Erica Lindsey Busch

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Education

Yale University — New Haven, Connecticut
PhD Candidate, Neuroscience — August 2020 – Present
Advisors: Nick Turk-Browne, BJ Casey
Thesis topic: Manifold learning and neurofeedback with fMRI

Dartmouth College — Hanover, New Hampshire
BA in Cognitive Science, Computer Science — September 2016 – March 2020
Advisors: James Haxby, Caroline Robertson — *Cum Laude*
Thesis (High honors): *A deep learning approach to scene perception in autism*

Centro Tinku Academic Center — Cusco, Peru
Dartmouth Department of Spanish and Portuguese — Fall 2017
Advanced Spanish Language Study Abroad

Papers

Busch, E.L., Huang, J., Benz, A., Wallenstein, T., Lajoie, G., Wolf, G., Krishnaswamy, S.*, & Turk-Browne, N.B.* (2023). Multi-view manifold learning of human brain-state trajectories. *Nature Computational Science.*

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.*

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.*

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 — 2022
SANS Data Competition; 1st prize team

Graduate Research Fellowship — 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

Posters and Presentations

Busch, E.L., Bhaskar, D., Letrou, A., Zhang, X., Noah, J.A., Lajoie, G., Hirsch, J., Turk-Browne, N.B., Krishnaswamy, S. (2022). An encoder-decoder framework for cross-modal translation of brain imaging data. *Poster and selected lightning talk, Montreal AI-Neuroscience 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. *Poster at 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. *Poster at Real-time Functional Imaging and Neurofeedback Meeting.*

Busch, E.L., Rapuano, K.M., Anderson, K.M., Rosenberg, M.D., Watts, R., Casey, BJ, Haxby, J.V., & Feilong, M. (2022). Heritable template underlies reliable idiosyncrasies in the developing fine-scale connectome. *Poster at 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. *Poster and talk at 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. *Poster at 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. *Poster at 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. *Poster at 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

Shine Lab Meeting, University of Sydney April 2023
Title: *Multi-view manifold learning of human brain-state trajectories.*

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 Spring 2023

PSYC 258/558/NCSI 258: Computational methods in human neuroscience.

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

Grade 3 - undergraduate

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

Innovators in Cognitive Neuroscience 2020–present

Founding member and Yale University coordinator for the Innovators in Cognitive Neuroscience speaker series.

Wu Tsai Institute 2022–present

Student-Postdoc Committee Fellow.

Yale Psychology Colloquium Committee 2021–present

Yale Psychology Diversity Committee Sneak Peek 2022–present

Graduate school application mentor.

SIBS Youth Mentoring Program 2016 – 2020

Dartmouth Center for Social Impact

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

Nelson A. Rockefeller Center for Public Policy

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.