Maggie Henderson, Ph.D

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EMPLOYMENT

2024 – present	**Assistant Professor** Psychology Department and Neuroscience Institute Affiliated with Machine Learning Department Carnegie Mellon University, Pittsburgh, PA
2021 – 2024	**Postdoctoral Research Associate** Neuroscience Institute Carnegie Mellon University, Pittsburgh, PA Supervisors: Dr. Leila Wehbe and Dr. Michael Tarr

EDUCATION

2015 – 2021	**Ph.D in Neurosciences with a Specialization in Computational Neurosciences** University of California, San Diego, La Jolla, CA Supervisor: Dr. John Serences
2011 – 2015	**B.S. in Biological Sciences** Concentration in Neurobiology and Behavior Cornell University, College of Agriculture and Life Sciences, Ithaca, NY Summa Cum Laude with Distinction in Research

PRE-PRINTS & UNDER REVIEW

1. Luo, A.F., Wehbe, L., Tarr, M.J., & **Henderson, M.M.** (2023). Neural Selectivity for Real-World Object Size in Natural Images. *bioRxiv.* https://doi.org/10.1101/2023.03.17.533179

PEER-REVIEWED PUBLICATIONS

1. **Henderson, M.M.**, Serences, J.T., & Rungratsameetaweemana, N. (2025). Dynamic categorization rules alter representations in human visual cortex. *Nature Communications.* https://doi.org/10.1038/s41467-025-58707-4

2. Yeung, J., Luo, A.F., Sarch, G.H., **Henderson, M.M.**, Ramanan, D., & Tarr, M.J. (2025). Reanimating images using neural representations of dynamic stimuli. *Conference on Computer Vision and Pattern Recognition (CVPR; accepted for oral presentation).* Preprint: https://arxiv.org/abs/2406.02659

3. **Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2025). Origins of food selectivity in human visual cortex. *Trends in Neurosciences*. https://doi.org/10.1016/j.tins.2024.12.001

4. Luo, A.F., Yeung, J., Zawar, R., Dewan, S., **Henderson, M.M.**, Wehbe, L., & Tarr, M.J. (2025). Brain Mapping with Dense Features: Grounding Cortical Semantic Selectivity in Natural Images with Vision Transformers. *Proceedings of the International Conference on Learning Representations (ICLR; accepted).* Preprint: https://arxiv.org/abs/2410.05266

5. Luo, A.F., **Henderson, M.M.**, Tarr, M.J, & Wehbe, L. (2024). BrainSCUBA: Fine-Grained Natural Language Captions of Visual Cortex Selectivity. *Proceedings of the International Conference on Learning Representations (ICLR).* https://doi.org/10.48550/arXiv.2310.04420

6. Luo, A.F., **Henderson, M.M.**, Wehbe, L.*, & Tarr, M.J.* (2023). Brain Diffusion for Visual Exploration: Cortical Discovery using Large Scale Generative Models. *Proceedings of the Conference on Neural Information Processing Systems (NeurIPS); oral presentation*. https://doi.org/10.48550/arXiv.2306.03089

7. **Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2023). A texture statistics encoding model reveals hierarchical feature selectivity across human visual cortex. *Journal of Neuroscience.* https://doi.org/10.1523/JNEUROSCI.1822-22.2023

8. **Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2023). Low-level tuning biases in higher visual cortex reflect the semantic informativeness of visual features. *Journal of Vision.* https://doi.org/10.1167/jov.23.4.8

9. Jain, N., Wang, A., **Henderson, M.M.**, Lin, R., Prince, J.S., Tarr, M.J., & Wehbe, L. (2023*)*. Selectivity for food in human ventral visual cortex. *Communications Biology*. https://doi.org/10.1038/s42003-023-04546-2

10. Jinsi, O.*, **Henderson, M.M.***, & Tarr, M.J. (2023). Early experience with low-pass filtered images facilitates visual category learning in a neural network model. *PLOS ONE.* https://doi.org/10.1371/journal.pone.0280145

11. **Henderson, M.M**., Rademaker, R.L., & Serences, J.T. (2022). Flexible utilization of spatial- and motor-based codes for the storage of visuo-spatial information. *eLife.* https://doi.org/10.7554/eLife.75688

12. **Henderson, M.M**., & Serences, J.T. (2021). Biased orientation representations can be explained by experience with non-uniform training set statistics. *Journal of Vision.* https://doi.org/10.1167/jov.21.8.10

13. **Henderson, M.M**.*, Vo, V.A.*, Chunharas, C., Sprague, T.C., & Serences, J.T. (2019). Multivariate analysis of BOLD activation patterns recovers graded depth representations in human visual and parietal cortex. *eNeuro.* https://doi.org/10.1523/ENEURO.0362-18.2019

14. **Henderson, M.M**. & Serences, J.T. (2019). Human frontoparietal cortex represents behaviorally relevant target status based on abstract object features. *Journal of Neurophysiology.* https://doi.org/10.1152/jn.00015.2019

15. **Henderson, M.M**., Gardner, J., Raguso, R.A., & Hoffman, M.P. (2017). Trichogramma ostriniae (Hymenoptera: Trichogrammatidae) response to relative humidity with and without host cues. *Biocontrol Science and Technology.* https://doi.org/10.1080/09583157.2016.1262327

* These authors made equal contributions.

SELECTED PRESENTATIONS

1. **Henderson, M.M.**, Park., S., Wehbe, L., & Tarr, M.J. (2025). Cortical representations supporting coarse and fine object categorization. Poster to be presented at Vision Sciences Society meeting, St. Pete Beach, FL.

2. **Henderson, M.M.**, Luo, A.F., Park, S., Tarr, M.J., & Wehbe, L. (2025). Generative modeling tools for characterizing human higher visual cortex. Poster and Data Blitz talk at Cognitive Neuroscience Society meeting, Boston, MA.

3. **Henderson, M.M.**, Wehbe, L., & Tarr, M.J. (2024). Using texture synthesis to identify the features supporting coarse and fine object categorization. Poster at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/jov.24.10.1242

4. Luo, A.F., **Henderson, M.M.**, Wehbe, L., & Tarr, M.J. (2024). Leveraging vision and language generative models to understand the visual cortex. Poster at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/jov.24.10.1333

5. **Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2023). A texture statistics encoding model reveals sensitivity to mid-level features across human visual cortex. Talk at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/jov.23.9.5520

6. **Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2022). Informative associations between feature, spatial, and category selectivity in human visual cortex. Poster at Conference on Cognitive Computational Neuroscience, San Francisco, CA. https://doi.org/10.32470/CCN.2022.1043-0

7. Luo, A., Wehbe, L., Tarr, M.J., & **Henderson, M.M.** (2022). The Neural Representation of Real-World Object Size in Natural Images. Poster at Conference on Cognitive Computational Neuroscience, San Francisco, CA. https://doi.org/10.32470/CCN.2022.1136-0

8. **Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2022). Interpretable mid-level encoding models of human visual cortex reveal associations between feature and semantic tuning for natural scene images. Poster at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/jov.22.14.4118

9. **Henderson, M.M**., & Serences, J.T. (2020). Anisotropic representation of orientation by convolutional neural networks. Talk at Vision Sciences Society meeting, held virtually. https://doi.org/10.1167/jov.20.11.224

10. **Henderson, M.M**., Rademaker, R.L., & Serences, J.T. (2019). Complementary strategies for encoding information in working memory. Nanosymposium talk at Society for Neuroscience meeting, Chicago, IL.

11. **Henderson, M.M**. & Serences, J.T. (2019). Orientation representations in convolutional neural networks are more discriminable around the cardinal axes. Poster at Conference on Cognitive Computational Neuroscience, Berlin, Germany. https://doi.org/10.32470/CCN.2019.1122-0

12. **Henderson, M.M**., Rademaker, R.L., & Serences, J.T. (2019). Complementary visual and motor-based strategies for encoding information in working memory. Talk at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/19.10.91

13. **Henderson, M.M**., Serences, J.T. (2017). Occipital and parietal cortex encode representations of match between a viewed and sought object during visual target search. Poster at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/17.10.1136

14. **Henderson, M.M**., Vo, V.A., Chunharas, C., Sprague, T.C., & Serences, J.T. (2016). Reconstructing 3D stimuli using BOLD activation patterns recovers hierarchical depth processing in human visual and

parietal cortex. Poster at Vision Sciences Society meeting, St. Pete Beach, FL. https://doi.org/10.1167/16.12.298

15. **Henderson, M.M**., Gardner, J., & Raguso, R.A. (2015). Determining the optimal relative humidity conditions for release of the pest control agent Trichogramma ostriniae. Poster at Cornell Biology Honors Program Final Symposium, Ithaca, NY.

TEACHING

Cognition in the Age of AI (85-372/85-772)
Upper-level seminar covering topics at the intersection of neuroscience, cognitive psychology, artificial intelligence, and machine learning.
Offered at CMU starting in Spring 2025.

Guest Lecturer – **Representation and Generation in Neuroscience and AI**, CMU (Spring 2024)
Gave a lecture entitled: "Models of early and mid-level vision", in a seminar course taught by Professor Leila Wehbe.

Guest Lecturer – **Research Methods in Psychology**, CMU (Spring 2023)
Gave a lecture entitled "Machine Learning for Cognitive Neuroscience and Psychology" in a graduate-level course on Research Methods, taught by Professor Laurie Heller.

Teaching assistant – **Data Analysis in MATLAB**, UCSD (Fall 2016)
Teaching assistant for graduate-level course taught by Professor John Serences.

AWARDS AND HONORS

National Eye Institute Early Career Scientist Travel Grant, Vision Sciences Society (2023)
Distinguished Postdoctoral Fellowship from CMU Neuroscience Institute (2021-2023)
NIMH Predoctoral Fellowship in Cognitive Neuroscience, UCSD Institute for Neural Computation (2018-2019)
NSF GRFP honorable mention (2016)
Cornell University Academic Excellence Award (2015)
Cornell Hatch Supplement Grant (2012)
Alpha Xi Delta Slaymaker-Kinsey Award for Academic Achievement (2012)

SERVICE & OTHER ACTIVITIES

Faculty reviewer for uPNC (Undergraduate Program in Neural Computation) applications (2025).
Faculty reviewer for CNBC Awards Program (2024).
Open Science Program Advisory Board, CMU Libraries (2024 – ongoing).
Mentor for CMU Paths to AI Research (2024).
Organizing Carnegie Mellon brAIn Seminars (2021 – 2023).
Career Development Committee, UCSD Neurosciences Graduate Program (2017–2020).
Panelist for "Paths to PhDs" event, UCSD Psychology Department (2019).
Neurosciences Seminar Series Committee, UCSD Neurosciences Graduate Program (2017–2018)
Project Advisor, UCSD Neurosciences Graduate Program Bootcamp (2018).
Study group leader for Biology Scholars Program, Cornell University (2014)

ADVISING & MENTORSHIP

CMU graduate students: rotation

Meghna Krishnamurthy, Pitt/CMU Medical Science Training Program MD/PhD, Summer 2025.
Grayson Matthew, Program in Neural Computation, Fall 2024.
Wenjie Li, Program in Neural Computation, Fall 2024 (co-supervised with Jessica Cantlon, Yonatan Bisk).

CMU graduate students: M.S.

Ziyu Li, Computational Biology, Spring 2025 – ongoing.

CMU undergraduate students

Stephanie Lu, Summer 2025. Summer Undergraduate Research Apprenticeship (SURA) program.
Cecilia Jia, Spring 2025 – ongoing.
Ayat Karim, Fall 2024 – ongoing. Will present poster at National Conference on Undergraduate Research and at Meeting of the Minds symposium.
Evren Konuk, Fall 2024 – ongoing. Will present poster at Meeting of the Minds symposium.
Gaurika Sawhney, Fall 2022 – ongoing.
Owen Hershey, Spring 2023.
Omisa Jinsi, 2021 – 2022. Honors thesis; co-authored a publication; awarded the Glushko Prize for Distinguished Undergraduate Research.

CMU Undergraduate Program in Neural Computation (uPNC) students

William Friebel (Loyola University), Summer 2025.

CMU thesis committee membership

MJ Carter, Psychology, Fall 2024 – ongoing.
Jialin Li, Psychology, Fall 2024 – ongoing.
Andrew Luo, Program in Neural Computation, defended Fall 2024.

UCSD undergraduate students

Julie Eitzen, 2020.
Shruti Nishith, 2019 – 2020.
Ben Carfano, 2019.
Yong Hoon Chung, 2018 – 2019. Received Psychology Department Undergraduate Research Fellowship.
Vanessa Cancio, 2017.
Kelvin Lam, 2017 – 2018. Honors thesis.

REVIEWING

Journals

Cognitive Research: Principles and Implications
Communications Biology
eNeuro
Human Brain Mapping
Journal of Experimental Psychology: General
Journal of Neuroscience
Nature Communications
Nature Neuroscience
PLOS Computational Biology
Psychonomic Bulletin & Review
Visual Cognition

Conferences

Conference on Cognitive Computational Neuroscience

Proceedings of the ACM on Interactive, Mobile,
Wearable and Ubiquitous Technologies

Grants (ad-hoc)
National Science Foundation (Cognitive Neuroscience Program)

ACADEMIC MEMBERSHIPS

Vision Sciences Society (2016–present)
Society for Neuroscience (2015–2019, 2023, 2025)
Cognitive Neuroscience Society (2025)

OTHER ACADEMIC TRAINING

Computational Neuroscience: Vision, Cold Spring Harbor Laboratory summer course (2018).

OTHER RESEARCH EXPERIENCE

UC San Diego, La Jolla, CA (2016).
Rotation in the lab of Dr. Takaki Komiyama.
UC San Diego, La Jolla, CA (2016).
Rotation in the lab of Dr. Tatyana Sharpee.
Cornell University, Ithaca, NY (2012–2015).
Undergraduate thesis research, advised by Dr. Robert Raguso and Jeffrey Gardner.
Cold Spring Harbor Laboratory, Cold Spring Harbor, NY (2014).
Undergraduate summer research program, advised by Dr. Partha Mitra.
Uppsala University, Uppsala, Sweden (2013)
Research assistant for Dr. Magne Friberg.