

Deep Learning and the Brain

January 20-22, 2019

Becker Auditorium, Goodman Brain Sciences Building
Edmond J. Safra Campus, The Hebrew University, Jerusalem

Program

Sunday, January 20th:

9:00-9:30 – OPENING REMARKS

Session 1: Perceptual Representations

9:30-10:15 – Daniel Yamins, *Stanford University* – Broadening and deepening the role of Artificial Intelligence in Computational Neuroscience

10:15-11:00 – Daphna Weinshall, *The Hebrew University* – Old new frontiers in visual object recognition using deep learning: curriculum learning

11:00-11:30 – COFFEE BREAK

11:30-12:15 – Kalanit Grill-Spector, *Stanford University* – The functional neuroanatomy of face perception: from brain measurements to deep neural networks

12:15-13:00 – Adi Mizrahi, *The Hebrew University* – Perceptual learning in a mouse model: a progress report

13:00-14:00 – LUNCH BREAK

Session 2: Theory

14:00-14:45 – Shai Shalev-Shwartz, *The Hebrew University* – Decoupling gating from linearity

14:45-15:30 – Andrew Saxe, *University of Oxford* – High-dimensional dynamics of generalization error in neural networks: implications for experience replay

15:30-16:00 – COFFEE BREAK

16:00-16:45 – Naftali Tishby, *The Hebrew University* – The computational benefit of the hidden layers in Deep Neural Networks

16:45-17:30 – Tomaso Poggio, *MIT* – Three puzzles in the theory of deep learning

17:30-18:00 – Panel discussion

Monday, January 21st:

Session 3: Inference, Reasoning, and Memory

9:00-9:45 – Anna Schapiro, *Harvard Medical School* – Empirical and neural network modeling approaches to understanding human memory and consolidation

9:45-10:30 – Yael Niv, *Princeton University* – Representation learning in rats and men

10:30-11:00 – COFFEE BREAK

11:00-11:45 – Inbal Goshen, *The Hebrew University* – The Star Cells of Learning: Astrocytes modulate local neuronal activity to affect global behavior

11:45-12:30 – Aaron Courville, *University of Montreal* – Learning and generalization in visual question answering

12:30-13:30 – LUNCH BREAK

Session 4: Architectures

13:30-14:15 – Andrea Banino, *DeepMind* – Vector-based navigation using grid-like representations in artificial agents

14:15-15:00 – Daniel Soudry, *Technion* – Theoretical and empirical investigation of several common practices in Deep Learning

15:00-15:30 – COFFEE BREAK

15:30-16:15 – Yair Weiss, *The Hebrew University* – Why do deep convolutional networks generalize so poorly to small image transformations?

16:15-17:00 – Rob Fergus, *New York University* – Unsupervised learning via video prediction

17:00-17:30 – Panel discussion

Tuesday, January 22nd:

Session 5: Deep Learning and Neuroscience

9:00-9:45 – Andreas Tolias, *Baylor College of Medicine* – A less artificial Intelligence

9:45-10:30 – Matthias Bethge, *University of Tübingen* – Less-artificial vision with artificial neural networks

10:30-11:00 – COFFEE BREAK

11:00-11:45 – Srinivas Turaga, *HHMI Janelia Research Campus* – Connecting the structure and function of neural circuits

11:45-12:30 – Surya Ganguli, *Stanford University* – Neural networks and the brain: from the retina to semantic cognition, and beyond

12:30-13:30 – LUNCH BREAK

Session 6: Brain Learning Algorithms

13:30-14:15 – Timothy Lillicrap, *DeepMind* – Assessing the scalability of biologically-motivated deep learning algorithms and architectures

14:15-15:00 – Yonatan Loewenstein, *The Hebrew University* – Bounded learning: biological constraints of cortical learning

15:00-15:45 – Byron Yu, *Carnegie Mellon University* – Neural constraints on learning

15:45-16:15 – COFFEE BREAK

16:15-17:00 – Sophie Denève, *École Normale Supérieure* – The Brain as a hierarchical adaptive learner

17:00-17:45 – Michale Fee, *MIT* – Building a state space for song learning

17:45-18:00 – CLOSING REMARKS