Erica Lindsey Busch

Email: erica.busch@yale.edu
Github: github.com/ericabusch

Website: ericabusch.github.io
LinkedIn: linkedin.com/in/erica-busch

Education

Yale University
PhD Candidate, Neuroscience
Master of Science, Master of Philosophy
Thesis: Understanding and enhancing human cognition along neural manifolds
Advisor: Nicholas Turk-Browne

August 2020 – Present
Department of Psychology
Fall 2022, Spring 2023

Dartmouth College
BA in Cognitive Science, Computer Science
Thesis: A deep learning approach to scene perception in autism
Advisors: James Haxby, Caroline Robertson

September 2016 – March 2020
High Honors

Centro Tinku Academic Center
Advanced Language Study Abroad in Spanish

August – November 2017
Cusco, Peru

Awards and honors

Society for Neuroscience Annual Meeting Travel Award ($500 awarded twice)
Wu Tsai Institute at Yale University
2023 & 2025

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

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

Google PhD Fellowship (Finalist)
2024

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

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

Outstanding Undergraduate Research Award (Second Prize)
Neukom Institute for Computational Science
2020

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

Academic Achievement Prize in Cognitive Science
2020

Fulbright Fellowship (Withdrew due to COVID-19)
2020

High Honors in Cognitive Science
2020

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

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

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

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

Honors List, Dartmouth College   2017-2020

National Merit Scholarship (Finalist)   2015

** Awarded scholarship, fellowship, & grant amounts in USD; only select awards included

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. Human learning of a noninvasive brain-computer interface via manifold geometry. (Revised and resubmitted), 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. (Revised and resubmitted)

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

*Denotes equal contribution.

Invited talks

NYU Concats	*Upcoming: Dec. 2025*
Psychology Department, New York University	
Cognition, Perception, & Cognitive Neuroscience Seminar Series	*Upcoming: Nov. 2025*
Department of Psychological and Brain Science, University of California - Santa Barbara	
Machine Learning Seminar Series. 2025	
Department of Systems & Computational Biology, Albert Einstein College of Medicine	
Workshop on Functional Alignment of Information Encoded in Neural Activity	Sept. 2025
Center for Cognitive Neuroscience, Dartmouth College	
Center for Neuroscience Imaging Research Seminar	July 2025
Institute for Basic Science, Suwon, South Korea	
International Symposium on Decoded Neurofeedback	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., Krishnaswamy, S., & Turk-Browne, N.B. (2025) Neural dimensionality expands over the course of brain-computer interface learning. *Poster at the Society for Neuroscience Annual Meeting.* San Diego, CA, USA.

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: Research methods in cognitive neuroscience, *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 courses for students from historically underrepresented backgrounds in NYC 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

Rapporteur, CIFAR Brain, Mind, & Consciousness Program   2024-Present

Trainee Committee, Cognitive Computational Neuroscience Conference   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 and honors thesis student)   2024–Present

David Lee (Yale undergraduate)   2024–Present

E. Chandra Fincke (Yale undergraduate and honors thesis student)   2022–2024
  Now: Master's student in AI, Johns Hopkins University; 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, runner, illustrator, freelance data scientist, general flora and fauna enthusiast.