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Work Experience

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

I build computational models of the brain mechanisms of face perception and evaluate them using controversial and adversarial stimuli. I am also using deep neural networks to study how the visual system combines top-down and attention modulations with bottom-up and lateral connectivity to efficiently group visual input into objects.

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

I was pursuing 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 collaboration with a neurophysiology lab.

Data Scientist, Refinitiv Innovation Lab, Refinitiv, New York, NY Jan 2018 – Jan 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*
Designing experiments and building deep neural network models of visual attention to predict eye-movements and study the neuro-cognitive mechanisms underlying the 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
Thesis title: *Modeling salient object-object interactions to generate textual descriptions for natural images*

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

Skills

Machine Learning: Object recognition, Attention mechanisms, Recurrent neural networks, Capsule networks, Encoder-decoder models, Generative models, Vision transformers, Transformer object detection models
Programing: Python, MATLAB
Libraries: Pytorch, Torchvision, 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 for hypothesis testing
Other: Public speaking, Scientific writing and communication

Selected Publications (Google Scholar Link)

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*.

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

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*

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

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).

Selected Oral Presentations

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, FL 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, FL 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, FL USA

Teaching Experience

Cognitive Neuroscience (Graduate), The New School for Social Research	Fall 2022
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

Awards

Outstanding Graduate Student Award, East Carolina University, NC	2012
Gold Medalist in 13th National Chemistry Olympiad, Tehran, Iran	2009