Eghbal A. Hosseini

ehoseini@mit.edu
(703)789-6512

EDUCATION

Ph.D candidate, Brain and Cognitive Sciences 2016-present
Massachusetts Institute of Technology (MIT), Cambridge, MA
GPA 5.0/5.0

Relevant courseworks: Computational Neuroscience (Harvard - MCB131) Quantitative Methods in Neuroscience (MIT - 9.014), Computational Cognitive Science (MIT - 9.660), Cognitive Science (MIT - 9.012), How to Make Almost Anything (MIT - MAS 863) , Matrix Methods (MIT - 18.0651)

Analytical Connectionism 2023
Gatsby Computational Neuroscience Unit, UCL, London, UK

Brains, Minds, and Machines 2017
Marine Biological Laboratory, Woods Hole, MA

MS., Electrical Engineering 2012-2014
George Mason University (GMU), Fairfax, VA

Thesis: Multi-rate state-dependent primitives underlie the motor adaptation and unlearning to motion dependent force perturbation.
GPA: 3.8/4

BS., Electrical Engineering 2005-2010
Iran University of Science and Technology (IUST), Tehran, Iran

Thesis : Position control of DC motor using wavelet based multiresolution analysis.
GPA: 16.43/20 (3.41/4)

HONORS & AWARDS

Friends of the McGovern Institute Fellowship, MIT	2020
BCS Hilibrand Graduate Student Fellowship, MIT	2017-2018
Henry E. Singleton(1940) Presidential Fellowship, MIT	2016-2017
ECE Chairmans Award, Volgenau School of engineering, GMU	Spring 2014
Volgenau School of Engineering Dean Fellowship, GMU	Spring-Fall 2012
Honors in ECE control group class of 2005, IUST	Fall 2010
Honors student in ECE class of 2005, IUST	2005 & 2007

PUBLICATIONS

Selected

Eghbal A Hosseini, Evelina Fedorenko "Large language models implicitly learn to straighten neural sentence trajectories to construct a predictive representation of natural language.", accepted in Neural Information Processing Conference (NeurIPS) , 2023, New Orleans, U.S.A.

Eghbal A Hosseini, Noga Zaslavsky, Colton Casto, Evelina Fedorenko, "Teasing apart the representational spaces of ANN language models to discover key axes of model-to-brain alignment" Contributed talk - top 5% of submission, Computational Cognitive Neuroscience (CCN), 2023, Oxford, England .

Eghbal A Hosseini, Martin A Schrimpf, Yian Zhang, Samuel Bowman, Noga Za-

slavsky, Evelina Fedorenko. 2022. "Artificial neural network language models align neurally and behaviorally with humans even after a developmentally realistic amount of training" . BioRxiv

Schrimpf, Martin, Idan A. Blank, Greta Tuckute, Carina Kauf, **Eghbal A. Hosseini**, Nancy G. Kanwisher, Joshua B. Tenenbaum, and Evelina Fedorenko. 2021. "The neural architecture of language: Integrative reverse-engineering converges on a model for predictive processing" . PNAS

Continued

Tamar I Regev*, Colton Casto*, **Eghbal A Hosseini**, Markus Adamek, Peter Brunner, Evelina Fedorenko. 2022. "Intracranial recordings reveal three distinct neural response patterns in the language network" . BioRxiv

Wang, Jing, **Eghbal Hosseini** , Nicolas Meirhaeghe, Adam Akkad, and Mehrdad Jazayeri. 2020. "Reinforcement Regulates Timing Variability in Thalamus." eLife 9 (December). https://doi.org/10.7554/eLife.55872.

Tremblay, Sébastien, Leah Acker, Arash Afraz, Daniel L. Albaugh, Hidetoshi Amita, Ariana R. Andrei, Alessandra Angelucci,...,**Eghbal A. Hosseini**,... et al. 2020. "An Open Resource for Non-Human Primate Optogenetics." Neuron,

Alhussein, Laith, **Eghbal A. Hosseini** , Katrina P. Nguyen, Maurice A. Smith, and Wilsaan M. Joiner. 2019. "Dissociating Effects of Error Size, Training Duration, and Amount of Adaptation on the Ability to Retain Motor Memories." Journal of Neurophysiology 122 (5): 2027–42.

Nguyen K.P, Weiwei Z., McKenna E. L., Colucci K.,, Bray L. C., **Hosseini E.A.**, Alhussein L., Joiner W. M., 2019 "The 24 hour savings of adaptation to novel movement dynamics initially reflects the recall of previous performance", Journal of Neurophysiology,

Wang, Jing* Devika Narain*, **Eghbal A. Hosseini**, and Mehrdad Jazayeri. 2018. "Flexible Timing by Temporal Scaling of Cortical Responses." Nature Neuroscience 21 (1):102-10.

Remington, Evan D., Devika Narain, **Eghbal A. Hosseini** , and Mehrdad Jazayeri. 2018. "Flexible Sensorimotor Computations through Rapid Reconfiguration of Cortical Dynamics." Neuron 98 (5). Elsevier: 1005-19.e5.

Eghbal A Hosseini, Katrina P. Nguyen, and Wilsaan M. Joiner. 2017. "The Decay of Motor Adaptation to Novel Movement Dynamics Reveals an Asymmetry in the Stability of Motion State-Dependent Learning." PLoS Computational Biology 13 (5): e1005492.

Eghbal A Hosseini, and H. Sadjadian. 2015. "Noise Resistant Design of Wavelet Based Multiresolution Control." In American Control Conference (ACC), 2015, 4959?63.

Posters - Presentations

Eghbal A Hosseini, Martin A Schrimpf, Yian Zhang, Samuel Bowman, Noga Zaslavsky, Evelina Fedorenko. 2022. "Alignment of ANN Language Models with Humans After a Developmentally Realistic Amount of Training" .Cosyne 2023 ,Montreal, Canada

Hosseini E.A, Schrimpf M., Bowman S., Fedorenko E., Zaslavsky N. "The effect of

*co-first authors

training in neural network language models on predicting brain activity" Society for Neurobiology of Language, 2020.

Wang J. , **Hosseini E.A**, Meirhaeghe N., Akkad A., and Jazayeri M. , "Reinforcement regulates context-dependent timing variability in thalamus", Cosyne 2020 , Denver, CO

Remington E. D., Narain D. **Hosseini E.A.**, Jazayeri M., "Control of sensorimotor dynamics through adjustment of inputs and initial condition", Cosyne 2018 , Denver, CO

Wang J., **Hosseini E.A.**, Jazayeri M., "Reward-dependent modulation of variability mediates trial-by-trial motor learning", Society for Neuroscience meeting, 2018, San Diego, CA.

Wang J., Jazayeri M., **Hosseini E.A.**, Narain D., "The speed of neural dynamics as a neural code for motor timing", Computational and System Neuroscience Meeting (Cosyne), 2017, Salt Lake City, UT

Hosseini E.A., Wang J., Jazayeri M., "Representation of contextual information in cortico-basal ganglia circuits during motor timing", Society for Neuroscience meeting, 2016, San Diego, CA.

Wang J., **Hosseini E.A.**, Jazayeri M., "Scalar dynamics in neural activity during timing", Society for Neuroscience meeting, 2016, San Diego, CA.

Remington E. D., **Hosseini E.A.**, Jazayeri M., "Probing a sensorimotor transformation in dorsomedial frontal cortex using electrophysiology and optogenetics", Society for Neuroscience meeting, 2016, San Diego, CA.

Hosseini E.A., Nguyen K.P., Joiner W.M., "Multi-rate state-dependent primitives underlie the motor adaptation and unlearning to motion dependent force perturbation", McGovern Institute Spring Symposium, MIT, 2015, Cambridge, MA.

Remington E. D., **Hosseini E.A.**, Jazayeri M., "Sensory measurement and motor planning are not separable in interval timing", Society for Neuroscience, 2015, Chicago, IL.

Nguyen K.P, McKenna E. L., Bray L. C., Colucci K., Alhussein L. **Hosseini E.A.**, Joiner W. M., "The initial single-trial rate of motor adaptation savings is dependent on both the training duration and final adaptive state before a 24-hour break", Society for Neuroscience, 2015, Chicago, IL.

Alhussein L., **Hosseini E.A.**, Nguyen K.P., Joiner W.M., "The Intralimb stability of adaptation to novel movement dynamics is dictated by the training duration for different types of motion-dependent perturbations", Neural Control of Movement Conference, 2015, Charleston, SC.

Nguyen K.P, **Hosseini E.A.**, Joiner W.M., "The decay of motor adaptation to novel movement dynamics reveals hysteresis in motor primitive gain-space", Society for Neuroscience, 2014, Washington D.C.

Keshtkar H., Sartipizadeh H., **Hosseini E.A.**, Khandani A., Naghavi F., "The role of telework centers in development of electronic municipality", 1st international conference on electronic municipality, 2007, Tehran, Iran.

Keshtkar H., **Hosseini E.A.**, "Telework centers and economic productivity", National conference on industry, student and sustainable improvement, 2007, Tehran, Iran.

Patents

Hosseini E.A., Momtazan H., Momtazan A., "Automatic device for electric arc based production of carbon nanotubes in Liquid environment" Patent Number 72901, 2011, Iran.

RESEARCH EXPERIENCE

Graduate Research Assistant Summer 2020-Present
Dr. Evelina Fedorenko, EvLab, McGovern Institute for Brain Research, MIT

Graduate Fellowship Student Spring 2019-Fall 2019
Dr. Evelina Fedorenko, EvLab, McGovern Institute for Brain Research, MIT

Graduate Fellowship Student Spring 2019
Dr. Ila Fiete, Fiete Lab, McGovern Institute for Brain Research, MIT

Graduate Fellowship Student Summer 2017-Summer 2018
Dr. Edward S. Boyden, Synthetic Neurbiology Group, McGovern Institute for Brain Research, MIT

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

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

Undergraduate Research Assistant 2009-2010
Mechatronic and Robotic Research Lab, IUST

Undergraduate Research Assistant 2006-2007
Electronics Research Center, IUST

TEACHING EXPERIENCE

Teaching Assistant Sprint 2020
Introduction to Neural Computation, Department of Brain and Cognitive Sciences, MIT

Teaching Assistant Fall 2017
Science of Intelligence, Department of Brain and Cognitive Sciences, MIT

Teaching Assistant Fall 2014
Introduction to Biomedical Engineering, Bioengineering department, GMU

Graduate Research Assistant Summer 2012
Center for Outreach in Mathematics Professional Learning and Educational Technology (COMPLETE), GMU

- Designed a series of experiments for demonstrating the use of high school physics and calculus in solving engineering problems, and mentored high school teachers as they implemented these experiments in the coursework of two 10th grade classes in Northern Virginia high schools.

Teaching Assistant Spring-Fall 2012
Bioengineering Measurements Lab, Bioengineering department, GMU

Teaching Assistant Spring 2008- Fall 2010
Circuit Theory, Department of Computer Engineering, IUST

COMPUTER SKILLS

Languages & Software: MATLAB, Simulink, Python, Tensorflow,Pytorch, R, PSPICE, Protel DXP, Microsoft Office, Adobe Illustrator, Adobe Acrobat Pro. Solid-

works, LaTex, Slurm

Operating Systems: Linux (Ubuntu), Macintosh OS, Microsoft Windows

LANGUAGES English (fluent)
Farsi (native)

PROFESSIONAL MEMBERSHIP

Society for Neuroscience	2013-2019
Institute of Electrical and Electronic Engineers (IEEE)	2015-2018