

William E Bishop, PhD

Theory Fellow
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Current Position

- 2018 – present Theory Fellow
Janelia Research Campus, Howard Hughes Medical Institute, Ashburn, VA
- Performing independent research at both the first and senior author level developing novel machine learning theory and methods in the fields of deep learning, probabilistic models, and transfer learning with applications to neuroscience.

Previous Positions

- 2015 – 2018 Postdoctoral Researcher (Advisor: Byron Yu)
Machine Learning Department, Carnegie Mellon University, Pittsburgh, PA
- Developed novel theory and an unsupervised method for combining datasets with overlapping variables based on compressed sensing. Partnered with neuroscientists to apply the method to achieve more accurate decoding of brain signals from fully paralyzed individuals.

Education

- 2010 – 2015 PhD Machine Learning (Advisors Byron Yu & Rob Kass)
Machine Learning Department, Carnegie Mellon University, Pittsburgh, PA
- Special Track in the Center for the Neural Basis of Cognition
 - Thesis: Combining Neural Population Recordings: Theory and Application
- 2002 – 2005 BS Biomedical Engineering
The Johns Hopkins University, Baltimore, MD

Professional Experience

- 2006 – 2010 Associate Professional Staff
Neuroscience Section, Biomedical Engineering Group
The Johns Hopkins University Applied Physics Laboratory, Laurel, MD
- Developed and implemented classification, regression, and latent variable models for extracting movement intent from neural signals in a real-time system as an engineer on a fast-paced DARPA project.

Honors and Awards

- 2012 – 2015 National Defense Science & Engineering (NDSEG) Graduate Fellowship
2012 National Science Foundation (NSF) Graduate Fellowship
2006 The Johns Hopkins University Provost Undergraduate Research Award
2004 Vredenberg Scholarship

Guest Lectures

- 2016 Lecture on Poisson processes. Neural Signal Processing
Professor Byron Yu, Carnegie Mellon University
- 2015 Lecture on dynamical systems and movement control. Statistical Models of the Brain
Professor Rob Kass, Carnegie Mellon University
- 2008, 2009 Lecture on neural prosthetics. Biomedical Engineering in the Real World
The Johns Hopkins University

Teaching Assistantships

- 2012 Neural Data Analysis, Professor Steven Chase, Carnegie Mellon University
2011 Machine Learning, Professors Tom Mitchell & Aarti Singh, Carnegie Mellon University

Programming Skills

Python (fluent), PyTorch (fluent), MATLAB (fluent), Java (intermediate), C (intermediate)

Mentorship

- 2020-present Luuk Hesselink (MSc student, Donders Institute for Brain, Cognition and Behaviour)
- Mentored in collaboration with Misha Ahrens (Janelia) and Luuk Hesselink's advisor Bernhard Englitz (Radboud University)

Publications in Preparation

(See website for descriptions of work listed here)

- [1] Bishop WE, Hesselink L, Englitz B, Fitzgerald JE, Ahrens MB. Deep Probabilistic Model Synthesis. *In preparation*.
- [2] Bishop WE, Zandvakili A, Zhou X, Chase SM, Kohn A, Yu BM. Single manifold identification and latent estimation. *In preparation*.

Preprints

- [3] Koh TH, Bishop WE, Kawashima T, Jeon BB, Srinivasan R, Kuhlman SJ, Ahrens MB, Chase SM, Yu BM. Dimensionality reduction of calcium-imaged neuronal population activity. *bioRxiv*.

Peer Reviewed Publications

†, * denotes equal contribution

- [4] Degenhart AD[†], Bishop WE[†], Oby ER, Tyler-Kabara EC, Chase SM*, Batista AP*, Yu BM* (2020) Stabilization of a brain-computer interface via the alignment of low-dimensional spaces of neural activity. *Nature Biomedical Engineering* 4:672-685.
- [5] Biswas T, Bishop WE, Fitzgerald JE. (2020) Theoretical principles for illuminating sensorimotor processing with brain-wide neuronal recordings. *Current Opinion in Neurobiology* 65:138-145.
- [6] Bishop WE, Yu BM (2014) Deterministic symmetric positive semidefinite matrix completion. *Advances in Neural Information Processing Systems* 27:2762-2770.
- [7] Bishop WE, Chestek CA, Gilja V, Nuyujukian P, Foster JD, Ryu SI, Shenoy KV, Yu BM (2014) Self-recalibrating classifiers for intracortical brain computer interfaces. *Journal of Neural Engineering* 11 (026001).
- [8] White JR, Levy T, Bishop WE, Beaty JD. (2010) Real-time decision fusion for multimodal neural prosthetic devices. *PLoS One* 5(3):e9493.
- [9] Baker J, Bishop WE, Kellis S, Levy T, House P, Greger B. (2009) Multi-scale recordings for neuroprosthetic control of finger movements. *Proc 31st Annual Conf IEEE EMBS*:4573-4577.
- [10] Bishop WE, Yu BM, Santhanam G, Afshar A, Ryu SI, Shenoy KV. (2008) An efficient approximation for the real-time implementation of the mixture of trajectory models decoder. *Proc IEEE Biomedical Circuits and Systems Conference*:133-136.
- [11] Bishop WE, Yu BM, Santhanam G, Afshar A, Ryu SI, Shenoy KV, Vogelstein J, Beaty J, Harshbarger S. (2008) The use of a virtual integration environment for the real-time implementation of neural decode algorithms. *Proc 30th Annual Conf IEEE EMBS*:628-633.
- [12] Bishop WE, Armiger A, Burck J, Bridges M, Hauschild M, Englehart K, Scheme E, Vogelstein RJ, Beaty J, Harshbarger S. (2008) A real-time virtual integration environment for the design and development of neural prosthetic systems. *Proc 30th Annual Conf IEEE EMBS*:615-619.

Selected Conference Abstracts

†, * denotes equal contribution

(See website for complete list of abstracts)

- [13] Bishop WE, Crowder E, Zandvakili A, Zhou X, Chase SM, Kohn A, Olson CR, Yu BM. (2018) Leveraging low-dimensional structure in neural population activity to combine neural recordings. *COSYNE Abstracts*, no. I-69.
- [14] Bishop WE, Yu BM. Matrix completion and implications for combining overlapping population recordings. (2014) *NeurIPS Workshop on Large Scale Optical Physiology*.
- [15] Bishop WE, Chestek CA, Gilja V, Nuyujukian P, Ryu SI, Shenoy KV, Yu BM. (2012) Long-term decoding stability without retraining for intracortical brain computer interface. *COSYNE Abstracts no. III-40*.

Patents

- [16] Gao T, Bishop WE, Juang RR, Alm AM, White DM, Crawford DA, Babin SM, Chavis JS. Sensor-based adaptive wearable devices and methods. Pub. No.: US 2009/7629881 B2.