

# 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

GPA: 3.81; *Cum Laude*

### **Centro Tinku Academic Center**

Dartmouth Department of Spanish and Portuguese

Advanced Spanish Language Study Abroad

Cusco, Peru

Fall 2017

GPA: 4.00

## Papers

**Busch, E.L.**, Rapuano, K.M., Anderson, K.M., Rosenberg, M.D., Watts, R., Casey, BJ, Haxby, J.V., & Feilong, M. (Under review). The LEGO theory of the developing functional connectome. *bioRxiv*.

**Busch, E.L.**, Huang, J., Benz, A., Wallenstein, T., Lajoie, G., Wolf, G., Krishnaswamy, S.\*, & Turk-Browne, N.B.\* (Submitted). Temporal PHATE: A multi-view manifold learning method for 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. (Under review). Learning shared neural manifolds from multi-subject fMRI data. *arXiv*.

**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

2022

### **Graduate Research Fellowship**

National Science Foundation

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

2021-2024

<b>Outstanding Undergraduate Research Award</b>	2020
Neukom Institute for Computational Science; 2nd Prize	
<b>Made at Dartmouth Research Competition Winner</b>	2020
Dartmouth Undergraduate Advising and Research; <a href="#">Grand Prize</a>	
<b>Academic Achievement Prize</b>	2020
Dartmouth College Cognitive Science Program	
<b>Fulbright Fellowship Finalist</b> (Withdrew due to COVID-19)	2020
Fulbright Committee	
<b>High Honors in Cognitive Science</b>	2020
Dartmouth College Cognitive Science Program	
<b>William H. Neukom 1964 Scholar Award</b>	2019 and 2020
Neukom Institute for Computational Science	
<b>Citation for Academic Excellence in Machine Learning</b>	2019
Dartmouth College Department of Computer Science	
<b>Research Experience for Undergraduate (REU) Fellow</b>	2019
National Science Foundation	
<b>Citation for Academic Excellence in Cognitive Neuroscience</b>	2019
Dartmouth College Department of Psychological and Brain Sciences	
<b>David C. Hodgson Endowment Award</b>	2019
Undergraduate research in the field of cognitive neuroscience	
<b>James O. Freedman Presidential Scholar</b>	2018-2019
Dartmouth Undergraduate Advising and Research	
<b>Sophomore Research Scholar</b>	2018
Dartmouth Undergraduate Advising and Research	
<b>Dartmouth College Honors List</b>	2017-2020
Office of the Registrar	
<b>Citation for Academic Excellence in Intro to Programming</b>	2017
Dartmouth College Department of Computer Science	
<b>National Merit Scholarship Finalist</b>	2015
National Merit Scholarship Corporation	

#### Presentations

**Busch, E.L.**, Huang, J., Lajoie, G., Wolf, G., Krishnaswamy, S., & Turk-Browne, N.B. (2022). A neural manifold learning framework for real-time fMRI neuro-feedback. *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	<b>Current Works in Behavior, Genetics, and Neuroscience</b>	April 2022
	Title: <i>The LEGO theory of the developing functional connectome</i> .	
	<b>Guest lecture in NSCI 270: Yale University</b>	November 2021
	Title: <i>Advanced fMRI analysis techniques</i> .	
Research experience	<b>FINN Lab Meeting, Dartmouth College</b>	April 2021
	Title: <i>Hyperalignment: Foundations, flavors, and functions</i>	
	<b>Turk-Browne Lab</b>	2020 – Present
	Mentor: Nick Turk-Browne	Yale University
	Research focus: Machine learning, real-time fMRI, neurofeedback.	
	<b>Fundamentals of the Adolescent Brain (FAB) Lab</b>	2020 – Present
	Mentor: B.J. Casey	Yale University
	Research focus: Computational models of heritability, functional connectivity, and neurocognition in adolescents.	
	<b>Haxby Lab</b>	2018 – 2020
	Mentors: James V. Haxby and Feilong Ma	Dartmouth College
	Research focus: Hyperalignment algorithms, naturalistic stimuli.	
	<b>Robertson Lab</b>	2019 – 2020
	Mentor: Caroline Robertson	Dartmouth College
	Research focus: Deep learning models of visual perception in autism.	

	<p><b>Laboratory of Comparative Systems Neuroscience</b> Summer 2019  Mentor: David Gire University of Washington  Research focus: Deep learning models of octopus foraging.</p>
Teaching experience	<p><b>Teaching Fellow, Department of Psychology</b> Yale University Spring 2022  PSYC 258/558/NCSI 258: Computational methods in human neuroscience.</p> <p><b>Teaching Fellow, Department of Psychology</b> Yale University Fall 2021  PSYC 270 /NCSI 270: Research methods in cognitive neuroscience.</p> <p><b>TA, Department of Computer Science</b> Dartmouth College Spring 2020  COSC 74: Machine learning and statistical data analysis</p> <p><b>TA, Department of PBS</b> Dartmouth College Winter 2019  PSYC 6: Introduction to neuroscience</p> <p><b>Peer Tutor, Tutor Clearinghouse</b> 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)</p> <p><b>Instructor, Sonia Kovalevsky Math Day</b> Dartmouth College Spring 2018  Co-developed and facilitated workshop for young female students to learn the  basics of cryptography.</p> <p><b>College Access Coach, Let's Get Ready</b> Summer 2017  Created and taught bi-weekly math and verbal SAT prep classes for NYC low-  income high school students.</p> <p><b>Private tutor</b> 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 Statis-  tics, AP Physics, AP Computer Science, SAT / ACT  Undergraduate: Algebra, graph theory, programming in Java, Spanish.</p>
Service and outreach	<p><b>Innovators in Cognitive Neuroscience</b> 2020–present  Founding member and Yale University coordinator for the Innovators in Cog-  nitive Neuroscience speaker series.</p> <p><b>SIBS Youth Mentoring Program</b> 2016 – 2020  <i>Dartmouth Center for Social Impact</i>  Directed and mentored for a one-on-one youth mentorship program for Dart-  mouth undergrads and Upper Valley youth. Responsible for communication  with mentors, parents, and social workers, and interviewing/training mentors.</p> <p><b>Dartmouth Leadership, Attitudes, and Behaviors Program</b> 2018 – 2019  <i>Nelson A. Rockefeller Center for Public Policy</i>  Facilitated student discussion groups about value-driven leadership, both on  campus and in practice.</p>

## 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, running, hiking, rock climbing, reading fiction, burning food.

Extensive dog sitting credentials and enthusiasm.