

Erica Lindsey Busch

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Education

Yale University

PhD in Psychology, Neuroscience Area

Mentors: Nick Turk-Browne, BJ Casey

New Haven, Connecticut

August 2020 – Present

Dartmouth College

BA in Cognitive Science, Computer Science

Mentors: James Haxby, Caroline Robertson

Thesis (High honors): *A deep learning approach to scene perception in autism*

Hanover, New Hampshire

September 2016 – March 2020

Cum Laude

Centro Tinku Academic Center

Dartmouth Department of Spanish and Portuguese

Advanced Spanish Language Study Abroad

Cusco, Peru

Fall 2017

Papers

Busch, E.L., Rapuano, K.M., Anderson, K.M., Rosenberg, M.D., Watts, R., Casey, BJ, Haxby, J.V., & Feilong, M. (Under review). Dissociation of reliability, predictability, and heritability in fine- and coarse-scale functional connectomes during development. *bioRxiv*.

Busch, E.L., Huang, J., Benz, A., Wallenstein, T., Lajoie, G., Wolf, G., Krishnaswamy, S.*, & Turk-Browne, N.B.* (Under review). Multi-view manifold learning of human brain state trajectories. *bioRxiv*.

Huang, J.*, **Busch, E.L.***, Wallenstein, T., Gerasimiuk, M., Benz, A., Lajoie, G., Wolf, G., Turk-Browne, N.B., & Krishnaswamy, S. (2022). Learning shared neural manifolds from multi-subject fMRI data. *IEEE Machine Learning for Signal Processing*.

Busch, E.L.*, Slipski, L.*, Feilong, M., Guntupalli, J.S., Visconti di Oleggio Castello, M., Huckins, J.F., Nastase, S.A., Gobbini, M.I., Wager, T.D., & Haxby, J.V. (2021). Hybrid hyperalignment: A single high-dimensional model of shared information embedded in cortical patterns of response and functional connectivity. *NeuroImage*.

Busch, E.L., Feilong, M., Nastase, S.A., & Haxby, J.V. (In prep). Individual differences in fine-grained signatures of mental states.

Walton, A., **Busch, E.L.**, Ratoff, W., Smith, W., Holtzheimer, P., & Roskies, A. (In prep). An assessment tool for understanding changes in agency with neurointerventions.

Honors and Scholarships

Social and Affective Neuroscience Society

SANS Data Competition; 1st prize team

Graduate Research Fellowship

2022

2021-2024

National Science Foundation
 Title: *Enhancing human learning along the neural manifold.*

Outstanding Undergraduate Research Award 2020
 Neukom Institute for Computational Science; 2nd Prize

Made at Dartmouth Research Competition Winner 2020
 Dartmouth Undergraduate Advising and Research; [Grand Prize](#)

Academic Achievement Prize 2020
 Dartmouth College Cognitive Science Program

Fulbright Fellowship Finalist (Withdrew due to COVID-19) 2020
 Fulbright Committee

High Honors in Cognitive Science 2020
 Dartmouth College Cognitive Science Program

William H. Neukom 1964 Scholar Award 2019 and 2020
 Neukom Institute for Computational Science

Citation for Academic Excellence in Machine Learning 2019
 Dartmouth College Department of Computer Science

Research Experience for Undergraduate (REU) Fellow 2019
 National Science Foundation

Citation for Academic Excellence in Cognitive Neuroscience 2019
 Dartmouth College Department of Psychological and Brain Sciences

David C. Hodgson Endowment Award 2019
 Undergraduate research in the field of cognitive neuroscience

James O. Freedman Presidential Scholar 2018-2019
 Dartmouth Undergraduate Advising and Research

Sophomore Research Scholar 2018
 Dartmouth Undergraduate Advising and Research

Dartmouth College Honors List 2017-2020
 Office of the Registrar

Citation for Academic Excellence in Intro to Programming 2017
 Dartmouth College Department of Computer Science

National Merit Scholarship Finalist 2015
 National Merit Scholarship Corporation

Presentations

Busch, E.L., Letrou, A., Huang, J., Lajoie, G., Wolf, G., Krishnaswamy, S., & Turk-Browne, N.B. (2022). A neural manifold learning framework for real-time fMRI neurofeedback. *Society for Neuroscience Annual Meeting.*

Busch, E.L., Letrou, A., Huang, J., Lajoie, G., Wolf, G., Krishnaswamy, S., & Turk-Browne, N.B. (2022). A neural manifold learning framework for real-time fMRI neurofeedback. *Real-time Functional Imaging and Neurofeedback Meeting.*

Busch, E.L., Rapuano, K.M., Anderson, K.M., Rosenberg, M.D., Watts, R., Casey, B.J., Haxby, J.V., & Feilong, M. (2022). Heritable template underlies reliable idiosyncrasies in the developing fine-scale connectome. *Organization for Human Brain Mapping Annual Meeting.*

Letrou, A., **Busch, E.L.**, & Turk-Browne, N.B., (2022). Relating neural dynamics and emotion dynamics with nonlinear manifold learning. *Social and Affective Neuroscience Society Annual Meeting*.

Busch, E.L., Huang, J., Benz, A., Wallenstein, T., Lajoie, G., Wolf, G., Krishnaswamy, S., & Turk-Browne, N.B. (2021). Manifold learning to capture brain-state trajectories in fMRI. *Society for Neuroscience Annual Meeting*.

Walton, A.E., Nizzi, M.C., West, B., Mofe, E., Roth, R.M., **Busch, E.L.**, Holtzheimer, P.E., & Roskies A.L. (2021). The impact of anxiety and depression on dimensions of agency. *Seventh Annual NIH BRAIN Initiative Annual Meeting*.

Sivitilli, D.M., Weertman, W.L., **Busch, E.L.**, Ullmann, J.F., Smith, J.R., Gire, D.H. (2021). Strategies of single arm foraging in Octopus rubescens in the absence of visual feedback. *Society for Integrative and Comparative Biology*.

Busch, E.L., Haskins, A.J., Isik, L., & Robertson, C.E. (2020) A deep learning approach to understanding real-world scene perception in autism. *Presidential Undergraduate Research Symposium, Dartmouth College*.

Walton, A.E., **Busch, E.L.**, Ratoff, W., Smith, W., Holtzheimer, P.E., & Roskies, A.L. (2020). Developing an agency assessment tool for understanding changes in agency with neurointerventions: Preliminary results. *Sixth Annual NIH BRAIN Initiative Annual Meeting*.

Botch, T.L., **Busch, E.L.**, & Robertson, C.E. (2020). Application of deep neural networks to model omnidirectional gaze behavior in immersive VR. *Vision Sciences Society Annual Meeting*.

Busch, E.L., Sivitilli, D.M., & Gire, D.H. (2019). Using deep learning to model octopus arm motion. *Center for Neurotechnology Research Symposium, University of Washington*.

Busch, E.L., Ma, F., Nastase, S.A., & Haxby, J.V. (2019). Individual differences in fine-grained neural correlates of mental states. *Wetterhahn Science Symposium, Dartmouth College*.

Invited talks

Yale Brain Imaging Center Users Meeting October 2022

Title: *Enhancing human learning along the neural manifold*.

ABCD Imaging Analytics Working Group September 2022

Title: *The LEGO theory of the developing functional connectome*.

Current Works in Behavior, Genetics, and Neuroscience April 2022

Title: *The LEGO theory of the developing functional connectome*.

Guest lecture in NSCI 270: Yale University November 2021

Title: *Advanced fMRI analysis techniques*.

FINN Lab Meeting, Dartmouth College April 2021

Title: *Hyperalignment: Foundations, flavors, and functions*

Research experience

Turk-Browne Lab 2020 – Present

Mentor: Nick Turk-Browne Yale University

Research focus: Machine learning, real-time fMRI, neurofeedback.

	Fundamentals of the Adolescent Brain (FAB) Lab 2020 – Present Mentor: B.J. Casey Yale University Research focus: Computational models of heritability, functional connectivity, and neurocognition in adolescents.
	Haxby Lab 2018 – 2020 Mentors: James V. Haxby and Feilong Ma Dartmouth College Research focus: Hyperalignment algorithms, naturalistic stimuli.
	Robertson Lab 2019 – 2020 Mentor: Caroline Robertson Dartmouth College Research focus: Deep learning models of visual perception in autism.
	Laboratory of Comparative Systems Neuroscience Summer 2019 Mentor: David Gire University of Washington Research focus: Deep learning models of octopus foraging.
Teaching experience	Teaching Fellow, Department of Psychology Yale University Fall 2022 NSCI 160/PSYC 160: The human brain. Teaching Fellow, Department of Psychology Yale University Spring 2022 PSYC 258/558/NCSI 258: Computational methods in human neuroscience. Teaching Fellow, Department of Psychology Yale University Fall 2021 PSYC 270 /NCSI 270: Research methods in cognitive neuroscience. TA, Department of Computer Science Dartmouth College Spring 2020 COSC 74: Machine learning and statistical data analysis TA, Department of PBS Dartmouth College Winter 2019 PSYC 6: Introduction to neuroscience Peer Tutor, Tutor Clearinghouse Dartmouth College 2017 - 2020 SPAN 1-3 (Intro Spanish), SPAN 9 (Culture and Conversation: Advanced), SPAN 20 (Writing and Reading) COSC 1 (Intro to Programming and Computation), COSC 10 (Object-Oriented Programming), COSC 50 (Software Design), COSC 74 (Machine Learning) PSYC 6 (Intro to Neuroscience), PSYC 10 (Statistics) COGS 1 (Intro to Cognitive Science) Instructor, Sonia Kovalevsky Math Day Dartmouth College Spring 2018 Co-developed and facilitated workshop for young female students to learn the basics of cryptography. College Access Coach, Let's Get Ready Summer 2017 Created and taught bi-weekly math and verbal SAT prep classes for NYC low-income high school students. Private tutor 2012 – Present <i>Grade 3 - undergraduate</i> K-12: New York State Regents mathematics and sciences, English, writing, Spanish, history, Advanced Placement (AP) Calculus AB and BC, AP Statistics, AP Physics, AP Computer Science, SAT / ACT Undergraduate: Algebra, graph theory, programming in Java, Spanish.

Service and outreach	Yale Psychology Colloquium Committee	2021–present
	Yale Psychology Diversity Committee Sneak Peek	2022–present
	Graduate school application mentor.	
	Innovators in Cognitive Neuroscience	2020–present
	Founding member and Yale University coordinator for the Innovators in Cognitive Neuroscience speaker series.	
	SIBS Youth Mentoring Program	2016 – 2020
	<i>Dartmouth Center for Social Impact</i>	
	Directed and mentored for a one-on-one youth mentorship program for Dartmouth undergrads and Upper Valley youth. Responsible for communication with mentors, parents, and social workers, and interviewing/training mentors.	
	Dartmouth Leadership, Attitudes, and Behaviors Program	2018 – 2019
	<i>Nelson A. Rockefeller Center for Public Policy</i>	
Reviewing	Facilitated student discussion groups about value-driven leadership, both on campus and in practice.	
Reviewing	Proceedings of the National Academy of Sciences of the United States of America; International Conference on Learning Representations	
Skills	Programming	
	Proficient in: Python, MATLAB, BASH, C, C# for Unity, R, Java.	
	Familiar with: Keras, Caffe, Tensorflow, HTML, C++, Torch.	
	Languages	
	Spanish (fluent), Italian and Portuguese (intermediate)	
	Miscellaneous	
	Equestrian, freelance data science, running, hiking, reading fiction.	
	Extensive dog sitting credentials and enthusiasm.	