CARL WILLIAM HARRIS

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EDUCATION

Johns Hopkins University, Baltimore, MD **Expected June 2027**
Ph.D., Biomedical Engineering **GPA: 4.00/4.00**
Advised by Dr. Rama Chellappa and Dr. Robert Stevens

- Premedical coursework: General chemistry I & II, Organic chemistry I & II, General biology I & II, Physics I & II, Biochemistry

Dartmouth College, Hanover, NH **June 2021**
B.A., Applied Mathematics and Neuroscience (High Honors), Economics Minor **GPA: 3.88/4.00**

- *Honors Thesis:* "DeepAction: A MATLAB toolbox for automated classification of animal behavior in video"
- *Activities:* Men's Division I varsity lightweight rowing, study group leader

AWARDS AND HONORS

Johns Hopkins University, Baltimore, MD

- NSF GFRP Fellowship ($159,000 over three years)

Dartmouth College, Hanover, NH

- *Magna cum laude*
- High honors in neuroscience major
- Dartmouth rowing varsity letter winner
- Dartmouth Economics Research Scholar (additional mentoring for students with high research potential; 2019-2021)
- Neukom Scholar (grant for development of novel computational techniques; 2020)
- David C. Hodgson Undergraduate Research Award (leave-term award for cognitive neuroscience research; 2020)
- James O. Freedman Presidential Scholar (two-term paid assistantship with Dr. Erzo Luttmer (economics); 2019)
- Academic citations for meritorious performance (exceptional performance in class) in *The Price System* (2017), *Microeconomics* (2018), *Topics in Public Economics* (2021), and *Honors Neuroscience Research* (2021)

RESEARCH EXPERIENCE

Johns Hopkins University, Baltimore, MD **Sep. 2023 –**
Ph.D. student, Department of Biomedical Engineering **June 2027 (expected)**

- Supervise 15 projects (26 students) across ML applications in critical care within the Laboratory of Computational Intensive Care Medicine (PI: Dr. Robert Stevens), culminating in 9 poster presentations and 7 publications (accepted and in-review) over 2 years.
- Manager of a pilot study to evaluate a non-invasive blood pressure sensor in Intensive Care Units (WICU, SICU, CVISU) the Johns Hopkins Hospital. Wrote successful grant application to fund effort (Accelerated Translational Incubator Pilot Program; $50,000).
- Developed novel methods for risk stratification of patients undergoing major surgery, estimation of drug treatment effects, and integration of multimodal data in clinical prediction tasks.

National Institute of Mental Health, Bethesda, MD **July 2021 –**
Postbaccalaureate IRTA, Machine Learning Team and Data Science & Sharing Team **Aug. 2023**
Advisors: Francisco Pereira and Adam Thomas

- Developed ML models forecasting COVID-19 mental-health trajectories from multi-modal survey and activity data.
- Established and benchmarked a novel cross-classification neural encoding model against classical approaches via large-scale Biowulf HPC simulations; co-authored methods manuscript.
- Led development of an extension to the Neurodata Without Borders (NWB) data standard for holographic photostimulation modalities and wrote a successful grant application to fund effort (Kavli Foundation, $15,457).
- Created pipeline to track 3D macaque pose in video. Developed tool to segment animal movement in video using an autoregressive hidden semi-Markov model.

Tse Laboratory (Octopus Lab), Hanover, NH **May 2019 –**
Undergraduate Researcher **June 2021**
Advisor: Peter U. Tse

- Built the *DeepAction* toolbox: CNN-RNN classifier with calibrated confidence and GUI for automated animal behavior classification.

- Engineered 24/7 video acquisition & HPC workflows extracting multi-animal trajectories from >25 TB of footage.
- Generated 3-D octopus reconstructions via stereo vision and non-rigid point-cloud registration to capture body-shape dynamics.

Computational and Cognitive Neuroscience Laboratory, Hanover, NH **Mar. 2019 – June 2021**
Undergraduate Researcher
Advisor: Alireza Soltani
- Modeled rats' probabilistic reversal learning with GLMs, entropy metrics, and RL fits to separate discrimination vs. reversal phases.
- Simulated plastic & metaplastic neural networks to quantify encoding and decoding of uncertain reward probabilities.

Dartmouth Economics Department, Hanover, NH **Sep. 2018 – Jan. 2020**
Research Assistant
Advisor: Erzo F.P. Luttmer
- Responsible for the implementation of an online survey to examine the role of cognitive heuristics and biases on suboptimal annuity choice. Wrote HTML, CSS, and JavaScript code to generate questions and record results.
- Managed data from ~3,000 respondents, administered payments from the Dartmouth Economics Department, and created a project website to communicate with respondents.

VOLUNTEER AND CLINICAL EXPERIENCE

Reading Partners, Baltimore, MD **Sep. 2024 – Present**
Tutor
- Provide reading support to first and second grade students in a Title I school twice a week.

Gilchrist Hospice, Baltimore, MD **Oct. 2024 – Present**
Volunteer, in-patient unit
- Provide companionship and emotional support to hospice patients through weekly conversations, fostering meaningful connections during their end-of-life care.

University of Maryland Medical Center, Baltimore, MD **Sep. 2024 – Mar. 2025**
Volunteer, Shock Trauma
- Supported healthcare staff and patients in the Shock Trauma Unit.

TECHNICAL SKILLS

- MATLAB, Python, Java

PUBLICATIONS

Journal articles

- [Link] **Harris, C**., Pimpalkar, A., Aggarwal, A., Yang, J., Chen, X., Schmidgall, S., ... & Stevens, R. D. (2025). Preoperative risk prediction of major cardiovascular events in noncardiac surgery using the 12-lead electrocardiogram: an explainable deep learning approach. British Journal of Anaesthesia.
- [Link] Hsu, J., Kim, H., Gong, K., **Harris, C.**, Azad, T. D., & Stevens, R. D. (2025). A Machine Learning Model to Predict Treatment Effect Associated with Targeted Temperature Management After Cardiac Arrest. *Neurocritical Care*, 1-9.
- [Link] Schmidgall, S.*, **Harris, C.***, Essien, I., Olshvang, D., Rahman, T., Kim, J. W., ... & Chellappa, R. (2024). Evaluation and mitigation of cognitive biases in medical language models. *npj Digital Medicine*, 7(1), 295.
- [Link] **Harris, C.**, Olshvang, D., Chellappa, R., & Santhanam, P. (2024). Obesity Prediction: Novel Machine Learning Insights into Waist Circumference Accuracy. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 103113.
- [Link] Olshvang, D., **Harris, C.**, Chellappa, R., & Santhanam, P. (2024). Predictive modeling of lean body mass, appendicular lean mass, and appendicular skeletal muscle mass using machine learning techniques: A comprehensive analysis utilizing NHANES data and the Look AHEAD study. *PloS one*, *19*(9), e0309830.
- [Link] **Harris, C.**, Finn, K. R., Kieseler, M. L., Maechler, M. R., & Tse, P. U. (2023). DeepAction: a MATLAB toolbox for automated classification of animal behavior in video. *Scientific Reports*, *13*(1), 2688.
- [Link] **Harris, C.***, Aguirre, C.*, Kolli, S., Das, K., Izquierdo, A., & Soltani, A. (2021). Unique features of stimulus-based probabilistic reversal learning. *Behavioral Neuroscience*, 135(4), 550.

Commentary

- [Link] Stevens, R. D., & **Harris, C.** (2025). Unlocking host response signatures in sepsis and critical illnesses: Critical care. *Nature Medicine*, 1-3.

Conference articles

- [Link] Han, X., Nguyen, H.†, **Harris, C.**†, Ho, N., & Saria, S. (2024). FuseMoE: Mixture-of-Experts Transformers for Fleximodal Fusion. *arXiv preprint arXiv:2402.03226*. [*NeurIPS* 2024]

Manuscript preprints

- [Link] Rapuri, S., Harris, C. W., Gong, K. D., & Stevens, R. D. (2025). A Comparative Analysis of Electronic Health Record and Electrocardiogram Waveform Data for Pulmonary Embolism Identification in Critically Ill Patients. medRxiv, 2025-09.
- [Link] Rahman, S., Farah, M., Kwok, A., Varghese, J., Xu, B., Daraie, A., **Harris, C.,** ... & Briggs, K. (2025). Longitudinal TCR repertoires in ulcerative colitis patients show features distinguishing disease states. bioRxiv, 2025-07.
- [Link] Lin, T., Ryu, J., Sreevarsha, P., Srinivasaragavan, R., Satavlekar, R., Kim, S., **Harris, C.,** ... & Green, K. (2025). EyePose: Pose-guided Saccadic Eye Movement Video Generation for Deep Learning-Based Neurologic Disease Phenotyping.
- [Link] Schmidgall, S., Ziaei, R., **Harris, C.**, Reis, E., Jopling, J., & Moor, M. (2024). AgentClinic: a multimodal agent benchmark to evaluate AI in simulated clinical environments. *arXiv preprint arXiv:2405.07960*.
- [Link] Nguyen, H., Han, X., **Harris, C. W.**, Saria, S., & Ho, N. (2024). On Expert Estimation in Hierarchical Mixture of Experts: Beyond Softmax Gating Functions. arXiv preprint arXiv:2410.02935.
- [Link] **Harris, C.**, Farmer, C., Atlas, L. Y., Gibbons, A., Shaw, J. D., Chung, J., & Pereira, F. (2022). *Prediction of mental well-being from individual characteristics and circumstances during the COVID-19 pandemic*. PsyArXiv.
- [Link] Yenho, C., **Harris, C.**, Ma, X., Li, Z., Pereira, F., Zheng, C. (2022). *Testing for context-dependent changes in neural encoding in naturalistic experiments*. arXiv.
- [Link] Finn, K., **Harris, C.**, Marie-Luise, K., Atkisson, C., Maechler, M., Edelman, D., Tse, P. Octopus biomaculoides' *activity depends on who their neighbor is*. SSRN.

Manuscripts under review

- Rapuri, S., Gong, K., **Harris, C.**, Stevens, R. (2025) *A Machine Learning Model to Identify Pulmonary Embolism in Patients Admitted to Intensive Care*.
- Ryu, J., **Harris, C.**, Zhang, C., Liu, T., Gong, K., Stevens, R. (2025) *Stress Cardiomyopathy Identification Using the 12-lead Electrocardiogram: A Deep Learning Approach*.
- Jos, N., **Harris, C.**, Gong, K., Stevens, R. (2025) *A Computational Predictive Model for Early Detection of ICU-Acquired Weakness.*

* Denotes co-first authorship.
† Denotes co-second authorship.

CONFERENCES

- Rapuri, S., **Harris, C.**, Dias, S., Stevens, R. (2025, October 25-29). *Optimized Intravenous Heparin Dosing in Acute Pulmonary Embolism: A Reinforcement Learning Approach* [Poster presentation]. European Society of Intensive Care Medicine, Munich, Germany.
- Raskin, M., Karhu-Leperd, I., **Harris, C.** Lascarrou, J.B., Stevens, R. (2025, October 25-29). *Heterogeneous Treatment Effects in Cardiac Arrest Patients Receiving Targeted Temperature Management: A Causal Machine Learning Analysis Approach* [Poster presentation]. European Society of Intensive Care Medicine, Munich, Germany.
- Zhong., Y, Shekhar, H., Babel, S., **Harris, C.**, Dias, S., Stevens, R. (2025, October 25-29). *Heterogeneous Treatment Effects in Traumatic Brain Injury* [Conference presentation abstract]. European Society of Intensive Care Medicine, Munich, Germany.
- Raskin, M., Karhu-Leperd, I., **Harris, C.**, Lascarrou, J.B., Stevens, R. (2025, June 25-27). *A TTM Analysis: No HTA Found* [Poster presentation]. EuroNeuro, Paris, France.
- Ryu, J., **Harris, C.**, Zhang, C., Liu, T., Gong, K., Stevens, R. (2025, March 18-21). *Machine Learning Identification of Stress Cardiomyopathy using 12-lead Electrocardiograms* [Poster presentation]. International Symposium on Intensive Care & Emergency Medicine, Brussels, Belgium.
- Jooyoung intramural x2
- **Harris, C.**, Pimpalkar, A., Aggarwal, A., Yang, P., Chen, X., Taylor, C., Greenstein, J., & Stevens R. (2024, February 9). *Surgical risk prediction using an explainable deep learning approach applied to pre-operative 12-lead electrocardiograms* [Poster presentation]. Department of Medicine & Whiting School of Engineering Research Retreat, Baltimore, MD, United States.

SERVICE

Reviewer for *Annals of Internal Medicine, Neurocritical Care, Frontiers in Endocrinology, Journal of the American Geriatrics Society*, *Innovation in Aging, Journal of Gerontology: Medical Sciences*.

REFERENCES

Available upon request.