Erica L. Busch

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Education

Yale University Department of Psychology. **September 2020 – present**

Ph.D. Student in Neuroscience.

Advisors: Nicholas Turk-Browne & BJ Casey.

Dartmouth College. Hanover, NH **September 2016 - March 2020**

B.A. in Cognitive Science with High Honors; Minor in Computer Science

Honors Thesis: *A Deep Learning Approach to Understanding Real-World Scene Perception in Autism*

Cumulative GPA: 3.81; Major GPA: 3.87

Dartmouth Spanish Language Study Abroad Plus. Lima and Cusco, Peru **September – November 2017**

Research Experience

Robertson Lab. PI: Caroline E. Robertson **April 2019 - Present**

Dartmouth College Department of Psychological and Brain Sciences

Honors Thesis in Cognitive Science; Neukom Scholar (Spring 2020)

- Investigated patterns of spatial attention allocation within 360-degree, virtual-reality scenes across participants with autism, controls, and convolutional neural networks.
- Co-developed a pipeline for using convolutional neural networks to process omnidirectional images.
- Worked with eye-tracking data and convolutional neural networks in PyTorch and MATLAB.

Haxby Lab. PI: James V. Haxby **January 2018 – Present**

Dartmouth College Department of Psychology and Brain Sciences

Research Assistant **March 2020 – Present**

- Developed a computational framework for functionally aligning BOLD time-series information based upon both functional connectivity and stimulus-response data.
- Collaborating with Yale University researchers to use hyperalignment to predict attention in adolescents.

David C. Hodgson Endowment for Undergraduate Research Award **2019**

- Awarded a grant to conduct full-time cognitive neuroscience research.
- Worked independently on a project using fMRI, hyperalignment, representational similarity analysis (RSA), and multivariate pattern analysis (MVPA) to locate brain regions and pathways responsible for construction and interpretation of narratives.

James O. Freedman Presidential Scholar and *Neukom Scholar* **2018 – 2019**

- Investigated the neural responses in higher-order brain areas to interpretations of largely similar narratives using fMRI, hyperalignment, and MVPA.

Sophomore Research Scholar **2018**

- Assisted a PhD student's thesis characterizing the neural representation of faces using convolutional neural networks and fMRI data collected from participants watching naturalistic movie stimuli.

Laboratory of Comparative Systems Neuroscience. PI: David H. Gire **June – August 2019**

University of Washington Center for Neurotechnology

National Science Foundation Research Experience for Undergraduate Fellow

- Conducted research on octopus cognition, specifically decision-making during foraging tasks.
- Built a deep-learning model for tracking the motion of octopuses' individual arms and suckers to infer the local computations occurring within the arm's neural system.

Honors and Awards

Neukom Institute Prize for Outstanding Undergraduate Research, 2nd Prize.	**June 2020**
Made at Dartmouth Research Competition Grand Prize.	**May 2020**
Academic Achievement Prize in Cognitive Science.	**May 2020**
Fulbright Semi-Finalist & Fellowship Alternate.	**April 2020**
High Honors in Cognitive Science	**March 2020**
Citation for Academic Excellence in COSC 74: Machine Learning	**November 2019**
Neukom Institute Scholar	**June 2019, June 2020**
Citation for Academic Excellence in PSYC 128: Cognitive Neuroscience (Graduate level course)	**June 2019**
Dartmouth College Honors List	**2016 – 2020**
David C. Hodgson Endowment for Undergraduate Research Award	**January 2019**
James O. Freedman Presidential Scholar	**June - November 2018**
Sophomore Research Scholar	**January - June 2018**
Citation for Academic Excellence in CS1: Introduction to Programming and Computation	**June 2017**

Grants

William H. Neukom Scholar Award, Neukom Institute for Computational Science. $1000.	**Spring 2020**
Research Experience for Undergraduates (REU) Grant, National Science Foundation. $5500.	**Summer 2019**
William H. Neukom Scholar Award, Neukom Institute for Computational Science. $1000.	**Spring 2019**
David C. Hodgson Endowment Undergraduate Research Award, Dartmouth College. $5000.	**Winter 2019**
James O. Freedman Presidential Scholar Award, Dartmouth College. $2000.	**Summer & Fall 2018**
Sophomore Research Scholar Award, Dartmouth College. $1000.	**Spring 2018**

Posters, Presentations, and Publications

Busch, E., Slipski, L., Ma, F., Wager, T., & Haxby, J. (*in prep) Hyperalignment based upon both functional connectivity profiles and neural response profiles to naturalistic stimuli.*

Busch, E., Ma, F., Nastase, S., & Haxby, J. (*in prep*) *Individual differences in neural correlates of social cognition.*

Busch, E., Haskins, A.J., Isik, L., & Robertson, C. *(in prep) A deep learning approach to understanding real-world scene perception in autism.*

Walton, A. E., **Busch, E.,** 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 presented at NIH BRAIN Conference.

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

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

Busch, E., Sivitilli, D., & Gire, D. (2019). *Using deep learning to model octopus arm motion.* Poster presented at the Center for Neurotechnology Summer Research Symposium, University of Washington, Seattle, WA.

Busch, E., Sivitilli, D., & Gire, D. (2019). *Using deep learning to model octopus arm motion.* Talk given at the Center for Neurotechnology Summer Research Symposium, University of Washington, Seattle, WA.

Busch, E., Ma, F., Nastase, S., & Haxby, J. (2019). *Individual differences in fine-grained neural correlates of mental states.* Poster presented at Karen E. Wetterhahn Science Symposium, Dartmouth College, Hanover, NH.

Relevant Coursework

Cognitive Neuroscience (Graduate level)	Computational Methods for the Neural Code (Graduate level)
Machine Learning and Statistical Data Analysis	Real-World Scene Perception
Deep Learning	Principles of Brain Mapping with fMRI
Software Design and Implementation	Cognitive Computing with Watson

Teaching experience

Teaching Assistant in Machine Learning **March 2020 – June 2020**

Dartmouth Department of Computer Science

- Held weekly office hours to reinforce machine learning and statistical concepts; graded assignments and exams; helped develop exam questions and projects.

Tutor and Study Group Leader **September 2012 – March 2020**

Dartmouth Tutor Clearinghouse and Private

- Experience tutoring undergraduate neuroscience, cognitive science, computer science, and Spanish; elementary through high school mathematics, social studies, and AP-level sciences and calculus.

Sonia Kovalevsky Math Day April 2018

Dartmouth Department of Mathematics

Cryptography Workshop Instructor

- Co-developed and facilitated workshop for young female students to learn the basics of cryptography.

Let's Get Ready Education Nonprofit June - September 2017

College Access Coach

- Created and taught bi-weekly math and verbal SAT prep classes for low-income high school students.
- Lead bi-weekly workshops on college preparation and college application support; continued working with students on applications through the winter.

Select leadership & volunteer experience

SIBS Youth Mentoring Program September 2016 – June 2020

Dartmouth Center for Social Impact

Student Director (present), Co-Chair (previously) March 2017 – June 2020

- Lead a 1-on-1 mentorship program of 70 pairs of undergrads and local youth involved with social services.
- Responsible for communication with mentors, parents, and social workers to ensure effective mentorship.
- Recruit, interview, train, and support mentors; assist social workers in matching mentors and mentees.
- Design and facilitate training sessions for incoming mentors on developmental mentorship.

Mentor October 2016 – June 2020

- Serve as role model and reliable adult for an elementary school girl with learning difficulties.

Dartmouth Leadership, Attitudes, & Behaviors Program Winter 2018 & 2019

Nelson A. Rockefeller Center for Public Policy

- Facilitated student discussion groups about value-driven leadership, both on campus and in practice.

First-Year Trip Leader September 2018

Dartmouth Outing Club

- Led a five-day backpacking trip for ten incoming Dartmouth freshmen in order to build community through wilderness involvement.

Skills

Programming

- Proficient in Python (PyTorch, NumPy, SciPy, Pandas), MATLAB, Java, C, Bash
- Experienced in Keras, Caffe, Tensorflow, HTML, C++

Neuroimaging

- fMRI: FreeSurfer, PyMVPA, AFNI, RSA, & FSL

Other

- Languages: Native English speaker, Fluent in Spanish, Intermediate in Italian
- Nationally-ranked equestrian (2010 – 2017)
- Extensive dog-sitting credentials; inquire for references from both dogs and humans.