JAY A. HENNIG

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EDUCATION

Ph.D., Neural Computation and Machine Learning   Aug 2015 - Mar 2021
Carnegie Mellon University

- *Thesis:* Structure and time course of neural population activity during learning.
- *Advisors:* Byron Yu, Steven Chase | *Committee:* Aaron Batista, Robert Kass, Eric Shea-Brown

B.S., Mathematics, with Highest Honors   Aug 2008 - May 2011
University of Texas at Austin

- Overall GPA: 3.99/4.0, Major GPA: 4.0/4.0

RESEARCH EXPERIENCE

Postdoctoral fellow   Aug 2021 - present
Advisor: Samuel Gershman   Harvard University, Cambridge, MA

- Studying theories of reinforcement learning to understand changes in the brain during learning

Graduate student   Aug 2015 - May 2021
Advisors: Byron Yu and Steven Chase   Carnegie Mellon University, Pittsburgh, PA

- Studied learning and skill acquisition using brain-machine interfaces in motor cortex
- Resulted in research articles in *Nature Neuroscience* and *eLife*, a book chapter in *Neural Engineering*, and a perspectives article in *Neuron*

Undergraduate research assistant   May 2009 - Aug 2011; May 2013 - Aug 2015
Advisor: Alexander Huk   University of Texas at Austin, Austin, TX

- Studied visual motion and decision making in visual area MT and decision area LIP
- Resulted in two research articles, both published in *The Journal of Neuroscience*

Research assistant   May 2005 - May 2009
Advisor: Alexander Pertsemlidis   UT Southwestern Medical Center, Dallas, TX

- Designed and implemented a relational database and web interface (using PostgreSQL and php) for storing and accessing microRNA target prediction results and exon/intron boundaries in human, mouse, and rat genomes.

PUBLICATIONS

How Learning Unfolds in the Brain: Toward an Optimization View

Hennig, J.A., Oby, E.R., Losey D.M., *Batista, A.P., *Yu, B.M., *Chase, S.M.
Neuron (in press).

Learning is shaped by abrupt changes in neural engagement

Hennig, J.A., Oby, E.R., ..., *Batista, A.P., *Chase, S.M., *Yu, B.M.
Nature Neuroscience (2021).

Intracortical brain-machine interfaces

Oby, E.R., Hennig, J.A., *Batista, A.P., *Yu, B.M., *Chase, S.M.
In Neural Engingeering, Springer, Cham, 2020 (pp. 185-221).

Constraints on neural redundancy

Hennig, J.A., Golub, M.D., ..., *Batista, A.P., *Yu, B.M., *Chase, S.M.
eLife, 7 (2018): e36774.

New neural activity patterns emerge with long-term learning

Oby, E.R., Golub, M.D., Hennig, J.A., ..., *Batista, A.P., *Yu, B.M., *Chase, S.M.
Proceedings of the National Academy of Sciences, 116.30 (2019): 15210-15215.

A Classifying Variational Autoencoder with Application to Polyphonic Music Generation

Hennig, J.A., Umakantha, A. Williamson, R. C.
arXiv preprint arXiv:1711.07050

A Distinct Mechanism of Temporal Integration for Motion through Depth

Katz, L.N., Hennig, J.A., Cormack, L.K., Huk, A.C.
The Journal of Neuroscience. 35(28), 10212-10216.

Signal Multiplexing and Single-Neuron Computations in Lateral Intraparietal Area During Decision-Making

Meister, M.LR., Hennig, J.A., Huk, A.C.
The Journal of Neuroscience, 33(6), 2254-2267.

* denotes equal contribution.

In preparation

Correlated subfields yield beneficial noise correlations in visual area MT

Hennig, J.A., Pillow, J.W., Huk, A.C., Yates, J.L.

PRESENTATIONS

Oral presentations

Learning is shaped by abrupt changes in neural engagement   2021

· Talk given at Joint Symposium in Computational Neuroscience, NIH Blueprint for Neuroscience Research

Learning is shaped by an abrupt change in neural engagement

· Talk given at IEEE EMBS Neural Engineering

Constraints on neural redundancy   2019

· Talk given at the Carnegie Mellon Center for Neural Basis of Cognition Retreat

Neural coding and decision making   2013

· Talk given at the Melbourne Maths and Sciences Meetup

Poster presentations

Learning is shaped by an abrupt change in "neural engagement"   2021

· Poster presented at Computational and Systems Neuroscience (Cosyne)

Predicting neural activity in behaviorally irrelevant dimensions   2016

· Poster presented at Computational and Systems Neuroscience (Cosyne)

Predicting neural activity in behaviorally irrelevant dimensions

· Poster presented at the Society for Neuroscience Conference (SfN)

Differential temporal integration of 2D and 3D motion   2015

· Poster presented at the INS Neuroscience Symposium, University of Texas at Austin

The aperture problem in three dimensions   2010

· Poster presented at the Workshop on Natural Environments Tasks and Intelligence (NETI)

The aperture problem in three dimensions

· Poster presented at the Vision Sciences Society Conference (VSS)

TEACHING EXPERIENCE

Guest Lecturer, Neural Signal Processing   Spring 2019
Carnegie Mellon University

· Guest lecture on "Introduction to Clustering," covering k-means and Gaussian mixture models
· Graduate course (42-590/18-699), Instructor: Byron Yu

Teaching Assistant, Neural Signal Processing   Spring 2018
Carnegie Mellon University

· Graduate course (42-590/18-699), Instructor: Byron Yu

Teaching Assistant, Introduction to Machine Learning   Fall 2017
Carnegie Mellon University

· Graduate course (10-601), Instructor: Roni Rosenfeld

PROFESSIONAL EXPERIENCE

Software developer and consultant   Nov 2011 - May 2013
Biarri Optimisation   *Melbourne, VIC, Australia*

· Designed a linear programming formulation and developed a working implementation (in C++ and Python) to optimize the capacity of existing production facilities and the locations of new facilities. This tool was used by Australia Post, Australia's national postal service, to plan upgrades to their existing postal network.
· Contributed to development of a software tool (in C++) for designing fiber optic networks to minimize materials cost. Used by NBN Co. as part of an Australian government project to provide high-speed internet to 98% of the nation.

HONORS AND AWARDS

McClelland Prize: Outstanding Paper Award for *Constraints on neural redundancy*
Center for the Neural Basis of Cognition, Carnegie Mellon University (2019)

Andrew Carnegie Prize in Mind and Brain Sciences Fellowship
Carnegie Mellon University (2018)

2nd place in Qualcomm Neurohackathon (included travel award)
Carnegie Mellon University (2016)

Presidential Fellowship in the Life Sciences, Richard King Mellon Foundation
Carnegie Mellon University (2015 - 2016)

Phi Beta Kappa
University of Texas at Austin (2011)

Valedictorian
Booker T. Washington High School, Dallas, TX (2007)

SERVICE, OUTREACH & EXTRACURRICULAR

PhD Admissions Committee member 2019/20, 2020/21
- · Machine Learning Department, Carnegie Mellon University

Mentor for Carnegie Mellon's A.I. Mentoring Program 2019 - 2020
- · Mentoring program for undergraduates in underrepresented groups interested in machine learning
- · Machine Learning Department, Carnegie Mellon University

Archiving academic paper summaries called 'tweeprints' 2019 - present
- · Dataset: link
- · @tweeprint: `https://twitter.com/tweeprint`

***Paper Trails*, an e-newsletter covering recent scientific research** 2018 - 2020
- · I wrote a series of posts relating recent scientific research to non-scientific readers (100+ subscribers)
- · `https://mobeets.github.io/paper-trails/`

***mpm*, a package manager for Matlab** 2018 - present
- · I developed and maintain a package manager for Matlab
- · `https://github.com/mobeets/mpm`

University of Pittsburgh Gamelan Ensemble 2017, 2019
- · I performed in a music ensemble performing traditional and modern Javanese gamelan music

***Speak Neuron*, an educational comic about neural coding** 2011 - 2014
- · I wrote and illustrated a mini graphic novel to introduce concepts of signal processing and neural coding.
- · `https://mobeets.github.io/speak-neuron/`