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

- **Henderson, M.M.**, Serences, J.T., & Rungratsameetaweemana, N. (2023). Dynamic categorization rules alter representations in human visual cortex. *bioRxiv (under review).* https://doi.org/10.1101/2023.09.11.557257

- 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

- 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

- 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

- **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

- **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

- 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

- 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

- **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

- **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

- **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

- **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

- **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

- **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.

- 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.

- **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

- **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

- 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

- **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

- **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

- **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.

- **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

- **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

- **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

- **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

- **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 (85-372/772)
Seminar course to be offered starting in Spring 2025.

Guest Lecturer – **Representation and Generation in Neuroscience and AI**, CMU (Spring 2024)
Gave 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.

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, 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

Open Science Program Advisory Board (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).
Paths to PhDs Panelist, UCSD Psychology Department (2019).
Neurosciences Seminar Series Committee, UCSD Neurosciences Graduate Program (2017–2018)
Project Advisor, UCSD Neurosciences Graduate Program Bootcamp (2018).
Teaching assistant for Data Analysis in MATLAB, UCSD (2016)
Study group leader for Biology Scholars Program, Cornell University (2014)

ADVISING & MENTORSHIP

Mentoring/Supervising students, Carnegie Mellon (2021 - ongoing).

Supervising undergraduate students in projects including: collection of behavioral data, image dataset labeling, computational analysis of neural data, neural network simulations.
Co-supervised the Honors Thesis project of a student in CMU Psychology Department (Omisa Jinsi), focused on neural network modeling. Weekly meetings including hands-on supervision. Student was awarded a competitive prize for her work.
Mentees include: Owen Hershey, Gaurika Sawhney, Omisa Jinsi, Evren Konuk, Ayat Karim.

Mentoring/Supervising students, UCSD (2016 – 2021).

Trained undergraduate students to collect behavioral, eye-tracking, and EEG data for ongoing projects, as well as basic programming and data analysis skills. Hold journal-club style meetings to discuss relevant papers and involve students in the research process. Supervised the Honors Thesis project of one student.
Mentees include: Kelvin Lam (Honors Program; went on to a PhD program at UC Santa Barbara), Yonghoon Chun (received a Psychology Department Undergraduate Research Fellowship; currently a PhD student at Dartmouth), Vanessa Cancio, Ben Carfano, Shruti Nishith, Julie Eitzen.

OTHER ACADEMIC TRAINING

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

PROFESSIONAL ACTIVITIES

Academic Memberships:

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

Ad-hoc reviewer:

Conference on Cognitive Computational Neuroscience, eNeuro, Nature Neuroscience, Communications Biology, Psychonomic Bulletin & Review, Journal of Experimental Psychology: General, Cognitive Research: Principles and Implications, Nature Communications, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, Visual Cognition

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.