barto. “Hierarchical reinforcement learning as a model of human behavior and brain function.”
- 10/2012 California State University, Fullerton, MARC Program (Minority Access to Research Careers). “The law of least mental effort.”
- 12/2012 Mathematical Biosciences Institute, Ohio State University, Workshop on Cognitive Neuroscience. “Some parallels between perception and action selection.”
- 3/2013 Institute of Cognitive Sciences and Technologies (ISTC-CNR), Rome, Italy. “Planning as inference.”
- 4/2013 Johns Hopkins University, Department of Psychological and Brain Sciences, “Hierarchical reinforcement learning.”
- 4/2013 University of Minnesota, Center for Cognitive Sciences, “Hierarchical reinforcement learning.”
- 5/2013 Workshop on Reinforcement Learning, Bellairs Research Institute (McGill University), Barbados. “Optimal behavioral hierarchy.”
- 5/2013 Conference on Mechanisms of Motivation, Cognition, and Aging Interactions (MOMCAI), Washington, D.C. “The intrinsic cost of cognitive control.”

- 5/2013 University of Zurich, Department of Economics, “The intrinsic cost of cognitive control.”
- 6/2013 National Science Foundation, Program for Collaborative Research in Computational Neuroscience, Annual meeting. “Hierarchical reinforcement learning.”
- 7/2013 Summer School in Computational and Cognitive Neuroscience, Institute of Neuroscience, Beijing, People’s Republic of China.
- 9/2013 University of Southern California, Neuroscience Graduate Program Distinguished Speakers Lecture Series. “Hierarchical structure in behavior and in the brain.”
- 10/2013 Rutgers University, Center for Cognitive Science. “Hierarchical reinforcement learning.”
- 11/2013 Champalimaud Neuroscience Programme (CNP), Lisbon, Portugal. “Hierarchical reinforcement learning.”
- 12/2013 Stanford University, Department of Psychology. “Hierarchical reinforcement learning.”
- 4/2014 University of Pennsylvania, Center for Cognitive Neuroscience. “Hierarchical reinforcement learning and human decision-making.”
- 5/2014 NSF workshop on Quantitative Theories of Learning, Memory and Prediction, Arlington, VA. “Representation in action.”
- 5/2014 Fourth International Symposium on the Biology of Decision-Making (SBDM), Paris. “Hierarchical reinforcement learning and human decision making.”
- 5/2014 Laboratoire de Neurosciences Cognitives, Ecole Normale Supérieure, Paris. “Adventures in state space: Neural representations at the interface of perception and action.”
- 5/2014 Department of Psychology, University of Ghent. “The cost of control.”
- 9/2014 Annual Meeting of the Society for Neuroeconomics, Invited Tutorial, “Hierarchical reinforcement learning.”
- 9/2014 Institute for the Interdisciplinary Study of Decision Making, New York University, Neuroeconomics Seminar, “Hierarchical reinforcement learning and neuroeconomics”.
- 9/2014 Department of Psychology, Cornell University, “Hierarchical reinforcement learning and human decision making.”
- 10/2014 Workshop on Computational Properties of Prefrontal Cortex, Whistler, BC. “The expected value of control.”
- 12/2014 Computing Community Consortium / NSF BRAIN Workshop, Washington, D.C. “Finding structure in behavior.”

- 12/2014 Department of Cognitive Science, Indiana University. “Hierarchical reinforcement learning and human decision making.”
- 1/2015 Department of Psychology, Applied Cognitive and Brain Sciences (ACBS) program, Department of Psychology, Drexel University. “Hierarchical reinforcement learning and human behavior.”
- 2/2015 Purdue University, Department of Psychological Sciences, “Hierarchical reinforcement learning and human behavior.”
- 3/2015 Department of Psychology, Ohio State University. “The intrinsic cost of self-control.”
- 4/2015 Center for Cognitive Neuroscience, Duke University. “Hierarchical reinforcement learning and human behavior.”
- 4/2015 Cognitive Science Department, University of Delaware, “The intrinsic cost of cognitive control.”
- 6/2015 Ernst Strungmann Forum on Computational Psychiatry, Frankfurt.
- 7/2015 Dresden Symposium 2015 "Regulation, Modulation, and Optimization of Cognitive Control", Technische Universitaat Dresden.
- 9/2015 University of Hertfordshire, Workshop on Information and Decision Making. “Optimal behavioral hierarchy”
- 10/2015 Bernstein Center for Computational Neuroscience, Berlin. “Hierarchical reinforcement learning and human decision making.”
- 10/2015 Yale University, Department of Psychology, “Hierarchical reinforcement learning and human behavior.”
- 7/2016 Gatsby Computational Neuroscience Unit, University College London. “Deep learning to learn.”
- 7/2016 Functional Imaging Laboratory, University College London. “A grey area between model-free and model-based reinforcement learning.”
- 3/2017 College de France, Paris, “Meta-reinforcement learning: A new paradigm for reward-driven learning in the brain.”
- 3/2017 University of Bristol, School of Experimental Psychology. “Deep neural systems that learn how to learn.”
- 4/2017 University of Warwick, Department of Psychology, “Meta-reinforcement learning: a bridge between prefrontal and dopaminergic function.”
- 4/2017 Gatsby-Kaken Joint Workshop on AI and Neuroscience, Gatsby Computational Neuroscience Unit, University College London
- 6/2017 Invited tutorial, Reinforcement Learning and Decision Making (RLDM), Ann Arbor, Michigan.
- 6/2017 Keynote Address, Annual Principal Investigators’ Meeting, National Science Foundation Program in Collaborative Research in Computational

- Neuroscience (CRCNS), “Deep reinforcement learning: Recent developments in AI and implications for neuroscience.”
- 7/2017 Summer School in Computational and Cognitive Neuroscience, Institute of Neuroscience, Shanghai, People’s Republic of China
- 7/2017 NYU Neuroeconomics Summer School, Shanghai, People’s Republic of China
- 7/2017 Symposium on Artificial Intelligence and Brain Science, Japanese Neuroscience Society, annual meeting, Makuhari, Japan
- 7/2017 Workshop on Deep Learning in Computational Cognitive Science, Annual Meeting of the Cognitive Science Society, London, UK
- 7/2017 Invited Symposium on the Computational Basis of Cognition, Annual Meeting of the Cognitive Science Society, London, UK
- 9/2017 Workshop on Memory and Imagination in Humans and Machines, Jesus College, Cambridge University. “Memory and imagination in AI: Basic mechanisms”
- 11/2017 Symposium on Neural Implementation of Learning Models, Ecole Polytechnique federale, Lausanne, Switzerland. “Meta-reinforcement learning”
- 11/2017 Neurotheory Group, Oxford University
- 12/2017 Hierarchical Reinforcement Learning Workshop, NIPS, Long Beach, CA
- 12/2017 Workshop on Cognitively Informed Artificial Intelligence: Insights from Natural Intelligence, NIPS, Long Beach, CA
- 12/2017 British Neuroscience Society, Christmas Symposium, London
- 3/2018 Canonical Computation in Brains and Machines, New York University
- 3/2018 Cambridge Neuroscience Seminar, Cambridge University, closing plenary lecture
- 4/2018 Weinberg Institute for Cognitive Science, University of Michigan, Symposium on “The Shared Frontiers of Artificial Intelligence and Cognitive Science,” keynote address
- 4/2018 Princeton Institute for Advanced Study, Workshop on the Language of Thought. “Nature versus Nurture in AI”
- 5/2018 Department of Psychology, Harvard University, “Prefrontal cortex as a meta-reinforcement learning system”
- 6/2018 University College London, Annual Neuroscience Symposium
- 6/2018 Institut du Cerveau et de la Moelle Epinière, Paris
- 6/2018 Lindau Nobel Laureate Meeting, Tenth Innovation Forum, Lindau, Germany
- 7/2018 Cognitive Science Society, annual meeting, Madison, Wisconsin. Keynote address

10/2018	Stanford Neurosciences Institute, Fifth Annual Symposium
10/2018	Champalimaud Research Symposium, Lisbon
10/2018	Instituto Superior Técnico (IST), Lisbon
10/2018	Workshop on Computational Properties of Prefrontal Cortex, Nashville
12/2018	Workshop on Mechanistic Cognitive Neuroscience, Janelia Research Campus, Howard Hughes Medical Institute
2/2019	Center for Information and Neural Networks, Fifth Annual CiNet Conference, Osaka, Japan.
4/2019	Sainsbury Wellcome Centre for Circuits and Behavior, Workshop on Predictive Processing in the Brain.
5/2019	MRC-CBU, University of Cambridge, 'Chaucer Club' Cognitive Neuroscience Seminar
5/2019	Columbia University, Program for Economic Research, Workshop on Efficient Coding and Resource-Limited Cognition.
5/2019	BrainMind Summit, MIT
5/2019	Brown University, Workshop on Control Processes.
5/2019	Workshop on Structure and Priors in Reinforcement Learning (SPiRL), International Conference on Learning and Representation, New Orleans.
5/2019	Cold Spring Harbor Laboratories, Research seminar.
6/2019	Gatsby Computational Neuroscience Unit, UCL. Tri-Center Meeting (with Columbia University Center for Theoretical Neuroscience and Safra Center for Brain Sciences, Hebrew University)
7/2019	2019 Computational Psychiatry Course, New York City, keynote address.
7/2019	MIT, Workshop on the Visual Brain, Keynote address.
8/2019	UK-Korea Neuroscience Symposium, London, plenary address
8/2019	Laboratory for Social and Neural Systems Research, University of Zurich
9/2019	Ascona Meeting on Neural Circuits, Ascona, Switzerland
9/2019	Bernstein Center for Computational Neuroscience, Berlin, Bernstein Conference
2019	Columbia University, Neurotheory Group
11/2019	Carnegie Mellon University, Center for the Neural Basis of Cognition.
11/2019	University of Geneva, Departmental Seminar, Department of Basic Neuroscience.
12/2019	University of Zurich, Department of Economics
2/2020	Cosyne (Computational and Systems Neuroscience) Meeting, Breckenridge, Colorado, Gatsby Lecture.

3/2020	University of Pennsylvania, Department of Psychology. Annual Pinkel Endowed Lecture
4/2020	University of Washington Computational Neuroscience Center (Postponed due to COVID-19).
5/2020	IEEE International Conference on Robotics and Automation (ICRA), workshop on Neuroscience and AI (keynote).
6/2020	Society for Stereotactic and Functional Neurosurgery, Annual Meeting.
7/2020	Computational Neuroscience Meeting, CNS2020 (keynote).
7/2020	Workshop on Cognitive Effort, Annual Meeting of the Cognitive Science Society, Toronto.
7/2020	Workshop on the Origins of Common Sense in Animals and Machines, Annual Meeting of the Cognitive Science Society, Toronto.
10/2020	International Symposium on Artificial Intelligence and Brain Science, Tokyo
10/2020	Stanford Human Centered AI Spring Symposium
11/2020	Utrecht University, Working Group on Human-Centered AI, Kickoff meeting. Keynote address.
12/2020	Workshop on Deep Reinforcement Learning, Neural Information Processing Systems (NeurIPS) annual meeting.
3/2021	Institute of Neuroinformatics UZH/ETH Zurich
4/2021	Nature Research online symposium, 'At the Interface of Brain and Machine'
5/2021	Max-Planck Institute for Biological Cybernetics, Tübingen
5/2021	Brain Science Seminar, RIKEN Center for Brain Science, Japan
5/2021	University of California, Berkeley, Helen Wills Neuroscience Institute, Neuroscience Seminar.
6/2021	University of California, San Diego, Neuroscience Graduate Program seminar.
6/2021	Virtual Dopamine Meeting (ViDA) Conference, Keynote.
6/2021	ELLIS Program in Semantic, Symbolic and Interpretable Machine Learning, Keynote.
6/2021	Virtual International Symposium on Cognitive Architecture (VISCA)
7/2021	RL4RealLife Workshop, <i>ICML</i> .
8/2021	Massey Lecture, Brain, Minds and Machines (BMM) and Methods in Computational Neuroscience (MCN) courses, Marine Biological Laboratory, Woods Hole, MA.
10/2021	Plenary Lecture, Online & Onsite Advanced Course & Symposium on Artificial Intelligence & Neuroscience (ACAIN) 2021, Grasmere, U.K.

2022	Interdisciplinary Workshop on Computational Developmental Science. Banff International Research Station.
1/2022	Institute of Cognitive Science of the Osnabrück University
4/2022	Neuroscience for Artificially Intelligent Systems (NAISys), Cold Spring Harbor Laboratory, New York
6/2022	Columbia University, Center for Theoretical Neuroscience
6/2022	University of California Los Angeles, Department of Neurology Grand Rounds
7/2022	International Symposium on Artificial Intelligence and Brain Science, Okinawa Institute of Science and Technology, Japan
10/2022	ECCV Workshop on Computer Perception
12/2022	Simons Foundation, Presidential Lecture
2022/3	Workshop on Artificial Consciousness, Future of Humanity Institute, University of Oxford
2/2023	Department of Psychological and Brain Sciences, Johns Hopkins University
4/2023	NIH Neuroscience Seminar Series
4/2023	Baylor College of Medicine, McNair Scholars Symposium, Keynote
5/2024	Lorna Casselton Memorial Lecture, Oxford University
12/2024	Stanford University, Deliberative Democracy Lab
1/2025	Kempner Institute for the Study of Natural and Artificial Intelligence, Harvard University
9/2025	Fourth Annual Symposium on Cyber & International Law, Washington College of Law, American University.
1/2025	University College London, Experimental Psychology Society Sir Frederick Bartlett Lecture
2/2025	Oxford Institute of Technology and Justice, Workshop on International Law and Emerging Technologies.

Organizing Roles in Scientific and Other Meetings:

2007	Program Committee, International Conference on Cognitive Modeling
2007	Co-Chair, Minisymposium on “Hierarchical structure in behavior: Computational and empirical perspectives,” Neural Information Processing Systems (NIPS), Whistler, British Columbia, Canada.
2008	Organizer for Invited Symposium, “The Role of Medial frontal Cortex in Cognition and Behavior,” International Congress of Psychology, Berlin, Germany.

- 2009 Symposium organizer, “Goal-Directed Decision Making: Behavior, Neuroscience, Computation.” Princeton University.
- 2012 Symposium co-chair: “Understanding events: New cross-disciplinary research.” Cognitive Neuroscience Society Annual Meeting, Chicago.
- 2013 Planning Committee: NIH-funded Symposium “Mechanisms of Motivation, Cognition, and Aging Interactions,” Washington, D.C.
- 2013-14 Program Committee, Multidisciplinary Conference on Reinforcement Learning and Decision Making.
- 2017 Program Committee, Multidisciplinary Conference on Reinforcement Learning and Decision Making.
- 2017 Organizer, Tutorial: Recent Advances in Deep Learning, Annual Meeting of the Cognitive Science Society, London, UK.
- 2018 Co-organizer, Symposium, “Towards an AI architecture inspired by neuroscience,” Neural Information Processing Systems. *NeurIPS*.
- 2019 Co-organizer, Nano-symposium on “Representation learning for exploration and generalization in RL,” Society for Neuroscience, Annual Meeting.
- 2019 Programme Committee, Cambridge Neuroscience Symposium, Cambridge University.
- 2019 Co-organizer, DeepMind / UCL joint workshop on neuroscience and artificial intelligence, London
- 2019- Fellow, ELLIS Program in Natural Intelligence
- 2020-21 Program committee, Bernstein Center Conference on Computational Neuroscience
- 2022 Program committee, Multi-disciplinary Conference on Reinforcement Learning and Decision Making
- 2023 Organizing Committee, Boehringer Ingelheim Fonds Workshop on Neuroscience and AI.
- 2026-7 Steering Committee, Civic Learning Week National Forum

Publications:

Citation count (Google Scholar): 98,918
h-index: 108

Books:

Botvinick, M. (2026). *AI and Political Freedom*. Princeton University Press.

Research Publications, peer reviewed (150):

Botvinick, M. M. (1992). The painting as pilgrimage: Traces of a subtext in the work of Campin and his contemporaries. *Art History*, 15, 1-18.

Botvinick, M. & Cohen, J. D. (1998). Rubber hand ‘feels’ what eyes see. *Nature*, 391, 756.

Carter, C. S., Braver, T. S., Barch, D. M., Botvinick, M. M., Noll, D., & Cohen, J. D. (1998) Anterior cingulate cortex, error detection, and the online monitoring of performance. *Science*, 280, 747-749.

Botvinick, M., Nystrom, L., Fissell, K., Carter, C. & Cohen, J. (1999). Conflict monitoring vs. selection-for-action in anterior cingulate cortex. *Nature*, 402, 179-181.

Carter, S. C., Botvinick, M. M., & Cohen, J. D. (1999). The contribution of the anterior cingulate cortex to executive processes in cognition. *Reviews in the Neurosciences*, 10, 49-57.

Carter C. S., MacDonald A. M., Botvinick, M., Ross, L. L., Stenger, A., Noll, D., & Cohen, J. D. (2000). Parsing executive processes: strategic versus evaluative functions of the anterior cingulate cortex. *Proceedings of the National Academy of Sciences*, 97, 1944-1948.

Botvinick, M., Braver, T., Barch, D. Carter, C. & Cohen, J. (2001). Conflict monitoring and cognitive control. *Psychological Review*, 108 (3), 624-652

Van Veen, V., Cohen, J. D., Botvinick, M. M., Stenger, V. A. & Carter, C. S. (2001). Anterior cingulate cortex, conflict monitoring, and levels of processing. *NeuroImage*, 14, 1302-1308.

Botvinick, M. & Plaut, D. C. (2002). Representing task context: proposals based on a connectionist model of action. *Psychological Research*, 66, 298-311.

Graziano, M., Cohen, J.D. & Botvinick, M. (2002). How the brain represents the body. *Attention and Performance XIX: Common Mechanisms in Perception and Action*. Prinz, W. and Hommel, B. (Eds.). Oxford, UK: Oxford University Press. 136-157

Botvinick, M., Cohen, J. D. & Carter, C. S. (2004). Conflict monitoring and anterior cingulate cortex: An update. *Trends in Cognitive Sciences*, 8, 539-546.

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- Botvinick, M. (2005). Effects of domain-specific knowledge on memory for serial order. *Cognition*, 97, 135-151.
- Botvinick, M. & Bylsma, L. M. (2005). Distraction and action slips in an everyday task: Evidence for a dynamic representation of task context. *Psychonomic Bulletin and Review*, 12, 1011-1017.
- Botvinick, M. & Bylsma, L. M. (2005). Regularization in short-term memory for serial order. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 31, 351-358.
- Botvinick, M., Jha, A. P., Bylsma, L. M., Fabian, S. A., Solomon, P. E. & Prkachin, K. M. (2005). Viewing facial expressions of pain engages cortical areas involved in the direct experience of pain. *NeuroImage*, 25, 312-319.
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- Botvinick, M. & Plaut, D. C. (2006). Short-term memory for serial order: A recurrent neural network model. *Psychological Review*, 113, 201-233.
- Thompson-Schill, S. L. & Botvinick, M. M. (2006). Resolving conflict: A response to Martin and Cheng (2006). *Psychonomic Bulletin and Review*, 13, 402-408.
- Botvinick, M. & Plaut, D. C. (2006). Such stuff as habits are made on: A reply to Cooper and Shallice (2006), *Psychological Review*, 113, 917-928. [Postscript: The way forward, 928.]
- Botvinick, M. (2007). Conflict monitoring and decision making: Reconciling two perspectives on anterior cingulate function. *Cognitive, Affective and Behavioral Neuroscience*, 7, 356-366. NIHMSID:344234.
- Botvinick, M. (2007). Multilevel structure in behavior and in the brain: a computational model of Fuster's hierarchy. *Philosophical Transactions of the Royal Society, Series B: Biological Sciences*, 362, 1615-1626.

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- Botvinick, M. M. (2008). Hierarchical models of behavior and prefrontal function. *Trends in Cognitive Sciences*, 12, 201-208. (NIHMS237047)
- Botvinick, M. M., An, J. (2008). Goal-directed decision making in prefrontal cortex: a computational framework. In: Koller, D., Bengio, Y., Y., Schuurmans, D., Boutou, L., & Culotta, A. (Eds.) *Advances in Neural Information Processing Systems (NIPS)*, Vol 21, 169-176.
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- Cole, M. W., Yeung, N., Freiwald, W. & Botvinick, M. (2010). Conflict over anterior cingulate cortex: Between-species differences in cingulate may support enhanced cognitive flexibility in humans. *Brain, Behavior and Evolution*, 75, 239-240.
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Abstracts and Conference Presentations (partial listing)* :

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- Cowan, E., Wang, J., Houk, J. & Botvinick, M. (2009). An analysis of serial recall in a macaque. *Society for Neuroscience*, Annual Meeting.
- Fernandes, J., McGuire, J., Niv, Y. & Botvinick, M. (2009). Neural correlates of hierarchical reinforcement learning: an fMRI study. *Society for Neuroscience*, Annual Meeting.
- Cikara, M., Botvinick, M. & Fiske, S. (2009). Red Sox v. Yankees: fMRI investigation of pain and pleasure responses to a rival group's outcomes. *Social and Affective Neuroscience Society*, Annual Meeting.
- McGuire, J. & Botvinick, M. (2009). Intrinsically aversive characteristics of controlled cognition correlate with BOLD signal in left inferior frontal gyrus. Organization for Human Brain Mapping.
- McGuire, J. & Botvinick, M. (2009). Cortical responses during interference from competing task sets. *Society for Neuroscience*, Annual Meeting.
- McGuire, J. & Botvinick, M. (2010). Perceptual ambiguity drives subjective decision costs: a test of neural mediation. *Society for Cognitive Neuroscience*, Annual Meeting.
- Schapiro, A., Rogers, T. & Botvinick, M. (2010). Beyond uncertainty: Behavioral and computational investigations of the structure of event representations. *Cognitive Science Society*, Annual Meeting.
- Pereira, F., Botvinick, M. & Detre, G. (2010). Learning semantic features for fMRI data from definitional text. NAACL-HLT (Association for Computational Linguistics Annual Meeting, Los Angeles, CA).
- Botvinick, M. M., Niv, Y., Diuk, C., Fernandes, J., & Barto, A. G. (2010). Hierarchical reinforcement learning. *Society for Neuroscience*, Annual Meeting. Contribution to a 'nanosymposium' entitled "Learning the Values of Actions."
- Diuk, C., Botvinick, M., Barto, A. & Niv, Y. (2010). Hierarchical Reinforcement Learning: An fMRI Study of learning in a two-level gambling task. *Society for Neuroscience*, Annual Meeting.
- Pereira, F., Detre, G., & Botvinick, M. (2010). Generating definitional text from single concept brain activation. *New York Academy of Sciences*, Annual Workshop on Machine Learning.
- Kool, W., Getz, S. & Botvinick, M. (2011). Neural correlates of the illusion of control. *Society for Neuroscience*, Annual Meeting.
- Diuk, C., Botvinick, M. & Niv, Y. (2011). Ventral striatum signals prediction errors at multiple levels of task structure. *Society for Neuroscience*, Annual Meeting.

- Diuk, C., Ribas-Fernandes, J., Córdova, N., Botvinick, M. & Niv, Y. (2011). Hierarchical behavior and the brain: a reinforcement learning perspective. *Cosyne (Computational and Systems Neuroscience)*, Annual Meeting.
- Todd, M., Botvinick, M., Schwemmer, M., Cohen, J. & Dayan, P. (2011). Optimal task switching. *Society for Neuroscience*, Annual Meeting.
- Botvinick, M., Schapiro, A., Cordova, N., Turk-Browne, Rogers, T. T. (2012). Events as categories. *Society for Cognitive Neuroscience*, Annual Meeting.
- Botvinick, M., Schapiro, A., Cordova, N., Turk-Browne, Rogers, T. T. (2012). Neural event representations arising from temporal ‘community’ structure. *Neural Computation and Psychology Workshop*, San Sebastian, Spain.
- Diuk, C., Botvinick, M. & Niv, Y. (2012). An fMRI study of learning in a two-level gambling task: simultaneous reward prediction errors in human ventral striatum. *Society for Neuroeconomics*, Annual Meeting.
- Diuk, C., Yee, D., Ribas-Fernandes, J., Cordova, N., Schapiro, A., Niv, Y. & Botvinick, M. (2012). Divide and conquer: task decomposition in humans. *Society for Neuroscience*, Annual Meeting.
- Kool, W. & Botvinick, M. M. (2012). A role for effort costs in self-control and inter-temporal choice. *Society for Neuroscience*, Annual Meeting.
- Ribas-Fernandes, J. & Botvinick, M. M. (2012). Unsigned prediction errors in anterior cingulate cortex during performance of a hierarchical task. *Society for Neuroscience*, Annual Meeting.
- Berliner, J. S., Taylor, J. A. & Botvinick, M. M. (2013). Assessing structure learning in motor tasks. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*.
- Botvinick, M. (2013). Discovering hierarchical task structure. *Cognitive Science Society*, Annual Meeting, Symposium on Structured cognitive representations and complex inference in neural systems.
- Botvinick, M. (2013). Optimal behavioral hierarchy. *Robotics Science and Systems*, Workshop on Hierarchical and Structured Learning for Robotics.
- Kool, W., & Botvinick, M. M. (2013). The intrinsic cost of cognitive control. *Society for Psychophysiological Research (SPR)*, Annual Meeting.
- Miller, K., Ehrlich, J. Kopek, C., Botvinick, M. & Brody, C. (2013). A seven parameter mixture model that describes steady-state rodent behavior on a two-armed bandit task nearly as well as it can be described; Applications to orbitofrontal cortex

inactivations. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*.

- Pereira, F. & Botvinick, M. (2013). Simitar: simplified searching of statistically significant similarity structure. *Third International Workshop on Pattern Recognition in NeuroImaging*.
- Shenhav, A., Straccia, M. A., Botvinick, M. M. & Cohen, J. D. (2013). Conflict and value comparator accounts can account for anterior cingulate engagement in a “foraging” context. *Society for Neuroeconomics*, Annual meeting.
- Solway, A., Diuk, C., Cordova, N., Yee, D., Barto, Niv, Y. & Botvinick, M. (2013). Optimal task decomposition. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*.
- Miller, K., Ehrlich, J., Kopec C., Botvinick, M. & Brody, C. (2013). A multi-step decision task in rats to distinguish model-based from model-free reinforcement learning. *Society for Neuroscience*, Annual meeting.
- Miller, K., Ehrlich, J. Kopek, C., Botvinick, M. & Brody, C. (2013). A seven parameter mixture model that describes steady-state rodent behavior on a two-armed bandit task nearly as well as it can be described. *Cosyne: Computational and Systems Neuroscience*. Workshop on Information Sampling and Behavior Optimization.
- Miller, K., Ehrlich, J. Kopek, C., Botvinick, M. & Brody, C. (2014). A multi-step decision task elicits planning behavior in rats. *Cosyne: Computational and Systems Neuroscience*.
- Schapiro, A. C., Turk-Browne, N. B., & Botvinick, M. M. (2014). Learning of complex event structure in the hippocampus. *Annual Symposium on Context and Episodic Memory*.
- Botvinick, M. M., Diuk, C., Yee, D., Cheong, J., Weinstein, A., Niv, Y. & Barto, A. (2014). A general form for state-space representations in frontal and temporal cortex. *Society for Neuroscience*, Annual meeting.
- Horga, G., Mian, M. K., Patel, S. R., Eskandar, E. N., Botvinick, M. M. & Sheth, S. A. (2014). Distinct representation of conflict, response, and feedback selectivity by individual neurons in human dorsal anterior cingulate cortex. *Society for Neuroscience*, Annual meeting.
- Schapiro, A. C., Norman, K. A., Turk-Browne, N. B., & Botvinick, M. M. (2014). Rapid learning of complex temporal regularities in the hippocampus: fMRI and neural network modeling investigations. *Society for Neuroscience*, Annual meeting.

- Shenhav, A., Straccia, M. A., Cohen, J. D., & Botvinick, M. M. (2014) Neural Correlates of Sensory Integration in a Value-Based Decision-Making Task, *Society for Neuroeconomics*, Annual Meeting.
- Stachenfeld, K., Gershman, S. & Botvinick, M. (2014). Predictive representations in place fields facilitate navigation and reinforcement learning. *Society for Neuroscience*, Annual meeting.
- Vassena, E., Botvinick, M., Fias, W., & Verguts, T. (2014). Choosing to make an effort and preparing to overcome it: the role of anterior cingulate cortex. *Society for Neuroeconomics*, Annual meeting.
- Ritter, S., Long, C., Paperno, D., Baroni, M., Botvinick, M. & Goldberg, A. (2014). Leveraging Preposition Ambiguity to Assess Representation of Semantic Interaction in CDSM. *Neural Information Processing Systems (NIPS)*, Workshop on Learning and Semantics.
- Miller, K., Botvinick, M. & Brody, C. (2015). Neural mechanisms of cognitive planning in the rat. *Computational and Systems Neuroscience (Cosyne)*.
- Miller, K., Botvinick, M. & Brody, C. (2015). The role of hippocampus in cognitive planning task the rat. *Computational and Systems Neuroscience (Cosyne)*, *Workshop on Hippocampus and Decision Making*.
- Miller, K., Botvinick, M. & Brody, C. (2015). The Role of Orbitofrontal Cortex in Cognitive Planning in the Rat. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*. [Selected for oral presentation. Best Student Paper Award.]
- Stachenfeld, K., Gershman, S. & Botvinick, M. (2015). Reinforcement learning objectives constrain the cognitive map. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*. [Selected for oral presentation]
- Berliner, J. & Botvinick, M. (2015). Reward-based decision making with an infinite choice set. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*.
- Mommenejad, I., Cheong, J., Gershman, S. & Botvinick, M. (2015). The successor representation in human reinforcement learning: evidence from retrospective revaluation. *Multidisciplinary Conference on Reinforcement Learning and Decision Making*.
- Butcher, P. A., Straccia, M. A., Cohen, J. D., Botvinick, M. M., & Shenhav, A. (2015) Reach trajectories as another index of preferences in dietary choice. *Society for Neuroeconomics*, Annual meeting.

- Ritter, S., Long, C., Paperno, D., Baroni, M., Botvinick, M. & Goldberg, A. (2015). Leveraging Preposition Ambiguity to Assess Compositional Distributional Models of Semantics. *Fourth Joint Conference On Lexical And Computational Semantics (*SEM 2015)*
- Kool, W. & Botvinick, M. (2015). Dopaminergic genes predict the cost of cognitive control and reliance on habit. *Society for Neuroeconomics*, Annual meeting.
- Musslick, S., Shenhav, A., Botvinick, M. M., & Cohen, J. D. (2015). A computational model of control allocation based on the Expected Value of Control. *Second Multidisciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*.
- Miller, K., Botvinick, M. & Brody, C. (2016). The role of orbitofrontal cortex in model-based planning in the rat. *Cosyne*.
- Schapiro, A. C., Turk-Browne N. T. B., Botvinick, M. M., Norman, K. A. (2016). Complementary learning systems within the hippocampus. Workshop on Contemporary Neural Network Models, Philadelphia.
- Schapiro, A. C., Turk-Browne N. T. B., Botvinick, M. M., Norman, K. A. (submitted). Complementary learning systems within the hippocampus: A neural network modeling approach to reconciling episodic memory with statistical learning. *Society for Neuroscience, Annual Meeting*.
- Santoro, A., Bartunov, S., Botvinick, M., Wierstra, D., & Lillicrap, T. (2017). Meta-learning with memory-augmented neural networks. *Neural Information Processing Systems (NeurIPS), Workshop on Deep Learning*.
- Miller, K., Botvinick, M. & Brody, C. (2016). The role of orbitofrontal cortex in model-based planning in the rat. *Society for Neuroscience*, annual meeting.
- Miller, K., Botvinick, M. & Brody, C. (2017). The role of orbitofrontal cortex in planning: Decision process, learning process, or both? *Cosyne*.
- Wang, J., Kurth-Nelson, Z., TB, D., Liebo, J., Kumaran, D., & Botvinick, M. (2017). Meta-reinforcement learning: a bridge between prefrontal and dopaminergic function. (Oral presentation) *Cosyne*.
- Smith, E. H., Horga, G., Mikell, C. B., Yates, M. J., Banks, G. P., Pathak, Y. J., Pullman, S. L., Yu, Q., Schevon, C. A., Srinivasan, S., McKhann, G. M., Botvinick, M. M. & Sheth, S. A. (2017). Distributed temporal processing in human prefrontal cortical neurons during cognitive control. *Cosyne*.
- Wang, J., Kurth-Nelson, Z., Tiramula, D., Soyer, H., Leibo, J. Z., Kumaran, D., & Botvinick, M. (2017). Learning to reinforcement learn. Cognitive Science Society, annual meeting.

- Weinstein, A. & Botvinick, M. (2017). Structure learning in motor control: A deep reinforcement learning model. *Cognitive Science Society, Annual meeting*.
- Smith, E. H., Horga, G., Mikell, C. B., Yates, M. J., Banks, G. P., Pathak, Y. J., Pullman, S. L., Yu, Q., Schevon, C. A., Srinivasan, S., McKhann G. M. II, Botvinick, M. M. , Sheth, S. A. (2017). Distributed temporal processing in human prefrontal cortical neurons during cognitive control. *Society for Neuroscience, Annual Meeting 2017*.
- Miller, K., Boyd-Meredith, T., Botvinick, M. & Brody, C. (2017). Hippocampal Sequences and Model-Based Planning in the Rat. *Society for Neuroscience, Annual Meeting 2017*.
- Miller, K., Daw, N., Botvinick, M. & Brody (2018). Hippocampal sequences and model-based planning in the rat. *Cosyne*.
- Ritter, S., Wang, J., Kurth-Nelson, Z., Pascanu, R. & Botvinick, M. et al. (2018). Episodic control through meta-reinforcement learning. *Cognitive Science Society, Annual meeting*.
- McNamee, D., Botvinick, M. & Gershman, S. (2018). Corticostriatal substrates for learning efficient internal models. *Computational Cognitive Neuroscience, annual meeting*.
- Stachenfeld, K., McNamee, D., Botvinick, M. & Gershman, S. (2018). Compression by grid cells to support hierarchical reinforcement learning in the cognitive map. *Society for Neuroscience, annual meeting*.
- Miller, K., et al. (2019). Understanding Emergent Structure-Based Learning in Recurrent Neural Networks. *RLDM*.
- Pilarski, P. et al. (2019). Learned human-agent decision-making, communication and joint action in a virtual reality environment. *RLDM*.
- Dabney, W., Kurth-Nelson, Z., Uchida, N., Starkweather, C., Munos, R., Hassibis, D. & Botvinick, M. (2019) A distributional code for value in dopamine-based reinforcement learning. Conference on *Reinforcement Learning and Decision Making (RLDM)*. (Best Paper Award)
- Zhu, T, Hamrick, J. B., McKee, K. R., Koster, R., Balaguer, J., Battaglia, P., Botvinick, M. (2019). A resource-rational model of physical abstraction for efficient mental simulation. *Cognitive Science Society, annual meeting*.
- Piloto, L., TB, Dhruva, Weinstein, A., & Botvinick, M. (2020). Learning intuitive physics through objects. *ICLR ‘BAICS’ workshop*.

- Aldarondo, D., Merel, J., Marshall, J., Hansclever, L., Klibaite, U., Gellis, A., Tassa, Y., Wayne, G., Botvinick, M. & Ölveczky, B. (2022). A virtual rodent predicts the structure of neural activity across natural behavior. *Cosyne*.
- Kostadinov, D., Sezener, E., Grabska-Barwińska, A., Beau, M., Krishnagopal, S., Budden, D., Hutter, M., Veness, J., Botvinick, M., Clopath, C., Hausser, M., & Latham, P. E. (submitted). Dendritic gated networks: A rapid and efficient learning rule for biological neural circuits. EMBO DENDRITES Workshop.
- Moskovitz, T., Botvinick, M. et al. (submitted). Minimum description length control. Control Processes Workshop.
- Wispinski, N., Butcher, A., Chapman, C., Botvinick, M. & Pilarski, P. (2022). Adaptive patch foraging in deep reinforcement learning agents. Conference on *Reinforcement Learning and Decision Making (RLDM)*.
- Balaguer, J., Koster, R., Weinstein, A., Campbell-Gillingham, L., Summerfield, C., Botvinick, M. & Tacchetti, A. (2022). HCMD-zero: Learning Value Aligned Mechanisms from Data. *International Conference on Learning and Representation (ICLR). Workshop on Gamification and Multiagent Solutions*.
- Pilarski, P. M., Butcher, A., Davoodi, E., Johanson, B., Brenneis, D.J.A., Parker, A.S.S., Acker, L., Botvinick, M.M., Modayil, J., & White, A. (2022). The Frost Hollow Experiments: Pavlovian Signalling as a Path to Coordination and Communication Between Agents. *ALA2022: Adaptive and Learning Agents Workshop*.
- Miller, K., Botvinick, M., Harris, K. et al. (2022). Neural substrates of structured credit assignment. Conference on *Reinforcement Learning and Decision Making (RLDM)*.
- Achterberg, J., Akarca, D., Strouse, D. J., Astle, D., Botvinick, M. & Duncan, J. (2022). Spatially-embedded Recurrent Neural Networks: Bridging common structural and functional findings in neuroscience, including small-worldness, functional clustering in space and mixed selectivity. *Computational Cognitive Neuroscience (CCN)*.
- Daie, K., Rozsa, M., Humphreys, P., Lillicrap, T., Clopath, C., Grabska-Barwinska, A., Kinsey, L., Kulkarni, M., Botvinick, M., & Svoboda, K. (2022). Optical brain computer interface for measuring circuit plasticity during learning. Society for Neuroscience, Annual Meeting.
- Miller, K., Freeman, L., Oh, Y. J., Botvinick, M. & Harris, K. D. (2022). Structured credit assignment in mice. *Society for Neuroscience, Annual meeting*.
- Miller, K., Freeman, L., Oh, Y. J., Botvinick, M. & Harris, K. D. (2023). Structured credit assignment in mice. *Computational Cognitive Neuroscience, Annual meeting*.

- Azab, H., El-Gaby, M., Shah, S., Mathura, R., Bartoli, E., Watrous, A., Anand, A., Adkinson, J. A., Donoghue, T., Ferreira, S. M., Topalovic, U., Sakon, J., Kurth-Nelson, Z., Smith, E. H., Suthana, N., Fried, I., Jacobs, J., Botvinick, M., Behrens, T. E. J. & Sheth, S. (2023). “Where was I?”: Single neuron representations of sequential task structure emerge rapidly in human medial temporal and anterior cingulate cortices. *Society for Neuroscience, Annual Meeting*.
- Bull, M.S., Rozsa, M., Lagzi, F., Mi, L., Humphreys, P., Eckstein, M., Kurth-Nelson, Z., Stachenfeld, K., Lillicrap, T., Clopath, C., Botvinick, M., Svoboda, K., Daie, K. & Golub, M.D. (2023). Local circuit plasticity in motor cortex during learning. *Society for Neuroscience, Annual Meeting*.
- Michel, G., Michaelos, M., Winnubst, J., Sun, W., Miller, K., Mohar, B., Botvinick, M., Stachenfeld, K., & Spruston, N. (2024). Hippocampal neuronal populations over weeks and months in a simple continual learning task. *Cosyne*.
- Bull, M., Rozsa, M., Mi, L., Humphreys, P., Eckstein, M., Stachenfeld, K., Kurth-Nelson, Z., Lillicrap, T., Clopath, C., Botvinick, M., Svoboda, K., Daie, K., & Golub, M. D. (2024). Fast, sparse, and local learning in motor cortex. *Cosyne*.
- Aitken, K., Rozsa, M., Bull, M., Wang, C., Humphreys, P., Eckstein, M., Stachenfeld, K., Kurth-Nelson, Z., Kinsey, L., Kulkarni, M., Botvinick, M., Clopath, C., Lillicrap, T., Golub, M., Svoboda, K., Mihalas, S. & Daie, K. (2025). Three-factor gradient-ascent approximation explains local-circuit plasticity during BCI learning. *Cosyne*.
- Küchenhoff, S., Azab, H., El-Gaby, M., Harris, A. L., Baram, A., Sablé-Meyer, M., Mathura, R., Bartoli, E., Donoghue, T., Ferreira, S., Sakon, J., Smith, E., Suthana, N., Fried, I., Cowan, R., Jacobs, J., Botvinick, M., Son, S., Yoo, S.B.M., Sheth, S. & Behrens, T. (2026). The algorithmic representations of sequential behaviour in the human brain. *Cosyne*.
- Michel, G., Natrajan, M., Mohar, B., Zhong, L., Winnubst, J., Sun, W., Michaelos, M., Hay, T., Fitzgerald, J., Botvinick, M., Stringer, C., Pachitariu, M., Spruston, N. & Stachenfeld, K. (2026). Hippocampal sequences encode recent history independent of task relevance. *Cosyne*.
- Son, S., Azab, H., El-Gaby, M., Küchenhoff, S., Sablé-Meyer, M., Shah, S., Mathura, R., Bartoli, E., Watrous, A., Anand, A., Adkinson, J., Donoghue, T., Ferreira, S., Topalovic, U., Sakon, J., Kurth-Nelson, Z., Smith, E., Suthana, N., Fried, I., Jacobs, J., Botvinick, M., Behrens, T., Yoo, S.B.M. & Sheth, S. (2026). One-Shot Sequence Learning through Adaptive Feedback Control in Human Hippocampus. *Cosyne*.

Online pre-prints (material not published elsewhere)

- Miller, K. J., Brody, C. D. & Botvinick, M. M. (2016). Identifying model-based and model-free patterns in behavior on multi-step tasks. *bioRxiv*, 096339.

- Leibo, J. L., de Masson d'Autume, C., Zoran, D., Amos, D., Beattie, C., Anderson, K., García Castañeda, A., Sanchez, M., Green, S., Gruslys, A., Legg, S., Hassabis, D., & Botvinick, M. M. (2018). Psychlab: A Psychology Laboratory for Deep Reinforcement Learning Agents. *arXiv*, 1801.08116.
- Piloto, L., Weinstein A., Ahuja, A., Mirza, M., Wayne, G., Amos, D., Hung, C., & Botvinick, M. (2018). Probing physics knowledge using tools from developmental psychology. *arXiv*, 1804.01128.
- Ortega, P. A., Wang, J. X., Rowland, M., Genewein, T., Kurth-Nelson, Z., Pascanu, R. Heess, N. et al. (2019). Meta-learning of sequential strategies. *arXiv.1905.03030* (2019).
- Burgess, C. P., Matthey, L., Watters, N., Kabra, R., Higgins, I., Botvinick, M., & Lerchner, A. (2019). MONet: Unsupervised Scene Decomposition and Representation. *arXiv preprint arXiv:1901.11390*.
- Miller, K. J., Botvinick, M. M., & Brody, C. D. (2019). From predictive models to cognitive models: An analysis of rat behavior in the two-armed bandit task. *bioRxiv*, 461129.
- Wayne, G., Hung, C., Amos, D., Mirza, M., Ahuja, A., Grabska-Barwinska, A., Rae, J., Mirowski, P., Leibo, J., Santoro, A., Gemici, M., Reynolds, M., Harley, T., Mohamed, S., Rezende, D., Saxton, D., Cain, A., Hiller, C., Kavukcuoglu, K., Botvinick, M., Hassibis, D., Lillicrap, T., Silver, D., & Abramson, J. (2018). Unsupervised Predictive Memory in a Goal-Directed Agent. *arXiv preprint: 1803.10760*
- Weinstein, A., & Botvinick, M. M. (2017). Structure learning in motor control: A deep reinforcement learning model. *arXiv:1706.06827*.
- Brenneis, D., Parker, A. R., Butcher, A., Davoodi, E., Johanson, M. B., Acker, L., Botvinick, M. M., Modayil, J., White, A., & Pilarski, P. (2022). Assessing the interaction between an online reinforcement learning assistant and a human: A pilot study. *ACM CHI*.
- Sezener, E. Grabska-Barwinska, A., Kostadinov, Maxime Beau, M., Krishnagopa, S., Budden, B., Hutter, M., Botvinick, M., Clopath, C., Hausser, M., Latham, P. E. (2022). A rapid and efficient learning rule for biological neural networks. *bioRxiv*.
- Botvinick, M. (2024). Self-rule and self-control. *SSRN*.
- Goldberg, B., Acosta-Navas, D., Bakker, M., Beacock, I., Botvinick, M., Buch, P., DiResta, R., Donthi, N., Fast, N., Iyer, R., Jalan, Z., Konya, A., Kwak Danciu, G., Landemore, H., Marwick, A., Miller, C., Ovadya, A., Saltz, E., Schirch, L., Shalom,

D., Siddarth, D., Sieker, F., Small, C., Stray, J., Tang, A., Tessler, M. H., & Zhang, A. (2024). AI and the Future of Digital Public Squares. *arXiv*: 2412.09988.

Hughes, E., Zhu, T.O., Chadwick, M.J., Koster, R., Castañeda, A. G., Beattie, C., Graepel, T., Botvinick, M. M. & Joel Z. Leibo (2025). Modeling human reputation-seeking behavior in a spatio-temporally complex public good provision game. *arXiv*:2506.06032.

Botvinick, M., Kurth-Nelson, Z., Muller, T. & Dabney, W. (2025). Depression as a disorder of distributional coding. *arXiv*:2507.16598

Community Outreach and Advocacy:

- 2012-16 Mentor, First Lego League robotics team (ages 9-13), Philadelphia
- 2014-16 Germantown Friends School, Philadelphia. Lecturer in Upper School course in Neural Science.
- 7/2018 University of Wisconsin, Public lectures on Minds, Machines and Society
- 4/2019 Mentor, TeenHacks LI Hackathon, New York Institute of Technology.
- 7/2021 Visiting speaker, Nottingham High School, Nottingham, UK
- 11/2021 Women in Cognitive Science (WiCS) workshop, Annual Meeting of the Psychonomic Society, New Orleans

Media Coverage:

- 2/1998 Research featured in *Pittsburgh Post-Gazette*
- 6/1998 Research featured in *Discover* magazine
- 5/2002 Interviewed on the Todd Mundt Show, National Public Radio
- 6/2004 Research featured in *Geo* magazine (Germany)
- 11/2004 Research featured in *Scientific American Mind* magazine
- 1/2005 Research featured in *National Geographic* magazine
- 3/2005 Research featured in *El Mundo* (Spain)
- 8/2007 Research featured in *The New York Times*
- 2/2008 Research featured in *Wired*
- 2008 Exploratorium science museum in San Francisco installs permanent exhibit based on our research
- 8/2008 Research featured in ABC News report
- 12/2008 Research featured in *Scientific American Mind* magazine
- 10/2009 Research featured in *The New York Times*
- 8/2010 Research featured in *Psychology Today*
- 10/2010 Research featured on BBC Two, Horizon program
- 11/2010 Research featured in *Psychology Today*

11/2010	Research featured in <i>National Affairs</i>
11/2010	Research featured in <i>US News and World Report</i>
2/2011	Research featured in “We’re Only Human,” a blog of the American Psychological Association
2/2011	Research featured in <i>National Affairs</i>
8/2011	Research featured in <i>Popular Science</i> (popsci.com)
8/2011	Research featured on msnbc.com
8/2011	Research featured on TBS, Korea
8/2011	Research featured on Fox News (foxnews.com)
10/2011	Research featured in <i>Discover</i>
10/2011	Research featured in <i>Nature</i>
10/2011	Research featured in <i>New Scientist</i>
10/2011	Research featured in <i>The Economist</i>
12/2011	Research featured in <i>Nature</i>
7/2012	Research featured in <i>Discover</i>
1/2013	Research featured in <i>Innovation: The Princeton Journal of Science and Technology</i>
2/2013	Research featured in <i>The Huffington Post</i>
2/2013	Research featured on Society for Neuroscience blog BrainFacts.org
1/2013	Exhibit installed in new Exploratorium science museum in San Francisco, based on Botvinick & Cohen, 1998.
4/2013	Research featured in <i>Nature</i>
5/2013	Research featured on <i>Yahoo! News</i>
8/2013	Research featured on CNN.com
1/2014	Research featured in <i>National Geographic</i>
5/2014	Research featured in <i>The New Yorker</i>
9/2014	Research featured in <i>The New Yorker</i>
2/2015	Research featured in <i>Forskning & Framsteg</i> (Sweden)
5/2015	Research featured on ‘Through the Wormhole with Morgan Freeman,’ Science Network
8/2015	Research featured in <i>The Wall Street Journal</i>
9/2016	Research featured in <i>The Scientist</i>
10/2016	Research featured in <i>The Guardian</i>
5/2017	Research featured in <i>The Scientist</i>
3/2017	Research featured in <i>Financial Times</i>
7/2017	Research featured in <i>The Wall Street Journal</i>
10/2017	Research featured in <i>MIT Tech Review</i>
10/2017	Research featured in <i>New Scientist</i>
10/2017	Research featured in <i>Business Insider</i>
2/2018	Research featured in <i>APA Monitor on Psychology</i>
2/2018	Research featured in <i>New Scientist</i>
2/2018	Research featured on Silicon Angle (siliconangle.com)
2/2018	Research featured in <i>The Economist</i>
5/2018	Interview appearance on PBS television series <i>Nova Wonders</i>
8/2018	Research featured in <i>Technology Review</i>
2018	Research featured in <i>Wired</i>
10/2018	Research featured on ZDNet

10/2018	Research featured in <i>Publico</i> (Portugal)
12/2018	Research featured on <i>Brain Inspired</i> podcast (braininspired.co)
2019	Research featured on CBS television series <i>60 Minutes</i>
1/2019	Research featured in <i>Proceedings of the National Academy of Sciences</i>
2019	Research featured in <i>The New Yorker</i>
1/2020	Research featured in the <i>Daily Telegraph</i>
1/2020	Research featured in <i>MIT Tech Review</i>
1/2020	Research featured in <i>New Scientist</i>
1/2020	Research featured in <i>The Independent</i>
2/2020	Research featured in <i>New Scientist</i>
7/2020	Interview appearance on Lex Fridman AI podcast
2020	Research featured in <i>Trends in Cognitive Sciences</i> ('Spotlight')
2020	Research featured in <i>The Economist</i>
10/2020	Research featured in <i>Scientific American</i>
12/2020	Research featured in <i>VentureBeat</i>
11/2021	Research featured in <i>The New Yorker</i>
2022	Research featured in <i>Proceedings of the National Academy of Sciences</i>
7/2022	Research featured in <i>New Scientist</i> (Koster et al., 2022)
7/2022	Research featured in <i>Vice</i>
7/2022	Research featured in <i>MIT Technology Review</i>
7/2022	Research featured in <i>New Scientist</i> (Piloto et al., 2022)
7/2022	Research featured in <i>Scientific American</i>
7/2022	Research featured in <i>Daily Beast</i>
7/2022	Research featured in <i>Nature</i>
7/2022	Research featured in <i>Suddeutsche Zeitung</i>
7/2022	Research featured in <i>Forbes</i> magazine
2/2024	Research featured in the <i>Wall Street Journal</i>
3/2024	Research featured in <i>National Geographic</i>
3/2024	Research featured by <i>Axios</i>
3/2024	Research featured in <i>Scientific American</i>
5/2024	Research featured in <i>The Harvard Gazette</i>
5/2024	Research featured in <i>The Verge</i>
5/2024	Research featured on CNBC
6/2024	Research featured in <i>The Independent</i>
10/2024	Research featured in <i>Democracy Technologies</i>
10/2024	Research featured in <i>Science News</i>
10/2024	Research featured in <i>Nature</i>
10/2024	Research featured in <i>The Guardian</i>
10/2024	Research featured in <i>MIT Tech Review</i>
10/2024	Research featured on <i>The Naked Scientist</i> podcast
10/2024	Research featured in <i>Ars Technica</i>
6/2025	Research featured in <i>The Wall Street Journal</i>
7/2025	Research featured in <i>Foreign Affairs</i>
2025	Research featured in <i>Forbes</i>
3/2026	Work featured in <i>The Verge</i>
5/2026	Work featured in <i>Financial Times</i>
6/2026	Work featured in <i>Business Insider</i>