# Eghbal A. Hosseini

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Eghbal A. Hosseini https://eghbalhosseini.github.io

## Current Position

2025 – Present **Visiting Researcher**, Google DeepMind, San Francisco, CA

## Education

2016 – 2024 **Ph.D. Computational Neuroscience**, Massachusetts Institute of Technology (MIT)
Thesis: *Towards Synergistic Understanding of Language Processing in Biological and Artificial Systems*.

2023 **Analytical Connectionism**, Gatsby Computational Neuroscience Unit, University College London.

2017 **Brains, Minds, and Machines**, Marine Biological Laboratory University of Chicago.

2012 – 2014 **M.Sc. Electrical Engineering**, George Mason University (GMU)
Thesis: *Multi-rate state-dependent primitives underlie the motor adaptation and unlearning to motion dependent force perturbation*.

2005 – 2010 **B.Sc. Electrical Engineering**, Iran University of Science and Technology (IUST)
Thesis: *Position control of DC motor using wavelet based multi-resolution analysis.*.

## Research Publications

### Selected

**Hosseini**, **E. A.**, Cheung, B., Fedorenko, E., & Williams, A. H. (2026). Modulating cross-modal convergence with single-stimulus, intra-modal dispersion. *ICLR 2026 Re-Align Workshop*.

**Hosseini**, **E. A.**, Li, Y., Bahri, Y., Campbell, D., & Lampinen, A. K. (2026). Context structure reshapes the representational geometry of language models. *arXiv*.

**Hosseini**, **E. A.**, Casto, C., Zaslavsky, N., Conwell, C., Richardson, M., & Fedorenko, E. (2024). Universality of representation in biological and artificial neural networks. *bioRxiv*.

**Hosseini**, **E. A.**, Schrimpf, M., Zhang, Y., Bowman, S., Zaslavsky, N., & Fedorenko, E. (2024). Artificial neural network language models predict human brain responses to language even after a developmentally realistic amount of training. *Neurobiol Lang (Camb)*, *5*(1), 43–63.

**Hosseini**, **E. A.**, & Fedorenko, E. (2023). Large language models implicitly learn to straighten neural sentence trajectories to construct a predictive representation of natural language. *NeurIPS*.

**Hosseini**, **E. A.**, Zaslavsky, N., Casto, C., & Fedorenko, E. (2023). Teasing apart the representational spaces of ANN language models to discover key axes of model-to-brain alignment. *Computational Cognitive Neuroscience, (Oral presentation, top 5% submission)*.

### Aditional

Lampinen, A. K., Li, Y., **Hosseini**, **E. A.**, Bhardwaj, S., & Shanahan, M. (2026). Linear representations in language models can change dramatically over a conversation. *arXiv*.

Regev, T. I., Casto, C., **Hosseini**, **E. A.**, Adamek, M., Ritaccio, A. L., Willie, J. T., Brunner, P., & Fedorenko, E. (2024). Neural populations in the language network differ in the size of their temporal receptive windows. *Nat. Hum. Behav.*, *8*(10), 1924–1942.

Schrimpf, M., Blank, I. A., Tuckute, G., Kauf, C., **Hosseini**, **E. A.**, Kanwisher, N., Tenenbaum, J. B., & Fedorenko, E. (2021). The neural architecture of language: Integrative modeling converges on predictive processing. *Proc. Natl. Acad. Sci. U. S. A.*, *118*(45). .

Tremblay, S., Acker, L., Afraz, A., Albaugh, D. L., Amita, H., Andrei, A. R., Angelucci, A., Aschner, A., Balan, P. F., Basso, M. A., Benvenuti, G., Bohlen, M. O., Caiola, M. J., Calcedo, R., Cavanaugh, J., Chen, Y., Chen, S., Chernov, M. M., Clark, A. M., … Platt, M. L. (2020). An open resource for non-human primate optogenetics. *Neuron*. .

Wang, J., **Hosseini**, **E. A.**, Meirhaeghe, N., Akkad, A., & Jazayeri, M. (2020). Reinforcement regulates timing variability in thalamus. *Elife*, *9*. .

Alhussein, L., **Hosseini**, **E. A.**, Nguyen, K. P., Smith, M. A., & Joiner, W. M. (2019). Dissociating effects of error size, training duration, and amount of adaptation on the ability to retain motor memories. *J. Neurophysiol.*, *122*(5), 2027–2042. .

Nguyen, K. P., Zhou, W., McKenna, E., Colucci-Chang, K., Bray, L. C. J., **Hosseini**, **E. A.**, Alhussein, L., Rezazad, M., & Joiner, W. M. (2019). The 24-h savings of adaptation to novel movement dynamics initially reflects the recall of previous performance. *J. Neurophysiol.*, *122*(3), 933–946. .

Remington, E. D., Narain, D., **Hosseini**, **E. A.**, & Jazayeri, M. (2018). Flexible sensorimotor computations through rapid reconfiguration of cortical dynamics. *Neuron*, *98*(5), 1005–1019.e5. .

Wang, J., Narain, D., **Hosseini**, **E. A.**, & Jazayeri, M. (2018). Flexible timing by temporal scaling of cortical responses. *Nat. Neurosci.*, *21*(1), 102–110. .

**Hosseini**, **E. A.**, Nguyen, K. P., & Joiner, W. M. (2017). The decay of motor adaptation to novel movement dynamics reveals an asymmetry in the stability of motion state-dependent learning. *PLoS Comput. Biol.*, *13*(5), e1005492. .

**Hosseini**, **E. A.**, & Sadjadian, H. (2015). Noise resistant design of wavelet based multiresolution control. *American Control Conference (ACC), 2015*, 4959–4963. .

## Technical & Research Skills

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|---|---|
| Research Expertise | Computational neuroscience, Language modeling, Representation learning, Neural coding |
| Machine Learning Frameworks | PyTorch, TensorFlow, Slurm |
| Programming Languages | Python, MATLAB, R, Simulink, Pycharm, LaTeX |
| Web Development | HTML, CSS, JavaScript |
| Operating Systems | Linux, Macintosh OS, Microsoft Windows |
| Others | Neuroimaging analysis, Data visualization, Academic research, teaching, undergraduate advising, publishing and consultation |
| Languages | Fluent in reading, writing, and speaking *English* and *Persian* |

## Experiences & Awards

### Research Experience

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| 2025-Present | **Visiting Scientist**, Special Year on Large Language Models and Transformers, Part 2, Simons Institute for the Theory of Computing, UC Berkeley |
| 2024-2025 | **Postdoctoral Associate**, Dr. Evelina Fedorenko, EvLab, McGovern Institute for Brain Research, MIT |
| 2019-2024 | **Graduate Research Assistant**, Dr. Evelina Fedorenko, EvLab, McGovern Institute for Brain Research, MIT |
| 2017-2018 | **Graduate Fellowship Student**, Dr. Edward S. Boyden, Synthetic Neurbiology Group, McGovern Institute for Brain Research, MIT |

## Experiences & Awards (continued)

2015-2016 **Technical Assistant**, Dr. Mehrdad Jazayeri, JazLab, McGovern Institute for Brain Research, MIT

2013-2014 **Graduate Research Assistant**, Dr. Wilsaan Joiner, Sensorimotor Integration Lab, Volgenau School of Engineering, GMU

### Teaching Experience

2020 **Teaching Assistant**, Dr. Michale Fee, Introduction to Neural Computation, Department of Brain and Cognitive Sciences, MIT

2017 **Teaching Assistant**, Dr. Tomaso Poggio, Science of Intelligence, MIT

### Awards and Achievements

2020 **Friends of the McGovern Institute Fellowship**, MIT

2017-2018 **BCS Hilibrand Graduate Student Fellowship**, MIT

2016-2017 **Henry E. Singleton(1940) Presidential Fellowship**, MIT

2014 **ECE Chairmans Award**, Volgenau School of engineering, GMU

2012 **Dean Fellowship**, Volgenau School of engineering, GMU

2005,2007,2010 **Honors student in ECE**, IUST