Jonathan D. Cohen
Curriculum Vitae
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SUMMARY

I am a cognitive neuroscientist, with over three decades of research experience in computational and mathematical modeling as well as empirical studies of human brain function and behavior, focusing on the neural mechanisms responsible for cognitive control and human intelligence, and how our growing understanding of these can be brought to bear in the design of computational architectures with more human-like cognitive capabilities. My work lies at the points of contact between neuroscience, psychology, computer science and mathematics, as well as behavioral economics and psychiatry, and involves collaborations with investigators in each of these fields. I also have considerable experience in the coordination and administration of scientific research, as one of the two founding Co-Directors of the Princeton Neuroscience Institute, leading multi-institutional projects (NIHM Conte Center; Templeton Center Grant; NSF Convergence Accelerator grant; PNI-Intel Labs collaboration), and a number of open source software development projects.

Theoretical contributions. Some of the contributions that have emerged from the theoretical work of my colleagues and I are: the first computationally-explicit models of how cognitive control may be implemented in the brain [5] and the role of prefrontal cortex in control [64]; the role of dopaminergic function in the gating and updating of information in prefrontal cortex [4][56], noradrenergic regulation of the explore/exploit tradeoff [47][115][129], and the interaction of these modulatory systems in adaptive regulation of exploration in reinforcement learning [108]; how these mechanisms may be disturbed in psychiatric disorders [9][49][109]; the role of anterior cingulate cortex in performance monitoring [68][84][180] and the optimal allocation of control [172][202]; mathematical analysis of optimal control of simple decision making processes [124][148]; normative approaches to understanding capacity constraints associated with working memory [61][133] and cognitive control [181][240][203]; and how the brain regulates the balance between flexible control-dependent and efficient automatic processing [215]. Increasingly, our work has come to focus on how these mechanisms contribute to higher cognitive functions and human intelligence, such as the control of memory, planning, and abstract reasoning [227][250][249][259], including ways in which the human brain achieves the flexibility of symbolic forms of computation [104][174][237][253] while preserving the efficiency of computation in neural networks, and how this can be used to inform research in machine learning and artificial intelligence [256][269][285].

Empirical and methodological contributions. The theoretical work summarized above has served as the foundation for a number of empirical and methodological contributions. Empirical contributions include: the first demonstrations in humans of sustained activity in PFC associated with working memory performance [17][31]; the distinction between the roles of dorsolateral PFC (in the regulatory functions of control) and anterior cingulate cortex (monitoring and evaluative functions of control [45][51][57][94]; and the role of the locus coeruleus / norepinephrine system in regulating the explore-exploit tradeoff [157][208]. We have also made influential contributions to advances in quantitative methods in cognitive neuroscience, including: the introduction of cluster size correction into the analysis of fMRI data [43]; the use of fMRI to directly study midbrain neuromodulatory nuclei [144]; the design of systems for realtime fMRI analysis [19][251] and closed-loop feedback designs [191][242]; and whole brain, full correlation analysis of fMRI data and its use in realtime analysis [184]. Finally, I have lead or co-lead several large software development projects, including: PsyScope [14], the first graphical environment for the design and execution of cognitive behavioral experiments; BrainIAK [245][251] (in collaboration with Intel Labs), an open-source, python-based toolbox for the implementation and optimization of advanced methods of brain image analysis; PsyNeuLink, an open-source, python-based environment for the design and exchange of computational models of brain and cognitive function; SweetPea [255], a framework for specifying empirical experimental designs and machine learning training environments using factorial structure, and generating maximally unbiased sampling of trials; and a model description format [269] for expressing models of brain and cognitive function as computational graphs in machine readable form for exchange across modeling environments.

BIOGRAPHICAL

Business Address:	Princeton Neuroscience Institute	**Birth Date:** 10/5/55
	Princeton University	**Birth Place:** New York City
	Princeton, New Jersey 08544	**Citizenship:** U.S.A.
Business Phone:	(609) 258-2696 (voice)	
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EDUCATION and TRAINING

UNDERGRADUATE:

1973-77 Yale University   B.A., 1977 Biology and Philosophy

GRADUATE:

1979-83 University of Pennsylvania   M.D., 1983 Medicine

1987-90 Carnegie Mellon University   Ph.D., 1990 Cognitive Psychology

POST-GRADUATE:

1983-89 Internship in General Medicine, Neurology and Psychiatry

       Residency in Psychiatry

       Stanford University School of Medicine

1985-87 NIMH Research Training Fellowship

       Department of Psychiatry and Behavioral Sciences

       Stanford University School of Medicine

APPOINTMENTS and POSITIONS

ACADEMIC:

1989- 2005	Assistant to Full Professor of Psychiatry Western Psychiatric Institute and Clinic University of Pittsburgh
1990-98	Assistant to Associate Professor of Psychology Carnegie Mellon University
1992- present	Director, Clinical Cognitive Neuroscience Laboratory University of Pittsburgh
1998- 2005	Professor of Psychology, Princeton University
1999- 2007	Founding Director, Center for the Study of Brain, Mind and Behavior Princeton University
2000- 2008	Director, Program in Neuroscience Princeton University
2005- 2012	Eugene Higgins Professor of Psychology, Princeton University
2005- 2022	Founding Co-Director, Princeton Neuroscience Institute
2007- present	Director, Scully Center for the Neuroscience of Mind and Behavior
2012- present	Robert Bendheim and Lynn Bendheim Thoman Professor in Neuroscience Princeton University
2023- present	Director, Graduate Certificate Program in Statistics and Machine Learning Princeton University

HONORS and AWARDS

B.A. Cum Laude	1977
Distinction in the Biology Major	
Distinction in the Philosophy Major	
Yale University	
Miller Foundation Prize for Research in Psychiatry	1986
Department of Psychiatry and Behavioral Sciences	
Stanford University School of Medicine	
Annual Resident Research Award	1986
Northern California Psychiatric Society	
Joseph Zubin Memorial Fund Award for Research in Psychopathology	1993
Kempf Fund Award for Research Development in	2000
Psychobiological Psychiatry, American Psychiatric Association	
James McKeen Cattell Fund Sabbatical Fellowship Award	2003
Eugene Higgins Chaired Professorship, Princeton University	2005
Salmon Award Lecturer, New York Academy of Medicine	2006
Fellow, Association for Psychological Science	2007
Edward J. Sachar Award, Columbia University School of Medicine	2007
American Psychological Association Distinguished Scientific Contribution Award	2010
Fellow, American Association for the Advancement of Science	2012
William James Fellow Award, Association for Psychological Science	2018
Fellow, Cognitive Science Society	2019
Vannevar Bush Faculty Fellowship,	2021
Office of the Under Secretary of Defense for Research & Engineering	
Member, American Academy of the Arts & Sciences	2022
Lifetime Achievement Award, Society for Experimental and Cognitive Science,	2022
Division 3 of the American Psychological Association	

PUBLICATIONS

1. Peer-Reviewed Articles and Competitively-Reviewed Conference Papers

[291]   Z. Dulberg, R. Dubey, and J. D. Cohen. "Adapting to loss: A normative account of grief". In: *Psychological Review* (in press). URL: https://www.biorxiv.org/content/10.1101/2024.02.06.578702v3.

[290]   J. Masís, S. Musslick, and J. D. Cohen. "Learning expectations shape cognitive control". In: *Proceedings of the National Academy of Sciences, USA* (in press). URL: https://doi.org/10.31234/osf.io/d2cbg.

[289]   A. Nam, H. Conklin, Y. Yang, T. Griffiths, J. D. Cohen, and S-J Leslie. "Causal head gating: A framework for interpreting roles of attention heads in transformers". In: *NeurIPS 2025: Advances in Neural Information Processing Systems* (in press). URL: https://arxiv.org/abs/2505.13737.

[288]   G. Petri, S. Musslick, and J. D. Cohen. "An information-theoretic approach to reward rate optimization in the tradeoff between controlled and automatic processing in neural network architectures". In: *eLife* (in press). URL: https://doi.org/10.1101/2023.09.18.558214.

[287]   S. Suresh, K. Mukherjee, T. Giallanza, X. Yu, P. Patil, J. D. Cohen, and T. S. Rogers. "AI-enhanced semantic feature norms for 786 concepts". In: *ICLR 2025 and CHI 2025* (2025). URL: https://openreview.net/forum?id=m7bkC8Lxoh.

[286]   Y. Yang, D. I. Campbell, K. Huang, M. Wang, J. D. Cohen, and T. W. Webb. "Emergent symbolic mechanisms support abstract reasoning in large language models". In: *ICML 2025: Proceedings of the International Conference on Machine Learning* (2025). URL: https://arxiv.org/abs/2502.20332.

[285]   A. Altabaa, T. Webb, J. D. Cohen, and J. Lafferty. "Abstractors: Transformer modules for symbolic message passing and relational reasoning". In: *ICLR 2024: Proceedings of the International Conference on Learning Representations* (2024). URL: https://arxiv.org/abs/2304.00195.

[284]   A. O. Beukers, M. Hamin, K. Norman, and J. D. Cohen. "When working memory may just be working, not memory". In: *Psychological Review* (2024). URL: https://pubmed.ncbi.nlm.nih.gov/37956060/.

[283]   L. A. Bustamante, D. M. Barch, J. Solis, T. Oshinowo, I. Grahek, A. B. Konova, N. D. Daw, and J. D. Cohen. "Major depression symptom severity associations with willingness to exert effort and patch foraging strategy". In: *Psychological Medicine* (2024), pp. 1–12. URL: https://pubmed.ncbi.nlm.nih.gov/39618329/.

[282]   D. Campbell and J. D. Cohen. "A relational inductive bias for dimensional abstraction in neural networks". In: *CogSci 2024: Proceedings of the Annual Meeting of the Cognitive Science Society* 46 (2024). URL: https://arxiv.org/abs/2402.18426.

[281]   D. Campbell, S. Kumar, T. Giallanza, T. L. Griffiths, and J. D. Cohen. "Geometric abstraction in large foundation models". In: *CogSci 2024: Proceedings of the Annual Meeting of the Cognitive Science Society* 46 (2024). URL: https://arxiv.org/abs/2309.17363.

[280]   D. I. Campbell, S. Rane, T. Giallanza, N. De Sabbata, K. Ghods, A. Joshi, A. Ku, T. L. Griffiths, and J. D. Cohen. "Understanding the limits of vision language models throught the lens of the binding problem". In: *NeurIPS* (2024). URL: https://arxiv.org/abs/2411.00238.

[279]   T. Giallanza, D. Campbell, J. D. Cohen, and T. T. Rogers. "An integrated model of semantics and control". In: *Psychological Review* (2024). URL: https://pubmed.ncbi.nlm.nih.gov/39052340/.

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[277]   M. C. Iordan, V. J. Ritvo, K. A. Norman, N. B. Turk-Browne, and J. D. Cohen. "Sculpting new visual categories into the human brain". In: *Proceedings of the National Academy of Sciences, USA* (2024). URL: https://www.pnas.org/doi/10.1073/pnas.2410445121.

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[275]   T. Webb, S. Mondal, and J. D. Cohen. "Systematic visual reasoning through object-centric relational abstraction". In: *NeurIPS* (2024). URL: https://arxiv.org/abs/2306.02500.

[274]   T. W. Webb, S. M. Frankland, A. Altabaa, S. Segert, K. Krishnamurthy, D. Campbell, J. Russin, T. Giallanza, Z. Dulberg, R. O'Reilly, J. Lafferty, and J. D. Cohen. "The relational bottleneck as an

inductive bias for efficient abstraction". In: *Trends in Cognitive Science* (2024). URL: https://arxiv.org/abs/2309.06629.

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[254]   S. Segert and J. D. Cohen. "A Self-Supervised Framework for Function Learning and Extrapolation". In: *Transactions on Machine Learning Research* (2022). URL: https://openreview.net/pdf?id=ILPFasEaHA.

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[251]   G. Wallace, S. Polcyn, P. P. Brooks, A. Mennen, K. Zhao, P. S. Scotti, S. Michelmann, K. Li, N. B. TurkBrowne, J. D. Cohen, and K. A. Norman. "RT-Cloud: A cloud-based software framework to simplify and standardize real-time fMRI". In: *NeuroImage* 257 (2022), p. 119295. URL: https://doi.org/10.1016/j.neuroimage.2022.119295.

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[245]   M. Kumar, M. Anderson, J. Antony, C. Baldassano, P. B. Brooks, M. B. Cai, et al. "BrainIAK: The Brain Imaging Analysis Kit". In: *Aperture Neuro* (2021). URL: https://doi.org/10.52294/31bb5b68-2184-411b-8c00-a1dacb61e1da.

[244]   S. Kumar, I. Dasgupta, J. D. Cohen, N. D. Daw, and T. L. Griffiths. "Meta-learning of structured task distributions in humans and machines". In: *ICLR 2021: Proceedings of the International Conference on Learning Representations* (2021). URL: https://openreview.net/forum?id=--gvHfE3Xf5.

[243]   J. Masis, S. Musslick, and J. D. Cohen. "The value of learning and cognitive control allocation". In: *CogSci 2021: Proceedings of the Annual Meeting of the Cognitive Science Society* 43 (2021). URL: https://escholarship.org/uc/item/7w0223v0.

[242]   A. C. Mennen, N. B. Turk-Browne, G. Wallace, D. Seok, A. Jaganjac, J. Stock, and Y. I. Sheline. "Cloud-based fMRI neurofeedback to reduce the negative attentional bias in depression: a proof-of-concept study". In: *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* 6.4 (2021), pp. 490–497. URL: https://www.researchgate.net/publication/346510051_Cloud-based_fMRI_neurofeedback_to_reduce_the_negative_attentional_bias_in_depression_a_proof-of-concept_study.

[241]   I. Momennejad, J. Lewis-Peacock, K. A. Norman, J. D. Cohen, S. Singh, and R. L. Lewis. "Rational use of episodic and working memory: A normative account of prospective memory". In: *Neuropsychologia* 158 (2021), p. 107657. URL: https://doi.org/10.1016/j.neuropsychologia.2020.107657.

[240]   S. Musslick and J. D. Cohen. "Rationalizing constraints on the capacity for cognitive control". In: *Trends in Cognitive Sciences* 25.9 (2021), pp. 757–775. URL: https://www.sciencedirect.com/science/article/pii/S1364661321001480?via%3Dihub.

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[234]   S. M. Frankland and J. D. Cohen. "Determinantal point processes for memory and structured inference". In: *CogSci 2020: Proceedings of the Annual Meeting of the Cognitive Science Society* 42 (2020). URL: https://cognitivesciencesociety.org/cogsci20/papers/0812/index.html.

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[230]   S. Segert, M. Tepper, J. Turek, and J. D. Cohen. "Relaxed graph matching for analogical reasoning". In: *ICLR 2020: Proceedings of the International Conference on Learning Representations, Workshop on Bridging AI and Cognitive Science* (2020). URL: https://baicsworkshop.github.io/pdf/BAICS_4.pdf.

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[228]   C. T. Ellis, M. Lesnick, G. Henselman-Petrusek, B. Keller, and J. D. Cohen. "Feasibility of topological data analysis for event-based fMRI". In: *Network Neuroscience* (2019), pp. 1–12. URL: https://pubmed.ncbi.nlm.nih.gov/31410374/.

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Rilling JK, Sanfey AG, Aronson JA, Nystrom LE & Cohen JD (2002). Mapping the brain's response to reciprocated and unreciprocated social cooperation. Society for Neuroscience Abstracts, Program No. 78.10.

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Barch DM, Carter CS, Cohen JD & Sabb F (1997). The effects of D-amphetamine on language function in schizophrenia. Society for Neuroscience Abstracts, 23, 1952.

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Forman SD & Cohen JD (1995). Modeling saccadic eye movements in schizophrenia: Insights into memory mechanisms. Schizophrenia Research, 15(1-2), 175.

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Cohen JD, Ganguli R, Carter C, Brar J, Nichols T, DeLeo M & Mintun M (1995). Hypofrontality and working memory dysfunction in schizophrenia. Biological Psychiatry, 37, 633.

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Barch DB, Cohen JD, Servan-Schreiber D & Ganguli R (1995). The stability and interrelationships of CPT-AX and Stroop performance in schizophrenia. Schizophrenia Research, 15(1-2), 108.

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Huston T & Cohen JD (1994). Stimulus-induced shifts of task attention. Abstracts of the Psychonomic Society, 35th Annual Meeting.

Forman SD, Cohen JD, Noll DC, Mintun MA & Casey BJ (1994). Within subject comparison of PET & fMRI to visualize activation of prefrontal cortex (PFC). Society for Neuroscience Abstracts, 20.

Forman SD, Cohen JD, Mintun MA & Noll DC (1994). Improved assessment of significant change in functional magnetic resonance imaging (fMRI): Use of the contiguity threshold. Annual Meeting of the Society for Magnetic Resonance.

Carter CS, Cohen JD & Mintun M (1994). Interference, facilitation and strategy development in Stroop task performance: An 150H2O PET study. Abstracts of Panels and Posters, 33rd Annual Meeting of the American College of Neuropsychopharmacology.

Noll DC, Schneider W & Cohen JD (1993). Artifacts in functional MRI using conventional scanning (1993). Twelfth Annual Meeting of the Society of Magnetic Resonance in Medicine.

Noll DC, Cohen JD, Forman SD, Schneider W & Meyers CH (1993). Spiral k-space MRI of brain function. Twelfth Annual Meeting of the Society of Magnetic Resonance in Medicine.

Cohen JD, Forman SD, Casey BJ & Noll DC (1993). Spiral-scan imaging of dorsolateral prefrontal cortex during a working memory task. Twelfth Annual Meeting of the Society of Magnetic Resonance in Medicine.

Casey BJ, Cohen JD, Noll DC, Forman SD & Rapoport JL (1993). Activation of the anterior cingulate during the Stroop conflict paradigm using functional MRI. Society for Neuroscience Abstracts, 19, 1285, 1993.

Noll DC, Meyer CH, Cohen JD & Schneider W (1991). Spiral-scan imaging of cortical activation. 11th Annual Meeting of the Society of Magnetic Resonance Imaging.

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Cohen JD & Servan-Schreiber D (1991). Computer simulation models of the relationship between disturbances of dopamine, prefrontal cortex and cognitive function in schizophrenia. Abstracts of Panels and Posters, 30th Annual Meeting of the American College of Neuropsychopharmacology.

Cohen JD (1989). A network model of schizophrenic language deficits. Book of Abstracts, 142nd Annual Meeting of the American Psychiatric Association.

5. Manuscripts Under Review / In Prepartation

Conklin HC, Hosking T, Yi-Chern T, Cohen JD, Leslie S-J, Griffiths TL, Bartolo M & Goldfarb-Tarrant S (under review). Learningis forgetting: LLMS as lossy compression.

Dawes C, Segert S, Krishnamurthy K & Cohen JD (under review). A group theoretic analysis of the symmetries underlying base addition and their learnability by neural networks.

Geadah V, Arbelaiz J, Ritz H, Daw ND, Cohen JD & Pillow JW (under review). System identification and inverse optimal control for partially observed discrete-time stochastic linear quadratic regulators.

Giallanza T, Rogers TT & Cohen JD (under review). An integrated model of semantics and control, Part 2: Solving the similarity paradox through context inference. https://osf.io/preprints/psyarxiv/fxc87.

Haputhanthrige U, Campbell ID, Cohen JD & Webb TW (under review). Binding Visual Features Point by Point.

Huang J, Cohen JD & Busemeyer J (under review). A quantum model of arousal and cognitive control in decision making.

Musslick S, Saxe AM, Hoskin AN, Sagiv Y, Reichman D, Petri G & Cohen JD (under review). On the rational boundedness of cognitive control: Shared versus separated representations. https://psyarxiv.com/jkhdf.

Nam AJ, Griffiths TL, Cohen JD & Leslie S-J (under review). Understanding task representations in neural networks via Bayesian ablation. https://openreview.net/forum?id=SA8lLiWl8V.

Nurisso M, Fernando J, Deshpandes R, Perotti A, Marjieh R, Frankland SM, Lewis RL, Webb TW, Campbell D, Vaccarino F, Cohen JD & Petri G (under review). Bound by semanticity: universal laws governing the generalization-identification tradeoff. https://arxiv.org/abs/2506.14797.

Pothukuchi RP, Lufkin L, Shen YJ, Simon A, Trevisan BE, Tu M, Yang M, Foxman B, Pothukuchi VS, Kyaw TH, Epping G, Jongkees B, Busemeyer J, Cohen JD & Bhattacharjee A (under review). Quantum cognitive modeling: New applications and systems research directions. https://arxiv.org/abs/2309.00597.

Pyle R, Musslick S, Cohen JD & Patel AB (under review). A quantitative approach to predicting representational learning and performance in neural networks. https://arxiv.org/abs/2307.07575

Ravi S, Musslick S, Hamin M, Willke TL & Cohen JD (under review). Navigating the trade-off between multi-task learning and learning to multitask in deep neural networks. https://arxiv.org/abs/2007.10527.

Ritz H, Jha A, Pillow JW, Daw ND & Cohen JD. Active reconfiguration of neural task states. biorxiv.org/615

Shenhav A, Musslick S, Botvinick MM & Cohen JD (under review) Misdirected vigor: Differentiating the control of value from the value of control.

Wilson RC, Wang S, Sadhegiyeh H & Cohen JD (under review). Deep exploration as a unifying account of explore-exploit behavior. PsyArXiv: https://psyarxiv.com/uj85c.

Dubey R & Cohen JD (in preparation). Adapting to loss: A normative account of grief.

Frankland SM, Webb TW, Lewis RL & Cohen JD (in preparation). No coincidence, George: Processing limits in cognitive function reflect the curse of generalization. https://www.researchgate.net/pub/389017061

Dulberg Z, Henselman-Petrusek G, Giallanza T, Musslick S & Cohen JD (in preparation). Multitasking networks use multiaffine representations to direct flow of feature data.

Jonkes BJ, Todd MT, Lloyd K, Dayan P & Cohen JD (in preparation). When it pays to be quick: dissociating control over task preparation and speed-accuracy trade-off in task switching. https://psyarxiv.com/quhns.

Momennejad I, Tomov M, Norman KA & Cohen JD (in preparation). The strategic allocation of working memory and episodic memory in cognitive control: A neural network model of prospective memory.

Rosendahl L & Cohen JD (in preparation). A quantum framework for modeling cognitive control and arousal.

Shvartsman M, Sundaram N, Srivasta V, & Cohen JD (in preparation). A normative theory of decision making from multiple stimuli.

PROFESSSIONAL ACTIVITIES

TEACHING:

1. Courses

1989-96	Introduction to Cognitive Psychology (undergraduate survey course)
	Department of Psychology, Carnegie Mellon University
1989-96	Cognitive Neuroscience section of Cognitive Core (graduate survey course)
	Department of Psychology, Carnegie Mellon University
1990-93	Co-coordinator, Fellowship Training Program in Schizophrenia Research
	Western Psychiatric Institute and Clinic, University of Pittsburgh
1992-93	Research Methods in Cognitive Neuroscience (advanced undergraduate seminar)
	Department of Psychology, Carnegie Mellon University
1992-93	Functional Neural Circuits (graduate and advanced undergraduate seminar)
	Department of Psychology, Carnegie Mellon University
1994-95	Neural and Psychological Mechanisms of Working Memory (graduate and advanced undergraduate seminar)
	Department of Psychology, Carnegie Mellon University
1996-97	Advanced Topics in Cognitive Neuroscience (graduate and advanced undergraduate seminar)
	Department of Psychology, Carnegie Mellon University
1996-97	Biological and Psychological Mechanisms of Attention (graduate and advanced undergraduate seminar)
	Department of Psychology, Carnegie Mellon University; co- taught with Gary Aston-Jones.
1999-00	Neural Bases of Cognitive Control (undergraduate course)
	Department of Psychology, Princeton University
1999-01	Topics in Molecular and Cognitive Neuroscience (graduate seminar)
	Departments of Psychology and Molecular Biology, Princeton University
1999-01	Introduction to Neural Networks (undergraduate course)
	Department of Psychology, Princeton University
2001-02	Advanced Topics in Neural Network Models of Psychological Function (advanced undergraduate / graduate seminar)
	Department of Psychology, Princeton University
2002-03	Statistical Methods in Psychological Research (advanced undergraduate / graduate course)
	Department of Psychology, Princeton University
2004-07	Graduate Proseminar in Cognitive Psychology
	Department of Psychology, Princeton University

2009-16   Core Course for Ph.D. Program in Neuroscience

             Princeton Neuroscience Institute, Princeton University

2017   Introduction to Cognitive Psychology (undergraduate survey course, with laboratory

             component)

             Department of Psychology, Princeton University

2018-20   Computational Models of Psychological Function (undergraduate course, with laboratory

             component)

             Princeton Neuroscience Institute and Department of Psychology, Princeton University

2022   The Computational Basis of Natural Intelligence in the Human Brain (undergraduate seminar)

             Princeton Neuroscience Institute, Princeton University

2. Tutorials and Workshops

May, 1990-93   Cohen JD, Servan-Schreiber D. Course co-directors, A primer on neural modeling in

                   psychiatry. 144-7th Annual Meetings of the American Psychiatric Society, New York.

July, 1991   Invited faculty member. James S. McDonnell Summer Institute in Cognitive

                   Neuroscience, Dartmouth College, Hanover.

October, 1993   Applications of Functional MRI to Studies of Human Memory. Invited tutorial,

                   Memory Disorders Research Society, Boston.

November, 1993   Functional neuroimaging. Invited tutorial, Neural Information Processing Society,

                   Boulder.

August, 1996   Neuroimaging and Behavior. Invited workshop, XXVI International Congress of

                   Psychology, Montreal.

January, 1997   The Role of Neuromodulation in Cognition: Physiological and Computational Approaches.

                   Panel organizer, 30th Winter Conference on Brain Research, Breckenridge, Colorado.

July, 1997   Invited faculty member. James S. McDonnell Summer Institute in Cognitive

                   Neuroscience, Dartmouth College, Hanover.

September, 2000   International Workshop on Neural Bases of Executive Functions and Performance

                   Monitoring, Jena, Germany.

July, 2001   Invited faculty member. James S. McDonnell Summer Institute in Cognitive

                   Neuroscience, Dartmouth College, Hanover.

3. Trainees

<u>Graduate advisees:</u>

Therese Huston, Ph.D. (1990-1995)

CMU Department of Psychology

Behavioral and computational modeling studies of selective attention

Director, Center for Excellence in Teaching & Learning, University of Seattle

Todd Braver, Ph.D. (1992- 97)

CMU Department of Psychology

Computational and neuroimaging studies of prefrontal cortex and cognitive control

Professor of Psychology, Washington University, St. Louis

Matthew Botvinick, M.D., Ph.D. (1995-2001)

CMU Department of Psychology

Modeling and fMRI studies of the role of anterior cingulate cortex in conflict monitoring and control

Professor of Psychology and Neuroscience, Princeton University

Mark Gilzenrat, Ph.D. (1996-2006)

CMU Department of Psychology (1996-1998)

Princeton Department of Psychology (1998-2006)

Computational models and pupillometric studies of neuromodulatory influences on selective attention

Software architect, Navaraga Corporation

Raymond Cho, M.D. (1999-2003)

Department of Psychology, Princeton University

Assistant Professor of Psychiatry, University of Pittsburgh

Eric Shea-Brown, Ph.D. (1999-2004)

Program in Applied and Computational Mathematics, Princeton University

Co-advisor with Philip Holmes

Neural oscillators and integrators in the dynamics of decision tasks

Associate Professor of Applied Mathematics, University of Washington, Seattle

Sean Polyn (2000-2005)

Department of Psychology, Princeton University

Computational modeling of context updating, reinforcement learning and dopamine function

Associate Professor of Psychology and Psychiatry, Vanderbilt University

Aaron Schurger (2001-2008)

Department of Psychology, Princeton University

Electrophysiological and fMRI studies of perceptual awareness

Associate Professor, Inserm-CEA

Agatha Lenartowicz (2002-2008)

Department of Psychology, Princeton University

Behavioral, electrophysiological and fMRI studies of task switching

Postdoctoral Fellow, UCLA

Kimberly D'Ardenne McClure (2005-2008)

Department of Chemistry, Princeton University

fMRI studies of brainstem neuromodulatory nuclei

Postdoctoral Fellow, Montague Lab, Virginia Tech

Susan Robison (2005-2009; co-advised with Ken Norman)

Department of Chemistry, Princeton University

Behavioral and fMRI studies of cognitive control and episodic memory

Emily Chakwin (2006-2008)

Department of Psychology, Princeton University

Behavioral and fMRI studies of moral reasoning

Michael Todd (2006-2012)

Department of Psychology, Princeton University

Computational modeling studies of cognitive control

Data Scientist, Netflix

Adam Moore (2006-2011; co-advised with Andy Conway)

Department of Psychology, Princeton University

Behavioral and fMRI studies of moral reasoning

John White (2008-2013)

Department of Psychology, Princeton University

Behavioral and fMRI studies of economic decision making

Data Scientist, Netflix

Sarah Getz (2008-2013; co-advised with Andy Conway)

Department of Psychology, Princeton University

Behavioral and fMRI studies of economic decision making

Andra Geana (2010-2016)

Department of Psychology, Princeton University

Behavioral and fMRI studies of exploration and exploitation in decision making

Postdoctoral Fellow, Brown University

Jane Keung (2011-2016)

Princeton Neuroscience Institute, Princeton University

Behavioral and fMRI studies of prefrontal cortex and cognitive control

Postdoctoral Fellow, University of Arizona

Yida Wang (2011-2016)

Department of Computer Science, Princeton University

Co-advisor with Kai Li and Nick Turk-Browne

Full-correlation matrix analysis of fMRI data

Applied Scientist, Amazon

Olga Lositsky (2012-2017)

Princeton Neuroscience Institute, Princeton University

Behavioral and fMRI studies of decision making

Postdoctoral Fellow, Brown University

Gary Kane (2012-2018)

Department of Psychology, Princeton University

Behavioral and neurophysiological studies of foraging behavior and LC function in rodents

Postdoctoral Fellow, Harvard University

Sachin Ravi (2014-2019)

Department of Computer Science, Princeton University (Co-advisor with Kai Li)

Meta-learning and controlled vs. automatic processing

Machine Learning Research Engineer, Apple

Laura Bustamante (2014-2022)

Princeton Neuroscience Institute, Princeton University

Behavioral and fMRI studies of the cost of cognitive control

Postdoctoral Fellow, Washington University

Sebastian Musslick (2014-2022)

Princeton Neuroscience Institute, Princeton University

Behavioral and fMRI studies of cognitive control

Assistant Professor, Osnabrück University

Abigail Novick (2014-2022)

Department of Psychology, Princeton University

Behavioral and fMRI studies of representational sharing and multitasking

Lena Rosendahl (2016-2022)

Department of Mechanical and Aerospace Engineering

Co-advisor with Naomi Leonard

Quantum probabilistic models of cognitive control

Data Analyst, Mathematica

Mayank Agrawal (2017-2023)

Department of Psychology, Princeton University

Computational and Behavioral studies of learning and cognitive control

Zach Dulberg (2019-2025)

Princeton Neuroscience Institute, Princeton University

Learning mechanisms for acquiring representations that support generalization

Sreejan Kumar (2019-2025)

Princeton Neuroscience Institute, Princeton University

Neural mechanisms underlying learning, representation and reasoning

Simon Segert (2019-2024)

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Neurally-plausible mechanisms of relational reasoning

Tyler Giallanza (2020-2025)

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Neural mechanisms underlying learning, representation and processing of semantics

Samyak Gupta (2020-present)

Department of Computer Science, Princeton University

Co-advisor with Kai Li

Compilation and efficient computational of heterogeneous cognitive models

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Electrical and Computer Engineering, Princeton University

Neural mechanisms underlying learning, representation and generalization

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Computational models of human intelligence

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Automated methods for scientific discovery

Ph.D. Thesis Co-Advisor:

Cliona Golden (2004, Ingrid Daubechies), PACM, Princeton University

Adi Livnat (2005, Simon Levin), Ecology and Evolutionary Biology, Princeton University

Ilya Fischoff (2006, Daniel Rubenstein), Ecology and Evolutionary Biology, Princeton University

Juan Gao (2007, Phil Holmes), Program in Applied and Computational Mathematics, Princeton University

Yuan (Sophie) Liu (2007, Phil Holmes), Physics, Princeton University

Caitlin Newberry (2007, Wolf Richter), Chemistry, Princeton University

Phil Eckoff (2008, Phil Holmes), Program in Applied and Computational Mathematics, Princeton University

Andrea Nedic (2011, Phil Holmes), Electrical Engineering, Princeton University

Samuel Feng (Phil Holmes), Program in Applied and Computational Mathematics, Princeton University

Stephanie Goldfarb (2013, Naomi Leonard), Program in Applied and Computational Mathematics, Princeton University

Eran Eldar (2014, Yale Niv), Princeton Neuroscience Institute, Princeton University

Paul Reverdy (2014, Naomi Leonard), Mechanical and Aerospace Engineering, Princeton University

Postdoctoral trainees:

Steve Forman, M.D., Ph.D. (1992-1994)

University of Pittsburgh Department of Psychiatry

fMRI studies of prefrontal function

Associate Professor of Psychiatry, University of Pittsburgh

Medical Director of the Center for Treatment of Addictive Disorders, Pittsburgh VA

Marius Usher, Ph.D. (1993-1995)

CMU Department of Psychology

Computational models of catecholaminergic neuromodulation and selective attention

Professor of Psychology and Neuroscience, Tel Aviv University

Deanna Barch, Ph.D. (1993-1995)

University of Pittsburgh Department of Psychiatry

Professor of Psychology and Radiology, Washington University, St. Louis

William Perlstein, Ph.D. (1993-1996)

University of Pittsburgh Department of Psychiatry

Electrophysiological and fMRI studies of working memory in schizophrenia

Associate Professor of Clinical and Health Psychology and Psychiatry, University of Florida, Gainsville

Gregory Berns, M.D., Ph.D. (1995-1998)

University of Pittsburgh Department of Psychiatry

Functional neuroimaging studies of novelty detection

Professor of Economics, Emory University

Randy Gobbel, Ph.D. (1997-1998)

Carnegie Mellon University Department of Psychology

Computational modeling studies of basal ganglia function in control of sequential action

Computer Scientist, Artificial Intelligence Center, SRI International

James Kroger (1998-2001)

Princeton University Department of Psychology

FMRI studies of prefrontal cortex organization

Professor of Psychology, New Mexico State University

Nicholas Yeung, Ph.D. (1999-2004)

Princeton University Department of Psychology

Modeling, ERP and fMRI studies of conflict monitoring and cognitive control

University Lecturer in Experimental Psychology, University of Oxford

Gesine Dreisbach, Ph.D. (2000-2001)

Princeton University Department of Psychology

fMRI studies of task switching

Professor of Psychology, University of Regensburg

Clay Holroyd, Ph.D. (2001-2004)

Princeton University Department of Psychology

Neural network modeling, ERP, and fMRI studies of performance monitoring and reinforcement learning

Professor of Psychology, University of Victoria

James Rilling, Ph.D. (2001-2003)

Center for the Study of Brain, Mind & Behavior, Princeton University

Neural mechanisms of economic decision making; neural mechanisms in placebo responding

Associate Professor of Anthropology and Psychiatry and Behavioral Sciences, Emory University

Alan Sanfey, Ph.D. (2001-2003)

Center for the Study of Brain, Mind & Behavior, Princeton University

Neural mechanisms of economic decision making; neural mechanisms in placebo responding

Associate Professor of Psychology, University of Arizona

Principal Investigator, Donders Institute for Brain, Cognition and Behavior, Radboud University

Rafal Bogacz, Ph.D. (2002-2004)

Princeton University Department of Psychology

Neural network modeling and ERP studies of task switching and performance monitoring

Associate Professor of Clinical Neuroscience, University of Oxford

Sander Nieuwenhuis, Ph.D. (2002-2003)

Princeton University Department of Psychology

ERP studies and neural network modeling of performance monitoring, task switching and the attentional blink

Assistant Professor, Cognitive Psychology Unit, Leiden University

Joshua Greene, Ph.D. (2001-2006)

Princeton University Department of Psychology

Neural bases of moral reasoning

Professor of Psychology, Harvard University

Samuel McClure, Ph.D. (2003-2007)

Princeton University Department of Psychology

Neural network modeling and neuroimaging studies of reinforcement learning and decision making

Assistant Professor of Psychology, Stanford University

Jean-Baptiste Pochon, Ph.D. (2003-2005)

Princeton University Department of Psychology

Neuroimaging studies of decision making, conflict monitoring and cognitive control

Postdoctoral Fellow, L'Hôpital de la Salpêtrière in Paris

Patrick Simen, PhD. (2003-2007)

Princeton University Program in Applied & Computational Mathematics

Computational modeling, mathematical analysis, behavioral and neuroimaging studies of decision making and cognitive control

Assistant Professor, Oberlin College

Jason Chein, Ph.D. (2004-2005)

Princeton University Department of Psychology

Neuroimaging studies of prefrontal cortex organization and function

Assistant Professor of Psychology, Temple University

Brent Field, Ph.D. (2004-2015)

Center for Study of Brain, Mind and Behavior

Center for Health and Well-Being, Woodrow Wilson School of Public Policy

Behavioral and neuroimaging studies of attention and emotional regulation among meditation practitioners

Angela Yu, Ph.D. (2004-2008)

Princeton University Department of Psychology

Computational modeling and mathematical analysis studies of decision making and cognitive control

Associate Professor of Cognitive Science, University of California, San Diego

Damon Tomlin, Ph.D. (2006-2013)

Princeton University Department of Psychology and Princeton Neuroscience Institute

Neuroimaging studies of economic and social decision making and cognitive control

KongFatt Wong-Lin, Ph.D. (2006-2009)

Princeton University Department of Mechanical and Aerospace Engineering

Computational modeling and mathematical analysis studies of decision making and cognitive control

Lecturer, Ulster University

Yael Niv, Ph.D. (2007-2008)

Princeton University Department of Psychology

Neuroimaging and computational modeling studies of decision making and cognitive control

Associate Professor of Psychology and Neuroscience, Princeton University

Benjamin Eppinger, Ph.D. (2007-2010)

Princeton University Department of Psychology Center for Health and Well-Being, Woodrow Wilson School of Public Policy

Neuroimaging studies of age-related differences in economic decision making and cognitive control

Researcher, MPI for Human Development, Berlin

Marieke van Vugt, Ph.D. (2008-2010)

Princeton University Department of Psychology

Neuroimaging and computational modeling studies of decision making and cognitive control

Assistant Professor, University of Groningen

Fuat Balci, Ph.D. (2008-2010)

Princeton University Department of Psychology

Theoretical and behavioral studies of interval timing and decision making

Assistant Professor, Department of Psychology, Koc University, Istanbul

Robert Wilson, Ph.D. (2009-2014)

Princeton University Department of Psychology and Princeton Neuroscience Institute

Theoretical, behavioral and neuroimaging studies of cognitive control & locus coeruleus function

Assistant Professor, University of Arizona

Michael Schwemmer, Ph.D. (2010-2012)

Princeton Neuroscience Institute

Theoretical analyses of capacity constraints on cognitive control

Postdoctoral Fellow, Mathematical Biosciences Institute, Ohio State University

Jarrod Lewis-Peacock, Ph.D. in Psychology, University of Wisconsin-Madison

Princeton Neuroscience Institute (2011-2013; co-advised with Ken Norman)

Neuroimaging studies of cognitive control and prospective memory

Assistant Professor, University of Texas, Austin

Elliot Ludvig, Ph.D., Psychological and Brain Sciences, Duke University

Princeton Neuroscience Institute (2011-2013)

Theoretical model and behavioral studies of learning, memory and cognitive control

Professor, University of Warwick

Amitai Shenhav, Ph.D. in Psychology, Harvard University

CV Starr Fellow, PNI (2012-2016; co-advised with Matthew Botvinick)

Theoretical and neuroimaging studies of the costs of cognitive control

Associate Professor, Brown University

Aaron Bornstein, Ph.D. in Neuroscience, NYU

Princeton Neuroscience Institute (2013-2019; co-advised with Ken Norman)

Neuroimaging studies of episodic memory and decision making

Assistant Professor, University of California, Irvine

Ida Momennajad, Ph.D.

Princeton Neuroscience Institute (2013-2018; co-advised with Ken Norman & Nathaniel Daw)

Neuroimaging and theoretical modeling studies of prospective memory

Michael Shvartsman, Ph.D. in Cognitive Science, University of Michigan

Princeton Neuroscience Institute (2014-2018)

Theoretical analysis of decision making; Bayesian hierarchical analysis of neuroimaging data

Occulus Research

Hasan Kayhan Ozcimder, Ph.D. in Mechanical Engineering, Boston University

Princeton Neuroscience Institute (2015-2017; co-advised with Naomi Leonard)

Mathematical modeling of capacity constraints in controlled (interactive parallel) processing

Mathworks

Michael Lesnick, Ph.D in Applied Mathematics, Stanford University

Princeton Neuroscience Institute (2016-2018)

Tools for topological data analysis (TDA) and their application to neuroscientific data analysis

Department of Mathematics, SUNY Albany

Biswadip Dey, Ph.D. in Mechanical Engineering, University of Maryland, College Park

Princeton Neuroscience Institute (2015-present; co-advised with Naomi Leonard)

Mathematical modeling of capacity constraints in controlled (interactive parallel) processing

Marius Cătălin Iordan, Ph.D. in Computer Science, Stanford University

Princeton Neuroscience Institute (2016-present; co-advised with Daniel Osherson)

Theoretical and neuroimaging studies of semantic representations and cognitive control

Simon Cullen, PhD. in Philosophy, Princeton University

Princeton Neuroscience Institute (2017-2018)

Theoretical and experimental studies of moral reasoning

Assistant Professor, Carnegie Mellon University

Greg Henselman, Ph.D. in Applied Mathematics, University of Pennsylvania

Princeton Neuroscience Institute (2017-present)

Tools for topological data analysis (TDA) and their application to neuroscientific data analysis

Steven Frankland, Ph.D. in Psychology, Harvard University

Princeton Neuroscience Institute (2017-2023)

Neural network modeling of abstract reasoning

Assistant Professor, Dartmouth University

Taylor Webb, Ph.D. in Psychology, Princeton University

Princeton Neuroscience Institute (2018-2019)

Neural network modeling of analogical reasoning

Bryant Jonkes. Ph.D. in Cognitive Psychology, Leiden University, the Netherlands

Princeton Neuroscience Institute (2019-2020)

Theoretical modeling and behavioral studies of the dynamics of cognitive control

Assistant Professor in Cognitive Psychology Unit, Leiden University, the Netherlands

Javier Masis, Ph.D. in Psychology, Harvard University

Princeton Neuroscience Institute (2020-present)

Neural network modeling of learning and control

Kamesh Krishnamurthy, Ph.D. in Computational Neuroscience, University of Pennsylvania

CV Starr Fellow, PNI and Center for the Physics of Biological Function Fellow (2018-present)

Neural network models of symmetry discovery

Harrison Ritz, Ph.D. in Psychology, Brown University

CV Starr Fellow, PNI (2022-present)

Theoretical and neuroimaging studies of the dynamics of cognitive control

Andrew Nam, Ph.D. in Psychology, Stanford University

Fellow in Natural and Artificial Minds, (2024-present)

Computational models of human intelligence

RESEARCH AND PROFESSIONAL ACTIVITIES

1. Grants

NIMH Physician Scientist Award: Context Disturbance in Schizophrenia: Models and Measures; PI, 1987-92, MH00673

NIMH P50 PI: Cortical Circuitry and Cognition in Schizophrenia (Edward Stricker, PI); Project 4 (1990-96), Project 7 (1997-02): The Role of Prefrontal Cortex in the Cognitive Dysfunctions of Schizophrenia; Project 3 (2003-07): Neuroendophenotypes and the expression of illness liability in schizophrenia; PI, Projects 4, 7 & 3, 1990-07, MH45156

NIMH FIRST Award; RO1: Mechanisms of Context Processing in Schizophrenia; PI, 1991-2012, MH47073

NIMH Program Project: Toward Models of Normal and Disordered Cognition (James L. McClelland, PI); Project 2 (1991-96): Neuromodulation and the Processing of Context in Schizophrenia; Project 4 (1997-02): Mechanisms of Cognitive Control; PI Projects 2 & 4, 1991-2002, MH47566

NIMH P50: Center for Functional Brain Imaging (Robert Moore & Mark Mintun, Co-PIs) Cognitive Studies Core; Co-Director, Cognitive Core, 1992-97, MH49815

McDonnell Foundation: Neural Bases of Rehearsal and Maintenance in Working Memory; PI, 1994-96, JSMF 94-32

NSF CRI: Computational and Statistical Methods for the Analysis of Neuroimaging Datasets; PI, 1995-96, IBN9418982

NIMH RO1: fMRI Studies of Prefrontal Cortex; PI, 1996-2009, MH52864

NIMH Program Project: Toward Models of Normal and Disordered Cognition (James L. McClelland, PI); Project 2 (1991-96): Neuromodulation and the Processing of Context in Schizophrenia; Project 4 (1997-02): Mechanisms of Cognitive Control; PI Projects 2 & 4, 1997-02, MH47566

NIDA/HBP RO1: Advanced Methods for Neuroimaging Data Analysis; PI, 1997-99, DA11469

NSF ESI: Tracking the Human Brain: An Interactive Planetarium Exposition (Bryan Rogers, PI); Co-Investigator, 1997-99, ESI9705491

NARSAD Independent Investigator Award: An fMRI Study of the Role of Anterior Cingulate in Working Memory Dysfunction in Schizophrenia; PI, 1997-99

NIMH RO1: Neurophysiological and Modeling Studies of Locus Coeruleus; Co-PI (Gary Aston-Jones, Co-PI), 1998-2001, MH33194

NSF MRI: Acquisition of Core Equipment for Princeton Cognitive and Behavioral Neuroscience Initiative (Marcia Johnson and Charles Gross, Co-PIs); Co-PI, 1998-2001, MRI/ OSTI9871186

NJCST: New Jersey Brain Imaging Consortium: Acquisition of high field MRI scanner PI, 1999

NIMH/HBP RO1: Usability and Interoperability of Neuroimaging Software; PI, 2000-03, MH62006

NIMH RO1: Pathophysiology of Cognitive Disability in Schizophrenia (Cameron Carter, PI); Co-Investigator, 2000-04, MH59883

NIMH P50: Conte Center for Neuroscience Research: Cognitive and Neural Mechanisms of Conflict and Control; PI, 2000-10, MH62196

Seaver Institute: Neural Economics: Understanding the brain mechanisms underlying cognitive-emotional interactions in decision making; PI, 2001-02

NIDA R21: Hyperscan: Simultaneous fMRI Across the Internet (Emory University; Greg Berns, PI) Co-Investigator, 2001-03, DA014883

MacArthur Foundation: Neural Bases of Placebo Effect and the Expectation of Pain; PI, 2001-03

NIMH P50: IBSC: Toward a Neurobiologically Constrained Framework for Modeling Human Cognition (James L. McClelland, PI); Project 4: Mechanisms of Cognitive Control; PI Project 4, 2002-07, MH64445

NIMH RO1: New Wavelet-Based and Source Separation Methods for fMRI (Ingrid Daubechies, PI); Co-Investigator, 2002-07, MH067204

NIMH T32: Training Program in Quantitative Neuroscience; PI, 2002-present, MH65214

NJCST: Center for Molecular and Biomolecular Imaging (Warren Warren, PI); Co-Investigator, 2002-09

DURIP: Computing Environment for Computational Modeling of Brain Functions; PI, 2003, ONR

NSF BCS: Social Cognitive Neuroscience of Category-based Responses (Susan Fiske, PI); Co-Investigator, 2004-05

NIDA RO1: Neural Mechanisms and Social Influence in Delay Discounting and Impulsive Behavior; PI, 2006-11, DA022564

NIDA T90: Training Program in Quantitative and Computational Neuroscience (David Tank, Co-PI); Co-PI (David Tank, Co-PI), 2006-11, DA022770

MURI: Dynamic Decision Making in Complex Task Environments: Principles and Neural Mechanisms (James L. McClelland, PI); Co-Investigator, 2006-11, AFOSR

MURI: Behavioral Dynamics in the Cooperative Control of Mixed Human/Robotic Teams (John Baillieul, PI); Co-Investigator, 2006-11, AFOSR

DURIP: A Second Generation Flexible Computing Environment for Computational Modeling of Brain Function and Neuroimaging Data Analysis; PI, 2008, AFOSR

NCRR: Expansion of a Computing Facility for fMRI and Neuroimaging Analysis; PI, 2008, RR023532

NSF MRI: Acquisition of High Performance Compute Cluster for Multivariate Realtime; PI, 2012, BCS1229597

John Templeton Foundation: Toward a Scientific Understanding of the Human Capacity for Cognitive Control; PI, 2012-2022

Intel Corporation: Advanced Methods for Realtime Analysis of Human Brain Imaging Data; PI, 2014-2019

Templeton World Charity: System-Level Modeling of Intelligent Behavior; PI, 2018-2020, Beyond Turing

NIH CTSA: New Jersey Alliance for Clinical and Translational Science Co-Investigator, 2019-2024, UL1 TR003017

NIH R21: PsyNeuLink: A Block Modeling Environment for Cognitive Neuroscience; PI, 2019-2021, MH117548

NSF Convergence Accellerator — Track D: A Standardized Model Description Format for Accelerating Convergence in Neuroscience, Cognitive Science, Machine Learning and Beyond; PI, 2020-2021

DURIP: A Balanced, shared Computational Resource for Multidisciplinary Neuroscience Research; PI, 2020, AWD1006863

Vannevar Bush Faculty Fellowship: Toward a Brain-Inspired Model of the Flexibility and Autonomy of Human Behavior; PI, 2021-2026, N00014-22-1-2002

2. Invited Lectureships

American Association for the Advancement of Science (2002)

American Association of Directors of Psychiatry Residency Training (AADPRT), Annual Meeting, Schein Lecture (2012)

American College of Neuropsychopharmacology, Panels (1994, 1995, 1997, 1998, 1999, 2005)

American Economic Association, Symposia (2003, 2005, 2006)

American Psychological Association, Distinguished Scientific Contribution Award Lecture (2010)

American Psychological Society (1994, 1998)

ARVO (2000)

Association for Research in Nervous and Mental Disease, Annual Conference Special Lecture (2006)

Association for Psychological Science, William James Award Public Address (2018)

Attention and Performance XV, XVIII (1992, 1998)

Baylor College of Medicine, Neuroscience Colloquium (1999); Keynote speaker, Annual Neuroscience Retreat and Rush and Helen Record Forum (2008)

Beckman Institute for Advanced Science and Technology, University of Illinois, Smith, Hinchman & Grills Distinguished Lecture (2003)

Behavioral Neurology Society, Keynote Address (1998)

Biological Psychiatry Society, Presidential Symposium (2002, 2008)

Boston University, Department of Cognitive and Neural Systems Colloquium (2001)

Brandeis University, Department of Biology, Colloquium (1997, 2003)

Brown University, Shlossberg Colloquium (2017)

California Institute of Technology 2nd Annual Chen Center Distinguished Lecture (2018)

Cambridge University and the Royal Society, Symposium on Executive and Cognitive Functions of Prefrontal Cortex (1996)

Cardiff University, Cardiff Cognitive Neuroscience Seminar Series (2005) Carmel Conference XV (1997)

Carnegie Mellon University, Psychology Department Colloquium (1994, 2009)

CENTAI, Turin (2023), Navigating the Research Frontier of AI and Complexity

Cognitive Neuroscience Society (1995, 1996, 2000, 2002, 2006)

Cognitive Neuroscience Treatment Research to Improve Cognition in Schizophrenia Meeting, Invited Talk (2007)

Cold Spring Harbor Laboratory, Computational and Systems Neuroscience Workshop (2004)

College de France, Colloque de Rentrée, Invited Talk (2007)

Columbia Presbyterian Hospital, Joseph Zubin Memorial Fund Award Lecture (1994)

Columbia University, College of Physicians and Surgeons, Department of Psychiatry, Grand Rounds (1990)

Columbia University, College of Physicians and Surgeons, Department of Economics, Cognition and Decision Seminar Series (2016)

Computational Psychiatry 2017 Keynote Address (2017)

Computational Psychiatry 2018 Keynote Address (2018)

Cornell Medical School, Sackler Institute Colloquium (2002)

CUNY, Department of Psychology Colloquium (2000)

DARPA ISAT Toward Optimal Learning Workshop, Invited Address (2014)

Defense Basic Research Exchange Forum (2023)

Dynamical Systems in Neuroscience, Annual Meeting (1999)

Eden Institute Foundation, Lecture Series Fellow (2001)

Emory School of Medicine, Department of Psychiatry, Grand Rounds (1999)

Ellison Medical Foundation, Workshop of the Biological Assessment of Mental Processes (2006)

Eunice Kennedy Shriver Center for Developmental Cognitive Neuroscience, Colloquium (2000)

FENS and The Brain Prize, Brain Conference on New Insights into Psychiatric Disorders through Computational, Biological and Developmental Approaches, Keynote Address (2016)

Florida State University, Department of Psychology, Colloquium (1998)

Frankfurt Institute for Advanced Studies, Ernst Strüngmann Forum (2007)

Future Science Prize Ceremony and Future Forum Science Symposium Keynote Address (2018)

Harvard University, Department of Psychology, Colloquium (1996, 2002)

Harvard University, Department of Economics, Labor Economics Seminar (2003)

Human Brain Project, Annual Conference (1998, 1999)

Indiana University, William Lowe Bryan Memorial Lecture on Cognitive Science (1992)

Institute for Advanced Studies, Department of Mathematics, Symposium (2003)

Institute of Psychiatry, King's College, London, Paul Janssen Lecture (2010)

Intel Corporation Annual Developers' Conference, Keynote Address (2016)

Intel Corporation, 2018 Consumer Electronics Show Spotlight Presentation (2018)

Intel Corporation Technology Strategy and Leadership Meeting: Outsider Perspective (2018)

Intel Labs Open Innovation Leadership Forum, Invited Address (2015)

Intel Labs, Mini-Symposium: The Mind's Eye Project (2016)

Interface 95 - The 27th Symposium on the Interface: Computing Science and Statistics (1995)

International Conference on Cognitive and Neural Systems, 10th Annual Meeting (2006), Invited Address

International Conference on Cognitive Neuroscience, Keynote Address (1996)

International Congress on Schizophrenia Research (1997), Invited Address

International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine (1997)

International Neuropsychological Society (1992), Invited Address

James S. McDonnell Summer Institute in Cognitive Neuroscience (1995, 1997, 2001)

Japanese Neuropsychological Association, Keynote Address (1997)

Jena International Workshop on Executive Functions and the Brain (2000)

Kern Medina Seminar on Humanities and Science for State and Federal Judges (2014)

Lehigh University, Annual Neuroscience Retreat, Keynote Address (2015)

Library of Congress / NIMH Annual Decade of the Brain Public Program (1999)

Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Distinguished Guest Lecture Series (2011)

McGill University, Department of Psychiatry, Grand Rounds (1991)

Memory Disorders Research Society (1994, 1997, 1999)

Mind-Life Institute / M.I.T. (2003)

National Foundation for Functional Brain Imaging 1st Annual Meeting (1999)

New York Academy of Medicine, Annual Salmon Lecture (2006)

New York Academy of Sciences, Imaging Discussion Group Meeting (2005)

NIDA, Invited Seminar (2011)

NINDS, Cognitive Neuroscience Section, Grand Rounds (1993)

NIMH, St. Elizabeth's Hospital, Grand Rounds (1997)

NIMH Extramural program, Colloquia and Workshops (1999, 2000, 2001)

NIMH Intramural program, Neuroscience Colloquium (1999)

Nordic Center of Excellence and the Stockholm Brain Institute, Invited Talk (2007)

Northern California Psychiatric Society, Award Address (1986)

Northwestern University, Department of Psychology, Colloquium (1998)

NYU, Departments of Psychology and Neuroscience, Colloquia (1999, 2000)

Ohio State University, Mathematical Biosciences Institute Workshop on Systems Level Modeling (2002)

President's Council on Bioethics (2004)

Princeton Conference on Cerebral Vascular Disease (1994)

Princeton Plasma Physics Laboratory, Colloquium (2004)

Princeton University, Department of Psychology, Colloquium (1996)

Princeton University, Council on Science and Technology Public Lecture Series (2000)

Psychonomic Society, Invited Symposium Lectures (1996, 2002)

Queens College, CUNY, Annual Neuropsychology Symposium, Keynote Address (2007)

Reinforcement Learning and Decision Making, First Annual Meeting, Invited Address (2013)

Research Society on Alcoholism, Plenary Address (2002)

Rockefeller University, Neuroscience Colloquium (1999)

Rotman Research Institute, 10th Annual Conference on the Frontal Lobes (2000)

Royal Society, UK, Mental Processes in the Human Brain (2006)

Rutgers University, Department of Psychology & Center for Molecular and Behavioral Neuroscience Colloquium (1999, 2000)

Rutgers University Brain Health Institute, Invited Colloquium Address (2015)

Sierra Ventures 13th Annual CXO Summit Keynote Address (2018)

Simons Foundation SFARI Annual Scientific Meeting Keynote Address (2018)

SISA, Trieste Encounters in Cognition (1992)

Smithsonian Institute Public Lecture Series (1999)

Society for Psychophysiological Research, Invited Address (2006)

Society for Research on Psychopathology (1993)

Stanford University, Neurobiology Department, Frontiers in Neuroscience Lecture Series (2009)

Templeton Foundation, Annual Members Meeting Keynote Address (2016)

Templeton World Charities Fund Diverse Intelligences Grantee Meeting (2018)

TPG Annual Retreat, Featured Speaker (2007)

University of California, Berkeley, Helen Wills Neuroscience Institute Inaugural Lecture (2000)

University of California, Berkeley, Neuroscience Student Seminar Series (2010, 2016)

University of California, Davis, Keynote Address, Opening of Brain Imaging Center (2005)

University of California, Davis, Department of Psychiatry Grand Rounds (2005)

University of California, San Francisco, Department of Psychiatry Grand Rounds (2001)

University College London and Welcome Functional Imaging Laboratory (1997, 2000)

University of Colorado Boulder, Department of Psychology, Symposium (1997, 2002)

University of Colorado Boulder, Determinants of Executive Function & Dysfunction Conference (2013)

University of Illinois, Program in Neuroscience, Colloquium (1998)

University of Michigan, Departments of Psychology and Psychiatry Colloquia (1994, 2000)

University of Michigan, Marshall Weinberg Cognitive Science Symposium (2013)

University of Maryland, Psychiatric Research Center, 25th Anniversary Symposium (2002)

University of Maryland, Cognitive Science Colloquium (2016)

University of Medicine and Dentistry of New Jersey, Graduate Program in Physiology and Neurobiology, Special Lecture (1999)

University of Medicine and Dentistry of New Jersey, Dept. of Neurology Grand Rounds (2002)

University of North Carolina at Greensboro, Kendon Smith Annual Lecture Series (2004)

University of Oregon, Institute of Cognitive and Decision Sciences, Symposia (1990, 1996)

University of Pennsylvania, Department of Psychology, Cognitive Science Program, and Institute for Neural Sciences Colloquia (1996, 2001)

University of Pennsylvania, Institute of Neurological Sciences, James M. Sprague Annual Lecture (2006)

University of Pennsylvania and Philadelphia Psychoanalytic Center, Evening Program (2006)

University of Rochester, Department of Brain and Cognitive Sciences, Colloquium (2006)

University of Texas Austin, Cognitive Neuroscience & Imaging Research Center Seminar, Invited talk (2016)

University of Texas Southwestern Medical Center, Dept. of Psychiatry, Colloquium (2003)

University of Vermont, Department of Psychiatry, Grand Rounds (1992)

University of Waterloo, Centre for Theoretical Neuroscience, 5th Annual Brain Day (2011)

University of Waterloo, Neuroscience Colloquium Series (2021)

University of Wisconsin, Department of Psychology, Colloquium (1987, 2002)

University of Wisconsin Medical School, 5th Annual Symposium on Emotion (1999)

Vanderbilt University, Annual Neuroscience Retreat Keynote Address (2001)

Vanderbilt University, Stroopfest (2002)

Virginia Tech Carilion Research Institute Maury Strauss Distinguished Public Lecture (2018)

Washington University, Department of Psychiatry, Grand Rounds (2003)

Winter Conference on Brain Research (1993, 1996, 1997, 1998)

Workshop on Neural Modeling of Brain and Cognitive Disorders (1995, 1998)

Yale University School of Medicine, Department of Neurobiology, Colloquium (2002)

Yale University School of Medicine, Department of Psychiatry, Abraham Ribicoff Annual Lecture (2004)

3. Other research-related activities

Patents and Licenses

Title: ARTICLES AND METHODS FOR QUANTUM SCHEDULING, U.S. Provisional application 63/689,480 filed 8/29/25 and PCT/US2025/044232 application filed 8/30/25.

Advisory Boards and Councils

Allegheny County Neuropsychiatric Survey, Executive Advisory Board (1996-1998)

University of Michigan, Department of Psychology, External Advisory Board (1997)

National Alliance for Research on Schizophrenia & Depression (NARSAD), Scientific Council (1998-present)

NIMH Board of Scientific Counselors, Advisory Panel on Intramural Research Program (1999)

Yale-New Haven VAMC Schizophrenia Research Center, Scientific Advisory Board (1999)

International Organization of Human Brain Mapping, Governing Council (1998-2002), Treasurer (2000-2001), Chair of Neuroinformatics Committee (1998-2001), Chair, Nominations Committee (2001)

National Foundation for Functional Brain Imaging, Advisory Board (1999-2004)

Center for Magnetic Resonance Research, University of Minnesota, Advisory Board (2000)

Harvard Initiative in Systems Neuroscience, Advisory Board (2000)

American Psychiatric Association / NIMH DSM-V Workgroup on Neuroscience (2000-2002)

NIMH Workgroup on Strategic Plan for Mood Disorders (2000-2002)

International Association for the Study of Attention and Performance, Advisory Council (2001-present)

University of Pennsylvania NIMH Silvio O. Conte Center for Neuroscience Research, "The Neurobiology of Stimulus Encoding in Schizophrenia," External Advisory Board (2003, 2008)

Harvard University, Department of Psychology, External Review Committee (2003)

NIMH Measurement and Treatment Development Activities on Cognition in Schizophrenia (MATRICS), Neurocognition Committee (2002-2006)

Council of Princeton University, Executive Committee (2004-2005)

National Advisory Mental Health Council (NAMHC) (2004-2008)

The Society for Neuroeconomics, Board of Directors (2004-2005)

Gatsby Computational Neuroscience Unit, UCL, Quinquennial Review Panel (2005)

National Advisory Mental Health Council Workgroup on MRI Safety (2005-2007)

Brookhaven National Laboratory, Science and Technology Steering Committee (2005-2014)

Institute for Advanced Studies, Princeton, Decadal Visiting Committee for School of Social Sciences (2007)

National Advisory Mental Health Council Workgroup on Neuroscience Training (2007-2008)

University of Colorado, Boulder NIMH Interdisciplinary Behavioral Science Center, "Executive Function and Dysfunction," External Advisory Board (2009)

Johns Hopkins University, Psychological Brain Sciences Department and Mind Brain Institute External Review Committee (2011)

Princeton University, Research Computing Advisory Council, Member (2011-present)

Harvard University, Mind, Brain and Behavior Initiative, External Review Committee (2013)

Ecole Normale Supérieure, Scientific Advisory Committee of the Département d'Etudes Cognitives (2014-present)

National Academy of Medicine, Forum on Neuroscience (2015-2023)

Yale University, Wu Tsai Institute, External Advisory Board (2022-present)

Max Planck Society, Appointment Commission for MPI for Human Cognitive and Brain Sciences, Member (2024-present)

Princeton University, Senior Advisor for Computing and Data, Office of the Dean for Research (2025-present)

Editorial Boards

American Journal of Psychiatry, Consulting Editor (2001-2006)

Biological Psychiatry, Board of Editors (1999-2009)

Brain Research, Senior Editor for Computational Neuroscience (2005-2010)

Cognitive Neuropsychology, Advisory editor (1997-2002)

Journal of Experimental Psychology: General, Consulting Editor (1996-2005)

Journal of Neurophysiology (2003-2004)

Neuroimage, Board of Editors (2002-2003)

Neuroinformatics, Board of Editors (2002-present)

Neuropsychopharmacology, Board of Editors (1999-2008)

Neuroscience, Board of Editors (1999-2003)

NMR in Biomedicine, Board of Editors (2003-2006)

Proceedings of the Royal Society, Biological Sciences, Board of Editors (2003-2008)

Science, Board of Reviewing Editors (1998-2014)

Trends in Cognitive Science, Advisory Editorial Board (2004-present)

Computational Psychiatry, Editorial Board (2014-present)

Grant Review

Integrative Cognitive Functional Neuroscience Study Section, NIH

Clinical Psychopathology Study Section, NIMH

Human Development and Aging Study Section, NIH

Human Frontier Science Program

Medical Research Council (MRC), UK

National Center for Research Resources, NIH

NIMH Intramural Research Program, NIH

NSF Review Panel

Wellcome Trust

Conference Organization

New Directions in Health Care and Education Annual Colloquium. University of Pennsylvania Medical School, May, 1980. Founder and Co-organizer.

25th Annual Carnegie Symposium on Cognition: Scientific Approaches to the Question of Consciousness. Carnegie Mellon University, May, 1993. Co-organizer.

Center for Neuroscience and Mental Disorders bi-annual workshop: Cognitive Neuroscience Approaches to Schizophrenia. University of Pittsburgh, May, 1994. Organizer.

International Congress on Schizophrenia Research. Colorado Springs, April, 1997. Program Consultant.

Society for Research in Psychopathology. Palm Springs, October, 1997. Program Committee.

Neural Processes & Economics Workshop, Woodrow Wilson School, Princeton University, 2000. Co-organizer.

Organization for Human Brain Mapping, New York City, 2003, Chair, Local Organizing Committee.

Computational Cognitive Neuroscience Conference, Co-Founder (with Randall O'Reilly); 2005-2008, Program Committee.

Membership in Professional Organizations

American Academy of Arts and Sciences

American Association for the Advancement of Science

American Psychological Society

Cognitive Science Society

Psychonomic Society

Society for Neuroscience

Software Development

PsyScope [14]: Designer and Co-Producer with Brian MacWhinney, Psychology, Carnegie Mellon University — this is a graphical, interactive program for the design and implementation of cognitive experimental tasks on Macintosh computers. It provides the ability to present stimuli in text, graphic, and acoustic form, and can be used to record manual or voice responses with millisecond accuracy. It incorporates a fully general scripting language, as well as a graphic interface, and is extensible through the use of plug-and-play add-on modules. PsyScope was originally designed for Mac OS prior to and through System 9. It was independently ported to MacOS X, and continues to be supported by the community, freely available, and widely used (with over 3,000 downloads) for experimental research and as a teaching instrument in research centers throughout the world. The design of PsyScope also provided one of the foundations for E-Prime, a PC/Windows-based commercially supported package that was developed in collaboration with Psychology Software Tools (PST) Inc. and is also in widespread use.

Brain Image Analysis Kit [245]: Project Co-Director, with Ted Willke, Brain Inspired Computing Lab, Intel Labs; Ken Norman, Neuroscience and Psychology, Princeton; and Nicholas Turk-Browne, Psychology, Yale University — this is a Python-based, open source software package, developed in collaboration with Intel Labs, that supports the application of advanced methods from machine learning and multivariate statistics

to the analysis of neuroimaging data. It is tightly integrated with SciKit-Learn, and includes modules for Full Correlation Matrix Analysis (FCMA; Wang et al. 2015), Multi-voxel Pattern Analysis (MVPA), a suite of methods for Shared Response Modeling (SRM) (including hyper alignment and Inter-Subject Functional Correlation [IFSC]), Topographic Factor Analysis (TFA), and Bayesian-derived methods for Representational Similarity Analysis (RSA). Within the first year and a half of its development it has attracted over 9,000 downloads.

RT-Cloud [251]: Project Co-Director, with Ken Norman, Princeton Neuroscience Institute. This is an open-source software package, integrated into the BrainIAK environment, that makes it easier to build and deploy real-time fMRI experiments. The framework provides a coordination hub between the experimenter's script, a subject feedback script, the scanner data, and experiment control. It streams scanner data (in real-time) to an experimenter's script and forwards the results for use in subject feedback (optionally using tools like PsychoPy, jsPsych, or PsychToolbox). It provides a web-based user interface that allows for starting and stopping runs, changing settings, and viewing output. It can be configured to run in the cloud, on a cluster, or in the control room. This framework is under active development with funding from NIMH to further extend its capabilities, including support for standards such as BIDS and OpenNeuro.

PsyNeuLink: Designer and Lead Developer, with Abhishek Bhattacharjee, Computer Science, Yale University and Amitai Shenhav, Brain and Cognitive Sciences, Brown University; and support from Templeton World Charitable Foundation and NIMH — this is a "block modeling environment" designed for use by neuroscientists, psychologists, computational psychiatrists and others interested in building system-level models of the computational mechanisms underlying brain function and its expression in psychological processes and behavior, and in exploring their relationship to developments in research on machine learning and artificial intelligence. It allows components to be constructed that implement various, possibly disparate functions, at potentially different levels of analysis and/or timescale of operation, and integrate these into a coherent modeling environment that can be used to simulate and study their interaction. PsyNeuLink is written in Python, is open source, and meant to be extended. Its goal is to provide an environment for implementing models that are expressed in a concise and easy to read form, and that can be executed, shared, compared, and integrated with one another. PsyNeuLink maintains a publicly accessible library of its components and models, to which users can contribute, providing a common repository for model-sharing in a manner paralleling data-sharing efforts in empirical research.

SweetPea [255]: Co-Designer, with Matthew Flatt and Vivek Srikumar, Computer Science, University of Utah — this is an experimental design environment that simplifies and standardizes the format in which experimental factors are expressed and combined, and used to generate balanced samples of valid trial sequences. As experimental designs in psychology and neuroscience — as well as the theories they are designed to test — become more complex, the ability to insure appropriately balanced sampling of relevant experimental and control conditions becomes increasingly difficult, and designs that do so increasingly difficult to express and/or interpret, which poses challenges to reliability and/or reproducibility of results. Similar problems arise in computational modeling, where uncontrolled or poorly understood differences in the inputs to a simulation can confound interpretations of its behavior, just as it does empirical data. SweetPea addresses this problem by providing a declarative language for expressing a design— in terms of factors (experimental variables), levels (values for those variable to be sampled), crossings among factors, and constraints on trial sequences (e.g., number or types of repeats). The design is then translated into a form (currently, conjunctive normal form) that can be sampled using a SAT solver, to insure that valid trial sequences are sampled in a balanced fashion.

ModECI (Model Exchange and Convergence Initiative) [269]: Lead Developer with Padraig Gleason, Neuroscience, Physiology and Pharmacology, University of College London and NeuroML; in collaboration with Abhishek Bhattacharjee, Computer Science, Yale University; Sharon Crook, Arizona State University and NeuroML, Ted Willke, Brain Inspired Computing Lab, Intel Labs; and support from the NSF Convergence Accelerator Program — this project seeks to accelerate the convergence of progress in the brain, cognitive and computer sciences by facilitating the exchange of computational models through the development of a standardized model description format that expresses models in the form of a computational graph in which each node is a computational component and edges specify connections between them that determine the flow of computation. The format is implemented in serialized forms (e.g., JSON, YAML) that allows the exchange of models in machine-readable form among a broad range of existing environments — from biologically detailed ones (e.g., NeuroML, Emergent, and Nengo) and system-level level packages (such as

PsyNeuLink) to abstract symbol processing environments used in cognitive science (such as ACT-R) and neural network modeling ones served by the ONNX standard used in the machine learning community (e.g., PyTorch and TensorFlow).