Hossein Adeli
New York, NY
hosseinadeli.github.io

LinkedIn; Google Scholar

E-mail: ha2366@columbia.edu
hossein.adelijelodar@gmail.com

Positions

Associate Research Scientist, Zuckerman Mind Brain Behavior Institute, Columbia University   June 2023 –

I work at the intersection of neuroscience and AI (Neuro-AI). We build encoding models using modern machine learning and deep neural networks that predict neural activity to better understand computations in the brain. These models can also serve as "digital twins" on which we perform in silico experiments to reveal the selectivity of different units. We also are building state of the art decoding models to reconstruct perceived stimuli from brain activity. In other work, I study how the visual system combines top-down and attention modulations with bottom-up and lateral connectivity to efficiently group visual input into objects and reveal mechanisms of face perception.

Adjunct Faculty, The New School for Social Research   Aug 2022-
I teach Cognitive Neuroscience to the graduate students in the psychology department. I am also contributing to help create a new **Neuro-AI design lab at Parsons School of design**.

Senior Post-doctoral Research Fellow, Stony Brook University   Sep 2020 – May 2023

I pursued two lines of research. First on leveraging recent developments in deep auto-encoder models to build brain-inspired object-based attention models for multi-object recognition, detection, and visual reasoning. Second on modeling visual-motor principles in superior colliculus (a midbrain area for planning eye-movements) to predict fixation behavior and neural activity during different tasks such as scene viewing and reading and to verify these predictions through collaborations with a neurophysiology lab.

Data Scientist, Refinitiv Innovation Lab, Refinitiv, New York, NY   Jan 2018 – Aug 2020
(formerly Thomson Reuters Financial and Risk business)

At Refinitiv labs I was part of the team building prototypes to test and validate business hypotheses with customers and to identify product/growth opportunities enabled by AI and machine learning. Also planned and served as the technical contributor for hackathons and other outreach efforts to showcase our new prototypes to customers.

Education

Ph.D. in Cognitive Science, Stony Brook University, Stony Brook, NY   2017
Advanced Graduate Certificate in Cognitive Neuroscience
Thesis Title: *Deep Learning in Attention Networks*
Designed experiments and built deep neural network models of visual attention to predict eye-movements and study the neuro-cognitive mechanisms underlying perception and behavior and for incorporating such features to build better ML and deep learning models.

M.A. in Psychology, Stony Brook University, Stony Brook, NY   2014
Thesis title: *Explaining the Global Effect: A population model of saccade programming in the Superior Colliculus*

M.S. in Computer Science, East Carolina University, Greenville, NC   2012

Graduate Coursework in Electrical Engineering, Washington State University, Pullman, WA   2010

B.S. in Electrical Engineering (Control and System), Sharif University of Technology, Tehran, Iran   2009

Selected Publications (Google Scholar Link)

Adeli, H., Minni, S., & Kriegeskorte, N. (2025). Transformer brain encoders explain human high-level visual responses. In *Neural Information Processing Systems (NeurIPS)* **Spotlight (top %3)**

Feng, P., **Adeli, H.**, Guo, W., Cheng, F., Hwang, E., & Kriegeskorte, N. (2026). Towards Interpretable Visual Decoding with Attention to Brain Representations. In *International Conference on Learning Representations* (*ICLR*)

Nan, M.,Yu, M., Mai, W., Prince, J. S., **Adeli, H.**, ... & Luo, A. F. (2026). Meta-Learning In-Context Enables Training-Free Cross Subject Brain Decoding. In ***Computer Vision and Pattern Recognition (CVPR)***

Hwang, E., **Adeli, H**., Guo, W., Luo, A., & Kriegeskorte, N. (2025). In Silico Mapping of Visual Categorical Selectivity Across the Whole Brain. In ***Neural Information Processing Systems (NeurIPS)***

Yu, M., Nan, M., **Adeli, H.**, Prince, J. S., Pyles, J. A., Wehbe, L., ... & Luo, A. F. (2025). Meta-Learning an In-Context Transformer Model of Human Higher Visual Cortex. In ***Neural Information Processing Systems (NeurIPS)***

Adeli, H., Ahn, S., Luo, A., Zhang, M., Kriegeskorte, N., & Zelinsky, G. (2026). Human-like Object Grouping in Self-supervised Vision Transformers. *arXiv preprint arXiv:2603.13994.*

Ahn, S., **Adeli, H.**, & Zelinsky, G. J. (2025). Guiding attention during search using generative target template matching. ***In revision at Psychological Science.***

Leite, A., **Adeli, H**., McPeek, R. M., & Zelinsky, G. J. (2025). Multiple patterns of selectivity in superior colliculus control visual search. *bioRxiv,* 2025-11. (Under review)

Ahn, S., **Adeli, H.**, & Zelinsky, G. J. (2024). The attentive reconstruction of objects facilitates robust object recognition. ***PLOS Computational Biology***, *20*(6), e1012159.

Adeli, H., Minni, S., & Kriegeskorte, N. (2023). Predicting brain activity using Transformers. *bioRxiv*, 2023-08.

Adeli, H., Ahn, S., & Zelinsky, G. J. (2023). A brain-inspired object-based attention network for multiobject recognition and visual reasoning. ***Journal of Vision***, 23(5), 16-16.

Adeli, H., Ahn, S., Kriegeskorte, N., & Zelinsky, G. (2023). Affinity-based Attention in Self-supervised Transformers Predicts Dynamics of Object Grouping in Humans. *arXiv preprint arXiv:2306.00294*.

Zelinsky, G. J., Chen, Y., Ahn, S., **Adeli, H**., Yang, Z., Huang, L., ... & Hoai, M. (2021). Predicting goal-directed attention control using inverse-reinforcement learning. *Neurons, Behavior, Data Analysis and Theory*, *2021*, 10-51628.

Vitu, F., **Adeli, H.**, & Zelinsky, G. J. (2021). Readers move their eyes mindlessly using midbrain visuo-motor principles. *BioRxiv*, 2021-10.

Zelinsky, G. J., Chen, Y., Ahn, S., & **Adeli, H.** (2020). Changing perspectives on goal-directed attention control: The past, present, and future of modeling fixations during visual search. In ***Psychology of learning and motivation*** (Vol. 73, pp. 231-286). Academic Press.

Zelinsky, G., Yang, Z., Huang, L., Chen, Y., Ahn, S., Wei, Z., **Adeli, H.**, … & Hoai, M. (2019). Benchmarking gaze prediction for categorical visual search. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops*.

Adeli, H., & Zelinsky, G. (2018). Deep-BCN: Deep Networks Meet Biased Competition to Create a Brain-Inspired Model of Attention Control. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops* (pp. 1932-1942).

Adeli, H., & Zelinsky, G. (2018). Learning to attend in a brain-inspired deep neural network. *arXiv preprint arXiv:1811.09699*.

Adeli, H., Vitu, F., Zelinsky, G. J. (2017). A model of the superior colliculus predicts fixation locations during scene viewing and visual search. ***Journal of Neuroscience***, *37*(6), 1453-1467.

Vitu, F., Casteau, S., **Adeli, H**., Zelinsky, G. J., Castet, E. (2017). The magnification factor accounts for the greater hypometria and imprecision of larger saccades: Evidence from a parametric human-behavioral study. *Journal of Vision*, 17(4):2, 1–38.

Wei*, Z., **Adeli*, H**., Zelinsky, G., Samaras, D., Hoai, M. (2016). Learned region sparsity and diversity also predicts visual attention. In ***Neural Information Processing Systems (NIPS)*** (pp. 1894-1902).
*Equal Contribution

Zelinsky, G., **Adeli, H**., Peng, Y., Samaras, D. (2013). Modelling eye movements in a categorical search task. ***Phil. Trans. R. Soc. B***, *368*(1628), 20130058.

Selected Oral Presentations and Invited Talks

Adeli, H., Building Neuro-AI Models with Transformer Attention, at **Center for Theoretical Neuroscience, Columbia University.** Nov 2025.

Adeli, H., Transformer brain encoders explain human high-level visual responses, at **Zuckerman Institute Postdoctoral Seminar Series, Columbia University.** Nov 2025.

Adeli, H., Flexible relational neural encoder architecture explains human high-level visual responses, at **Department of Systems and Computational Biology, Albert Einstein College of Medicine**. April 2025

Adeli, H., Recurrent models optimized for face recognition exhibit representational dynamics resembling the primate brain. **SciFest at Zuckerman Mind Brain Behavior Institute**. September 2024.

Adeli, H., Predicting brain activity using Transformers, at **Center for Theoretical Neuroscience, Columbia University.** August 2024.

Adeli, H., Ahn, S., Zelinsky, G., & Kriegeskorte, N.. Object-based association fields for grouping and attention. **Vision Science Society Meeting (VSS) 2024**, USA

Adeli, H., Ahn, S., Zelinsky, G., & Kriegeskorte, N. (2024). Three theories of object-based attention implemented in deep neural network models. at **Using deep networks to re-imagine object-based attention and perception symposium, Vision Science Society Meeting (VSS)**, USA

Adeli, H., Minni, S., & Kriegeskorte, N. Predicting brain activity using Transformers, **Latin American Workshop on Computational Neuroscience**, 2023, Medellin, CO

Adeli, H., Minni, S., & Kriegeskorte, N. Predicting brain activity using Transformers, 2023, **NeuroAI Montreal**

Adeli, H., Minni, S., & Kriegeskorte, N. Predicting brain activity using Transformers, **Cognitive Computational Neuroscience Conference (CCN), 2023**, Oxford, UK

Adeli, H., Ahn, S., Zelinsky, G., A brain-inspired object-based attention network for multi-object recognition and visual reasoning. **Vision Science Society Meeting (VSS) 2022**, USA

Adeli, H., Ahn, S., Zelinsky, G., A brain-inspired object-based attention network for multi-object recognition and visual reasoning. **From Neuroscience to Artificially Intelligent Systems (NAISys),** 2022, CSHL, NY

Adeli, H., Zelinsky, G., A Computational Biased Competition Model of Visual Attention using Deep Neural Networks, Vision Sciences Society Meeting (VSS) 2016, USA

Adeli, H., Zelinsky, G., Vitu, F., A model of saccade programming during scene viewing based on population averaging in the superior colliculus. Vision Sciences Society Meeting (VSS) 2015, USA

Selected Conference Proceedings and Poster Presentations

Adeli, H., Guo, W., Feng, P., Hwang, E., Cheng, F., & Kriegeskorte, N. NeuroAdapter: Visual Reconstruction with Masked Brain Representation. **Cognitive Computational Neuroscience Conference (CCN) 2025**, Amsterdam, Netherlands

Community & Educational Initiatives

Developed a Tutorial on **Computation as Transformation of Representational Geometries** for the **Neuromatch NeuroAI** course with students from across the globe.   2024

Co-organized the **Using Deep Networks to Re-imagine Object-based Attention and Perception** symposium at VSS (2024) to better understand how the visual system forms meaningful, coherent object percepts.   2024

Teaching Experience

Cognitive Neuroscience (Graduate course), The New School for Social Research	2022-
General Psychology (Undergraduate course), Pratt Institute	2024-
Research Methods and Writing in Psychology (Undergraduate course), Stony Brook University	2013 2017
Sensation and Perception (Undergraduate course), Stony Brook University	2016
Numerical Computations using MATLAB (Undergraduate Lab), Washington State University	2010
Linear Control Systems (Undergraduate Lab), Washington State University	2009

Departmental, Mentoring, and Academic Services

Mentored a group of students in the graduate data science program at Columbia University to develop Generative Decoders of Visual Cortical Representations.	2025
Mentoring and lecturing students in the graduate design studio course at Parsons school of design to integrate neuro-AI into their design projects	2025
Graduate mentor for two undergraduate students' research projects presented at the Undergraduate Research & Creative Activities (URECA), Stony Brook University, NY	2014 - 2016

Ad-hoc reviewer: Journal of Vision, Philosophical Transaction of the Royal Society B: Biological Sciences, Neural Information Processing Systems, Attention Perception & Psychophysics, Conference on Cognitive Computational Neuroscience, Nature Machine Intelligence, Nature Communications Biology

Awards

Second place in Algonauts 2023 competition on "How the Human Brain Makes Sense of Natural Scenes". We built a state-of-the-art model to predict neural activity in response to scenes.	2023
Outstanding Graduate Student Award, East Carolina University, NC	2012
Gold Medalist in 13th National Chemistry Olympiad, Tehran, Iran	2009

Skills

Neuro-AI: Encoding and decoding models of the brain, Object recognition, Attention mechanisms, Recurrent neural networks, Capsule networks, Encoder-decoder models, Generative models, Vision transformers
Programming: Python, MATLAB
Libraries: Pytorch, Torchvision, Transformer, Keras, Pandas, NumPy, Scikit-learn, Matplotlib, PIL
Cognitive Science: Designing and performing experiments to study human behavior (attention behavior, eye-tracking and visual cognition), Computational modeling and statistical analyses of behavior
Other: Public speaking, Scientific writing and communication