Brian H. Hu

Kitware, Inc.
4100 North Fairfax Drive, Suite 820
Arlington, VA 22203

Mobile Phone: (703) 638-0245
Email: `brian.hsiaochuan.hu@gmail.com`
Homepage: `https://brianhhu.github.io/`

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: 3.99/4.00

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

Work and Research Experience

Kitware, Inc., Arlington, VA
Staff Research and Development Engineer, January 2023 - present
Senior Research and Development Engineer, April 2020 - December 2022

- Large language models, alignment techniques
- AI test and evaluation, open source software development
- Explainable AI (XAI), ethical AI, saliency algorithms
- Human-machine teaming, image and video retrieval, anomaly detection
- Small object detection, person/vehicle re-identification

Allen Institute for Brain Science, Seattle, WA
Scientist II, January 2020 - March 2020
Scientist I, December 2017 - December 2019

- 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. Lee, J. H. , Choe, Y. , Ardid, S. , Abbasi-Asl, R. , McCarthy, M. , and **Hu, B.** Functional microcircuits in the brain and in artificial intelligent systems. *Frontiers in Computational Neuroscience*, 17:1135507, 2023

2. Voina, D. , Recanatesi, S. , **Hu, B.** , Shea-Brown, E. , and Mihalas, S. Single circuit in v1 capable of switching contexts during movement using an inhibitory population as a switch. *Neural Computation*, pages 1–54, 2022

3. Schneider-Mizell, C. M. , Bodor, A. L. , ... , **Hu, B.** , ... , Reid, R. C. , and da Costa, N. M. Structure and function of axo-axonic inhibition. *eLife*, 10:e73783, 2021

4. **Hu, B.** , Tunison, P. , Vasu, B. , Menon, N. , Collins, R. , and Hoogs, A. XAITK: The Explainable AI Toolkit. *Applied AI Letters*, page e40, 2021. doi: https://doi.org/10.1002/ail2.40

5. Vasu, B. , **Hu, B.** , Dong, B. , Collins, R. , and Hoogs, A. Explainable, Interactive Content-Based Image Retrieval. *Applied AI Letters*, page e41, 2021. doi: https://doi.org/10.1002/ail2.41

6. **Hu, B.** , Garrett, M. , Groblewski, P. A. , Ollerenshaw, D. , Shang, J. , Roll, K. , Manavi, S. , Koch, C. , Olsen, S. R. , and Mihalas, S. Adaptation supports short-term memory in a visual change detection task. *PLoS computational biology*, 17(9):e1009246, 2021

7. Wagatsuma, N. , **Hu, B.** , von der Heydt, R. , and Niebur, E. Analysis of spiking synchrony in visual cortex reveals distinct types of top-down modulation signals for spatial and object-based attention. *PLoS computational biology*, 17 (3):e1008829, 2021

8. Siegle, J. H. , Jia, X. , ... , **Hu, B.** , ... , Olsen, S. R. , and Koch, C. Survey of spiking in the mouse visual system reveals functional hierarchy. *Nature*, pages 1–7, 2021

9. Iyer, R. , **Hu, B.** , and Mihalas, S. Contextual integration in cortical and convolutional neural networks. *Frontiers in Computational Neuroscience*, 14:31, 2020. doi: 10.3389/fncom.2020.00031

10. **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

11. **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

12. **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

13. **Hu, B.** , Ray, B. , Leung, A. , Summerville, A. , Joy, D. , Funk, C. , and Basharat, A. Language models are alignable decision-makers: dataset and application to the medical triage domain. In *Proceedings of the 2024 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies: Industry Track, NAACL 2024, Hybrid: Mexico City, Mexico + Online, June 16-21, 2024*. Association for Computational Linguistics, 2024

14. **Hu, B.** , RichardWebster, B. , Tunison, P. , Veenhuis, E. , Ravichandran, B. , Lynch, A. , Crowell, S. , Genova, A. , Bolea, V. , Jourdain, S. , and Whitesell, A. Nrtk: an open source natural robustness toolkit for the evaluation of computer vision models. In Harguess, J. and Bastian, N. , editors, *Assurance and Security for AI-enabled Systems*. International Society for Optics and Photonics, SPIE, 2024

15. **Hu, B.** , Tunison, P. , RichardWebster, B. , and Hoogs, A. Xaitk-saliency: an open source explainable ai toolkit for saliency. In *Proceedings of the AAAI Conference on Artificial Intelligence*, volume 37, pages 15760–15766, 2023

16. RichardWebster*, B. , **Hu*, B.** , Fieldhouse, K. , and Hoogs, A. Doppelganger saliency: Towards more ethical person re-identification. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 2847–2857, 2022

17. **Hu, B.** , Vasu, B. , and Hoogs, A. X-MIR: Explainable Medical Image Retrieval. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, January 2022

18. **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

19. **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`

20. **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

21. **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

22. **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

23. **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

Honors and Awards

Honorable Mention, Pytorch Hackathon (Responsible AI), 2021

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

Organizer, AAAI Fall Symposium on Assured and Trustworthy Human-centered AI (ATHAI), 2023

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

Member, Organization for Computational Neuroscience, 2018–2020

Member, Society for Neuroscience, 2013–2020

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