

Ali Hummos, PhD. MD.

Summary:

Studying intelligence at the interface between artificial and biological forms. Pursuing models with rich dynamics and representations that model brain function and advance the pursuit of artificial intelligence.

Education:

Post-doctoral research in Computational Neuroscience, MIT, Cambridge, MA (2020-present)

- Published research on the role of the cognitive thalamus in reconfiguring computations in the prefrontal cortex in a model with a latent embedding gating a reservoir RNN.
- Proposed a brain-inspired method for few-shot continual learning achieving state-of-the-art in domain incremental learning.

PhD in Computational Neuroscience, University of Missouri, Columbia, MO (2009- 2018)

- Built biologically realistic spiking neuron model of the hippocampus capable of switching between memory storage and memory retrieval modes dynamically.
- Studied differences between the two memory modes in suppressing runaway excitation and rhythmic activity generation.

Psychiatry Residency, University of Missouri, Columbia, MO (2006-2010)

- Served as chief resident leading a team of 20 psychiatry residents, 2009-2010

Doctor of Medicine, University of Jordan, Amman, Jordan (1998-2004)

Publications:

Hummos A, (2023) Thalamus: a brain-inspired algorithm for biologically-plausible continual learning and disentangled representations. <https://arxiv.org/abs/2205.11713>. International Conference on Learned Representations (under review).

Hummos A, Wang B, Drammis S, Halassa M., Pleger B., (2022) Thalamic regulation of frontal interactions in human cognitive flexibility. PLOS Computational Biology 18(9): e1010500 .

Hummos A, Nair S., (2017) An integrative model of the intrinsic hippocampal theta rhythm. PLoS ONE 12:e0182648.

Hummos A, Franklin CC, Nair SS (2014) Intrinsic mechanisms stabilize encoding and retrieval circuits differentially in a hippocampal network model. Hippocampus 24:1430–1448.

Ball JM, **Hummos AM**, Nair SS (2012) Role of sensory input distribution and intrinsic connectivity in lateral amygdala during auditory fear conditioning: A computational study. Neuroscience 224:249–267

Links:

<https://github.com/hummosa>

<https://www.linkedin.com/in/ali-hummos-b77a1422/>

Experience:

Computer Vision Intern, DeepenAI, San Francisco. (2019-2020)

- Researching various deep learning solutions to enable a positive feedback loop between deep learning models and human annotations.
- Managing massive databases in a production environment.
- Used graph neural networks, and linear programming, to match objects across video frames.

Founder, Synaptic Intelligence corp. (2017-2019)

- Developed visual object classifiers as a model of psychotic hallucinations, with the goal of finding adversarial input that might suppress them.
- Developed an energy-based model to solve reasoning problems using top-down feedback through propagation of gradients.

Assistant Professor of Psychiatry, University of Missouri-Columbia (2010-2013)

- Trained psychiatry residents and medical students.
- Lead a multidisciplinary team of 20+ professionals including nurses, social workers, and psychologists.

Chief Technology Officer and Co-founder, IconicHealth (2006-2013)

- Created an award-winning user interface design for desktop and mobile versions.
- Lead the local and the offshore computer developers to create and test prototypes.
- Interfaced between psychiatrists and programmers to design an electronic medical record.
- Filed two successful patent applications.

Grants Funded:

Primary-Investigator, SBIR grant Phase I, 2010 “Medication IconoGraphs: Visualization of Complex Medication Regimens” Grant number: 1R43MH081446-01A2 revised; Sponsor: National Institute of Mental Health. Company: IconicHealth LLC. Duties: Direct software development to meet clinical standards and HIPAA requirements, user interface usability and testing.

Primary-Investigator, SBIR USDA phase I grant, 2010 “Transformational Approach to Managing Major Depressive Disorder Among College Students from Rural Communities”. Award No.: 2010-33610-20853

Skills:

PyTorch, Python, Energy-Based Models, Reservoir computing, Probabilistic Graphical Models, Reinforcement learning, Meta-learning, Matlab, Biophysical neuron modelling.

Professional Societies:

American Psychiatric Association, 2006-present

Society for Neuroscience, 2010-present

Organization for Computational Neuroscience, 2011-present