Erica Lindsey Busch

Updated June 26, 2025

Email: erica.busch@yale.edu
Github: github.com/ericabusch
Website: ericabusch.github.io
LinkedIn: linkedin.com/in/erica-busch

Education

Yale University — August 2020 – Present
PhD Candidate, Neuroscience — Department of Psychology
Master of Philosophy, Master of Science — 2023
Thesis: Understanding and enhancing human cognition along neural manifolds
Advisor: Nicholas Turk-Browne

Dartmouth College — September 2016 – March 2020
BA in Cognitive Science, Computer Science — High Honors
Thesis: A deep learning approach to scene perception in autism
Advisors: James Haxby, Caroline Robertson

Centro Tinku Academic Center — August – November 2017
Advanced Language Study Abroad in Spanish — Cusco, Peru

Awards and honors

ReproNim/INCF Fellowship ($700) — 2024–2026
Center for Reproducible Neuroimaging Train-the-Trainer Program

Conference Travel Fellowship ($800) — 2025
Yale University Graduate Student Assembly

Google PhD Fellowship (Finalist) — 2024

Society for Neuroscience Annual Meeting Travel Award ($500) — 2023
Wu Tsai Institute at Yale University

Social and Affective Neuroscience Society Naturalistic Data Challenge (First Prize) — 2022
Project title: Relating neural dynamics and emotion dynamics with nonlinear manifold learning

National Science Foundation Graduate Research Fellowship ($138,000) — 2021–2024
Project title: Enhancing human learning along neural manifolds

Outstanding Undergraduate Research Award (2nd Prize) — 2020
Neukom Institute for Computational Science

"Made at Dartmouth" Research Competition Winner (First Prize) — 2020
Dartmouth College Undergraduate Advising and Research, video

Academic Achievement Prize in Cognitive Science — 2020

Fulbright Fellowship (Finalist, withdrew due to COVID-19) — 2020

High Honors in Cognitive Science — 2020

William H. Neukom Scholarship ($1,000, awarded twice) — 2019-2020
Neukom Institute for Computational Science

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

National Science Foundation Research Experience for Undergraduates ($5,500) — 2019
University of Washington Center for Neurotechnology
Project title: Deep learning models of octopus arm decision-making

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

David C. Hodgson Endowment Award for Cognitive Neuroscience Research ($5,000) 2019
Dartmouth College Undergraduate Advising and Research

James O. Freedman Presidential Scholarship ($1,000, awarded twice) 2018–2019
Dartmouth College Undergraduate Advising and Research

Sophomore Research Scholarship, Dartmouth College ($1,000) 2018
Dartmouth College Undergraduate Advising and Research

Citation for Academic Excellence in Introduction to Programming & Computation 2017
Dartmouth College Department of Computer Science

Honors List, Dartmouth College 2017-2020

National Merit Scholarship (Finalist) 2015

*** Awarded scholarship, fellowship, & grant amounts in USD*

Publications

Peer-reviewed articles and conference proceedings

Busch, E.L. & Turk-Browne, N.B. (2025). Intrinsic dimensionality of brain activity manifolds across tasks and development. *Accepted, Proceedings of the 8th Annual Conference on Cognitive Computational Neuroscience.*

Afrasiyabi, A., Bhaskar, D., **Busch, E.L.,** Caplette, L., Singh, R., Lajoie, G., Turk-Browne, N.B., & Krishnaswamy, S. (2025). Latent representation learning for multimodal brain activity translation. *IEEE International Conference on Acoustics, Speech, and Signal Processing [ICASSP2025].* 10.1109/ICASSP49660.2025.10887834

Busch, E.L.*, Conley, M.I.*, & Baskin-Somers, A. (2024). Manifold learning uncovers nonlinear interactions between the adolescent brain and environment that predict emotional and behavioral problems. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging.* doi.org/10.1016/j.bpsc.2024.07.001
• Analysis repository: github.com/ericabusch/manifold_abcd_psychopathology_bpcnni
• PIP package: pypi.org/project/EPHATE/

Roskies, A., **Busch, E.L.**, & Walton, A. Agency as a framework for thinking about neuropsychiatric disease: A prelude to asking causal questions. *Causal Concepts in Psychopathology: Multidisciplinary Perspectives*, Cambridge University Press.

Busch, E.L., Fincke, E.C., Lajoie, G., Krishnaswamy, S., & Turk-Browne, N.B. (2024). Learning along the manifold of human brain activity via real-time neurofeedback. *Proceedings of the 7th Annual Conference on Cognitive Computational Neuroscience.*

Busch, E.L., Rapuano, K.M., Anderson, K.M., Rosenberg, M.D., Watts, R., Casey, BJ, Haxby, J.V., & Feilong, M. (2024). Dissociation of reliability, predictability, and heritability in fine- and coarse-scale functional connectomes during development. *Journal of Neuroscience.* 44(6), doi:10.1523/JNEUROSCI.0735-23.2023.
• Analysis repository: github.com/ericabusch/ABCD_hyperalignment_JNeurosci

Skalaban, L.J., Chan, I., Lin, Q., Rapuano, K.M., Conley, M.I., **Busch, E.L.**, Watts, R., Murty, V., & Casey, B.J. (2024). Representational dissimilarity of faces and places during a working memory task is associated with subsequent recognition memory during development. *Journal of Cognitive Neuroscience.* 36(3) 415-434, doi:10.1162/jocn_a_02094.

Afrasiyabi, A., **Busch, E.L.,** Singh, R., Bhaskar, D., Capette, L., Turk-Browne, N.B., Krishnaswamy, S. (2024). Looking through the mind's eye via multimodal encoder-decoder networks. *Machine as Medium: Proceedings of the Center for Collaborative Arts and Media*, Fall 2024 Volume. doi:10.48550/arXiv.2410.00047.

Busch, E.L., Yates, T.S., & Turk-Browne, N.B. (2023). Tasks collapse the intrinsic dimensionality of activity in non-selective cortex. *Proceedings of the 6th Annual Conference on Cognitive Computational Neuroscience.*

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.* 3(3), 240-253, doi:10.1038/s43588-023-00419-0

• Analysis repository: github.com/ericabusch/tphate_analysis_capsule
• PIP package: pypi.org/project/TPHATE/

Busch, E.L. & Krishnaswamy, S. (2023). Revealing trajectories of the mind via non-linear manifolds of brain activity. *Nature Computational Science.* 3(3), 192-193, doi.org/10.1038/s43588-023-00423-4 *Invited research briefing.*

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. *Proceedings of the 32nd IEEE Machine Learning for Signal Processing.* doi:10.1109/MLSP55214.2022.9943383

Busch, E.L.*, Slipski, L.*, Feilong, M., Guntupalli, J., Visconti di Oleggio Castello, M., Huckins, J., Nastase, S., Gobbini, M.I., Wager, T., & Haxby, J. (2021). Hybrid hyperalignment: A single high-dimensional model of shared information embedded in cortical patterns of response and functional connectivity. *NeuroImage.* 233, doi:10.1016/j.neuroimage.2021.117975
• Analysis and software repository: github.com/ericabusch/hybrid_hyperalignment_neuroimage

Manuscripts

Busch, E.L., Fincke, E.C., Lajoie, G., Krishnaswamy, S., & Turk-Browne, N.B. Accelerated learning of a noninvasive human brain-computer interface via manifold geometry. (Article under review), Preprint doi:10.1101/2025.03.29.646109

Busch, E.L., Turk-Browne, N.B., & Baskin-Sommers, A.R. Revamping neuroimaging analysis to reveal biomarkers of adolescent mental health. (Invited Perspective under review)

Busch, E.L., & Turk-Browne, N.B. Intrinsic dimensionality of brain activity manifolds across diverse tasks and development. (In prep)

*Denotes equal contribution.

Invited talks

Workshop on Functional Alignment — *Upcoming: Sept. 2025*
Center for Cognitive Neuroscience, Dartmouth College

Center for Neuroscience Imaging Research Seminar — *Upcoming: July 2025*
Sungkyunkwan University, Suwon, South Korea

International Symposium on Decoded Neurofeedback — *Upcoming: July 2025*
Advanced Telecommunications Research Institute, Kyoto, Japan

Manhattan Area Memory Meeting — June 2025
Columbia University's Zuckerman Institute

fMRI Brown Bag — May 2025
Center for Cognitive Neuroscience, Dartmouth College

CompCog Joint Lab Meeting — Apr. 2025
Department of Cognitive Science, Yale University

Schoenbaum and Kahnt Labs Meeting — Apr. 2025
National Institute on Drug Abuse

Cognitive Science Group Meeting — Apr. 2025
Johns Hopkins University

Magnetic Resonance Research Center fMRI Lecture Series — Dec. 2024
Department of Radiology, Yale University

Kavli at Yale 20th Anniversary Symposium — Sept. 2024
Kavli Institute for Neuroscience, Yale University

ABCD Insights & Innovations Meeting — Mar. 2024
National Institute of Health

BrainWorks Projects in Progress — Nov. 2023
Wu Tsai Institute at Yale University

Shine Lab Meeting — Apr. 2023
The University of Sydney

MRI Users Meeting — Oct. 2022
FAS Brain Imaging Center, Yale University

Imaging Analytics Meeting — Sept. 2022
Adolescent Brain and Cognitive Development (ABCD) project resting-state fMRI working group

Current Works in Behavior, Genetics, and Neuroscience, Yale University — Apr. 2022
Yale University Department of Psychology

FINN Lab Meeting — Apr. 2021
Department of Psychological and Brain Sciences, Dartmouth College

Conference presentations

Busch, E.L., & Turk-Browne, N.B. (2025) Intrinsic dimensionality of brain activity manifolds across tasks and development. *Poster at 8th Annual Conference on Cognitive Computational Neuroscience.* Amsterdam, Netherlands

Busch, E.L., & Turk-Browne, N.B. (2025) Developmental differences in the intrinsic dimensionality of regional brain activity. *Poster at the Cognitive Neuroscience Society Annual Meeting.* Boston, M.A., USA.

Busch, E.L., Fincke, E.C., Lajoie, G., Krishnaswamy, S., & Turk-Browne, N.B. (2024) Learning along the manifold of human brain activity via real-time neurofeedback. *Oral Presentation at the Real-time Functional Imaging and Neurofeedback (rt-FIN) Meeting.* Heidelberg, Germany.

Busch, E.L., Fincke, E.C., Lajoie, G., Krishnaswamy, S., & Turk-Browne, N.B. (2024) Learning along the manifold of human brain activity via real-time neurofeedback. *Contributed Talk and Poster at 7th Annual Conference on Cognitive Computational Neuroscience.* Cambridge, M.A., USA.

Busch, E.L., Conley, M.I., & Baskin-Sommers, A. (2024). Using manifold learning to uncover the embedded brain and implications for mental health in youth. *Poster at the Organization for Human Brain Mapping Annual Meeting.* Seoul, South Korea.

Busch, E.L., Fincke, E.C., Lajoie, G., Krishnaswamy, S., & Turk-Browne, N.B. (2024). Learning on the manifold of human brain activity through real-time neurofeedback. *Poster at the Organization for Human Brain Mapping Annual Meeting.* Seoul, South Korea.

Busch, E.L., Fincke, E.C., Lajoie, G., Krishnaswamy, S., & Turk-Browne, N.B. (2023). Learning on the manifold of human brain activity through real-time neurofeedback. *Talk at the Society for Neuroscience Annual Meeting Nanosymposium on Neural Decoding and Neuroprosthetics.* Washington, D.C., USA.

Busch, E.L., Yates, T.S., & Turk-Browne, N.B. (2023). Tasks constrain the intrinsic dimensionality of activity in non-selective cortex. *Poster at the 7th Annual Conference on Cognitive Computational Neuroscience.*, Oxford, United Kingdom.

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 at the Montreal AI-Neuroscience Meeting.* Montreal, QC, Canada.

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 the Society for Neuroscience Annual Meeting.* San Diego, CA, USA.

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 the Real-time Functional Imaging and Neurofeedback Meeting.* New Haven, CT, USA.

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 the Organization for Human Brain Mapping Annual Meeting.* Glasgow, Scotland.

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

Roskies, A., Walton, A., Roth, R.M., **Busch, E.L.,** Holtzheimer, P.E., (2022). Measuring the dimensions of agency: A data-driven approach. *Poster at the Philosophy of Science Association.* Pittsburgh, PA.

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 the 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 the 7th 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 the 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. *Poster at the 6th 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 VR. *Poster at the Vision Sciences Society Annual Meeting.*

Busch, E.L., Sivitilli, D.M., & Gire, D.H. (2019). Using deep learning to model octopus arm motion. *Poster and talk at the Center for Neurotechnology Research Symposium.* Seattle, WA, USA.

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

Teaching experience

Instructor, Interdepartmental Neurosci. Program, *Yale University* — Aug. 2024 & 2025
fMRI Tutorial, INP First-Year Student Bootcamp.

Guest Lecturer, CPSC 663: Deep Learning, *Yale University* — Apr. 2025

Guest Lecturer, PSYC 220: Images of Mind, *University of Illinois* — Mar. 2025

Teaching Fellow, Department of Psychology, *Yale University* — Spring 2022 & 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.

Guest lecturer, NSCI 270: Advanced neuroimaging analysis methods, *Yale University* — Nov. 2021

Teaching Fellow, Department of Psychology, *Yale University* — Fall 2021
PSYC 270/NCSI 270: Research methods in cognitive neuroscience.

Teaching Assistant, Department of Computer Science, *Dartmouth College* — Spring 2020
COSC 74: Machine learning and statistical data analysis

Teaching Assistant, Department of Psychological & Brain Sciences, *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)

Cryptography Instructor, *Sonia Kovalevsky Math Day at Dartmouth College* — Apr. 2018

College Access Coach, *Let's Get Ready* — Summer 2017
Taught SAT and college application preparatory courses for high school students from historically underrepresented backgrounds in New York Public Schools.

Instructor, *Center for Gifted Youth, Long Island University* — Summer 2017
Designed and taught courses on mathematics and genetics for advanced middle school students.

Private tutor 2012–2024
K-12: NY State Regents math and sciences, English, History, Spanish; AP: Calculus AB and BC, Statistics, Physics, Computer Science; SAT / ACT; UG: Algebra, Graph Theory, Spanish.

Service and outreach

Trainee Committee, Cognitive Computational Neuroscience Society 2024

Organizer & Founding Member, Innovators in Cognitive Neuroscience Seminar Series 2020–Present

Fellow & Founding Member, Wu Tsai Institute Student, Postbac, & Postdoc Collective 2022–Present

Yale Psychology Colloquium Committee 2021–2023

Sneak Peek Mentor, Yale Psychology Diversity Committee 2021–2023

Facilitator and mentor, Dartmouth Leadership, Attitudes, and Behaviors Program 2018–2020
Ran 10-week workshops on value-driven leadership through the Nelson A. Rockefeller Center for Public Policy

SIBS Mentorship Program Director, Dartmouth Center for Social Impact 2016–2020
Mentored for and directed a one-on-one mentorship program for Dartmouth undergrads and local youth involved in county social services. Coordinated with mentors, teachers, parents, and social workers; responsible for training mentors.

Mentorship

Dominic Gearing (Yale undergraduate) 2024–Present
David Lee (Yale undergraduate) 2024–Present
E. Chandra Fincke (Yale undergraduate and honors thesis student) 2022–2024
Now: Space Operations Officer, United States Space Force
Ariadne Letrou (Lab manager and postgraduate researcher) 2021–2023
Now: PhD student, Princeton Psychology (PI: Ken Norman)
Kyle Andruczk (Yale undergraduate) 2022–2023
Now: Full stack software engineer

Ad-hoc reviewing

Nature Methods, Nature Human Behavior, Nature Computational Science, Journal of Neuroscience, Proceedings of the National Academy of Sciences (PNAS), Imaging Neuroscience, International Conference on Learning Representations (ICLR), Neural Information Processing Systems (NeurIPS), Cognitive Computational Neuroscience (CCN).

Other skills

Neuroimaging: rt-cloud (Real-time fMRI with cloud computing), MRI operator certified, MEG/EEG experienced. BrainIAK & PyMVPA Contributor, FSL, FreeSurfer, AFNI, Reproducible Neuroimaging.

Programming: Python, BASH, C, C++, C# for Unity, Java, MATLAB, R, HTML, Unity, PsychoPy, PsychToolbox, PyTorch, Keras, TensorFlow.

Languages: Spanish (fluent), Italian and Portuguese (intermediate).

Miscellaneous: Competitive equestrian, pet enthusiast, runner, illustrator, freelance data scientist.