Brian H. Hu

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Education

Johns Hopkins University, Baltimore, MD

Ph.D., Biomedical Engineering, October 2017
- Thesis: *Grouping mechanisms for object-based vision and attention*
- Advisor: Ernst Niebur, PhD

University of Pittsburgh, Pittsburgh, PA

B.S., Bioengineering (Minor in Chemistry), *summa cum laude*, May 2011
GPA: 3.99/4.0

- Swanson School of Engineering Outstanding Senior Award
- Department of Bioengineering Outstanding Student of the Year Award

Research Experience

Allen Institute for Brain Science, Seattle, WA

Scientist I, December 2017-present
- Short-term synaptic plasticity and memory in neural networks
- Figure-ground representation in deep neural networks
- Convolutional neural networks with extra-classical receptive fields
- Structure and generalization properties of noise
- Generative adversarial networks for inferring cortical learning rules
- Data-driven, predictive models of neural activity

Computational Neuroscience Laboratory, Johns Hopkins University, Baltimore, MD

Graduate Research Assistant, June 2012-November 2017
- Biologically-plausible image segmentation and contour detection
- Head movements and visual attention in virtual reality
- Models of 3D visual saliency and eye movements
- Models of 3D surface representation

Skills

Programming: Python, MATLAB, familiar with C/C++, JAVA, LabVIEW
Other Tools: PyTorch, Tensorflow, Jupyter, scikit-learn, pandas, Git, LaTeX, HTCondor, NEST, Neuron
Operating Systems: Linux, Windows, Mac OS

Publications

* denotes equal contribution

Peer-Reviewed Journal Articles

1. **Hu, B.** , von der Heydt, R. , and Niebur, E. Figure-ground organization in natural scenes: Performance of a recurrent neural model compared with neurons of area v2. *eNeuro*, 6(3), 2019. doi: 10.1523/ENEURO.0479-18.2019

2. **Hu, B.** and Niebur, E. A recurrent neural model for proto-object based contour integration and figure-ground segregation. *Journal of computational neuroscience*, 43(3):227–242, 2017. doi: 10.1007/s10827-017-0659-3

3. **Hu, B.** , Kane-Jackson, R. , and Niebur, E. A proto-object based saliency model in three-dimensional space. *Vision Research*, 119:42–49, 2016. doi: 10.1016/j.visres.2015.12.004

Conference Proceedings

4. **Hu*, B.** , Iyer*, R. , and Mihalas, S. Convolutional neural networks with extra-classical receptive fields. In *Thirty-third Conference on Neural Information Processing Systems (NeurIPS)*, Neuro AI Workshop, Vancouver, Canada, 2019. URL `https://openreview.net/forum?id=rkxSEQtLUS`

5. **Hu, B.** , Shang, J. , Iyer, R. , Siegle, J. , and Mihalas, S.   Does the neuronal noise in cortex help generalization? In *Thirty-third Conference on Neural Information Processing Systems (NeurIPS)*, Neuro AI Workshop, Vancouver, Canada, 2019. URL `https://openreview.net/forum?id=S1gc4XF8Lr`

6. **Hu, B.** , Khan, S. , Niebur, E. , and Tripp, B.   Figure-ground representation in deep neural networks. In *IEEE CISS-2019 53rd Annual Conference on Information Sciences and Systems*, pages 1–6, Baltimore, MD, 2019. IEEE Information Theory Society. doi: 10.1109/CISS.2019.8693039

7. **Hu, B.** , Johnson-Bey, I. , Sharma, M. , and Niebur, E.   Head movements are correlated with other measures of visual attention at smaller spatial scales. In *IEEE CISS-2018 52nd Annual Conference on Information Sciences and Systems*, pages 1–6, Princeton, NJ, 2018. IEEE Information Theory Society. doi: 10.1109/CISS.2018.8362264

8. **Hu, B.** , Johnson-Bey, I. , Sharma, M. , and Niebur, E.   Head movements during visual exploration of natural images in virtual reality. In *IEEE CISS-2017 51st Annual Conference on Information Sciences and Systems*, pages 1–6, Baltimore, MD, 2017. IEEE Information Theory Society. doi: 10.1109/CISS.2017.7926138

9. **Hu, B.** , von der Heydt, R. , and Niebur, E.   A neural model for perceptual organization of 3D surfaces. In *IEEE CISS-2015 49th Annual Conference on Information Sciences and Systems*, pages 1–6, Baltimore, MD, 2015. IEEE Information Theory Society. doi: 10.1109/CISS.2015.7086906

Working Papers

10. Siegle, J. H. , Jia, X. , ... , **Hu, B.** , ... , Olsen, S. R. , and Koch, C.   A survey of spiking activity reveals a functional hierarchy of mouse corticothalamic visual areas. Submitted to Nature. URL `https://www.biorxiv.org/content/10.1101/805010v1`

11. **Hu, B.** , Garrett, M. , Groblewski, P. A. , Ollerenshaw, D. , Shang, J. , Roll, K. , Manavi, S. , Koch, C. , Olsen, S. R. , and Mihalas, S. Uncovering the mechanisms of short-term memory in a visual change detection task. In preparation

12. Wagatsuma, N. , **Hu, B.** , von der Heydt, R. , and Niebur, E.   Interactions between distinct types of feedback signals modulate activity of border ownership selective cells in intermediate-level vision. In preparation

Honors and Awards

Computational and Systems Neuroscience (Cosyne) Travel Award, 2017

OIST Computational Neuroscience Course (OCNC) Travel Award, 2014

Visual Neuroscience Training Program Fellowship, 2012-2013

Neural Engineering Training Initiative Fellowship, 2011-2012

University Honors College Full Tuition Scholarship, 2007-2011

Professional Service and Activities

Reviewer for *Frontiers in Systems Neuroscience, IEEE Transactions on Image Processing, Journal of Cognitive Neuroscience*

Member, Organization for Computational Neuroscience, 2018–*present*

Member, Society for Neuroscience, 2013–*present*

Project Mentor, High School/Undergraduate Students, 2014-2016

Teaching Assistant, Modeling and Design (Fall 2013) and Networks (Fall 2014)