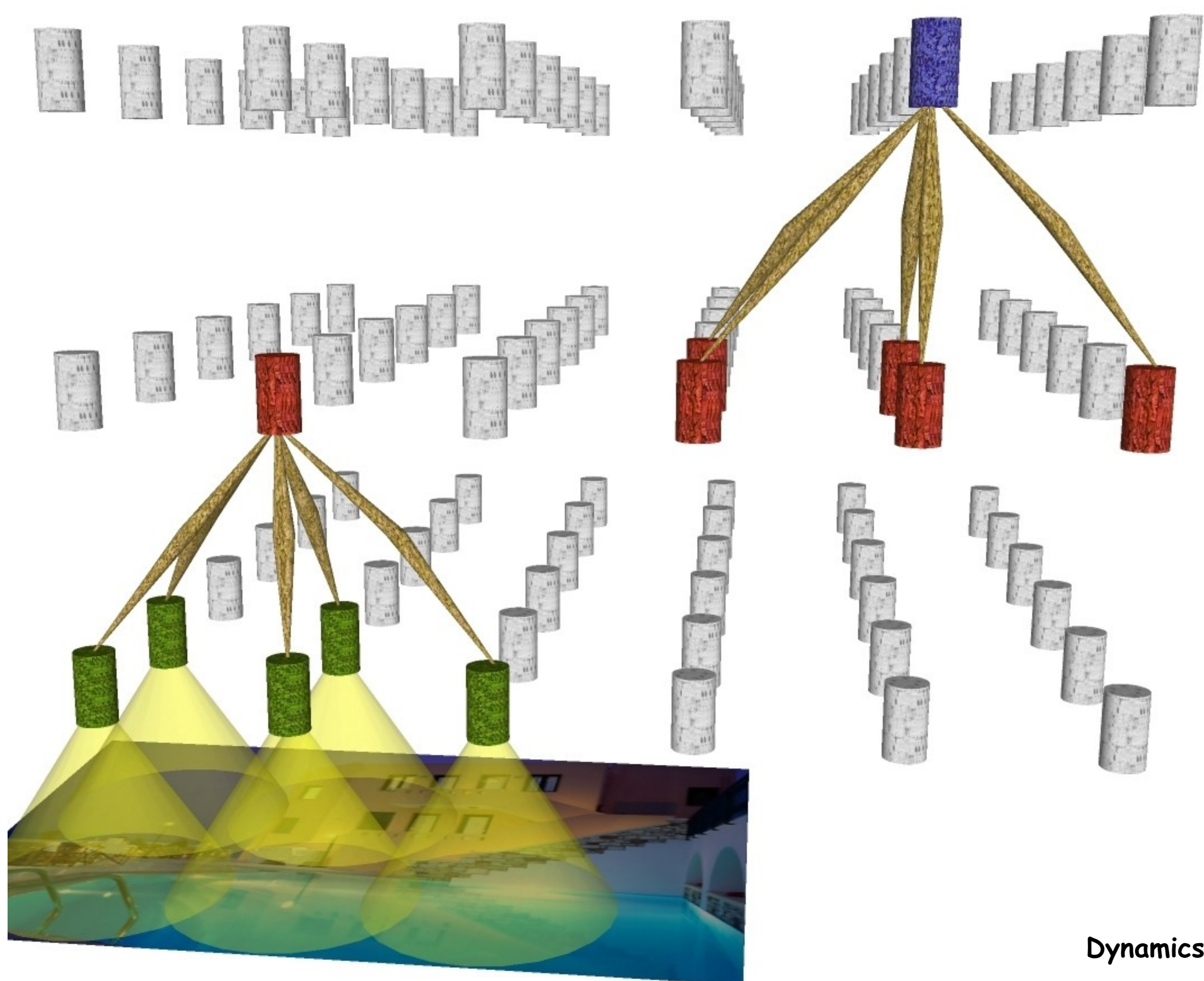


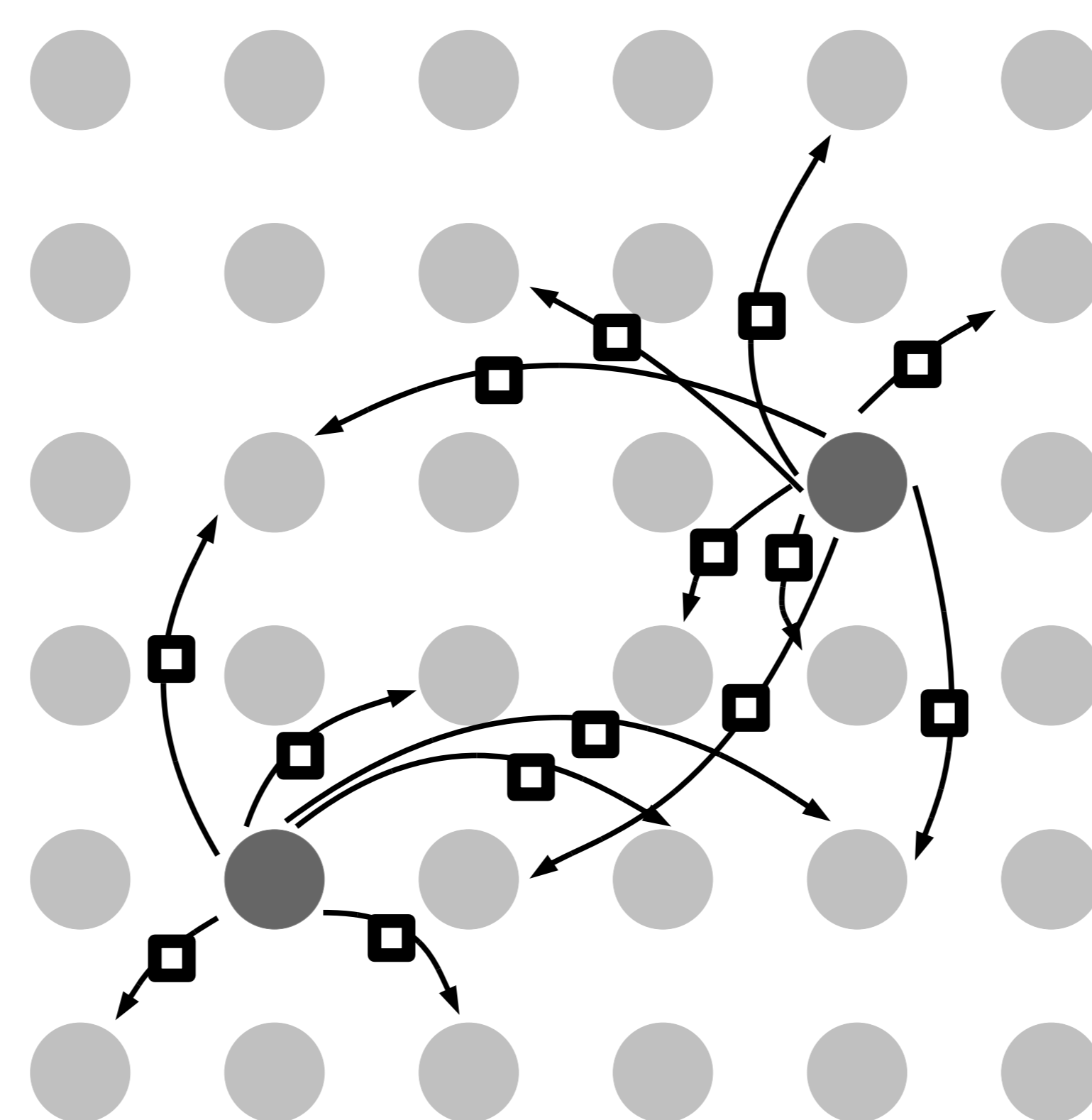
Visual processing as a large scale integration of associative neural networks

Socrates Dimitriadis

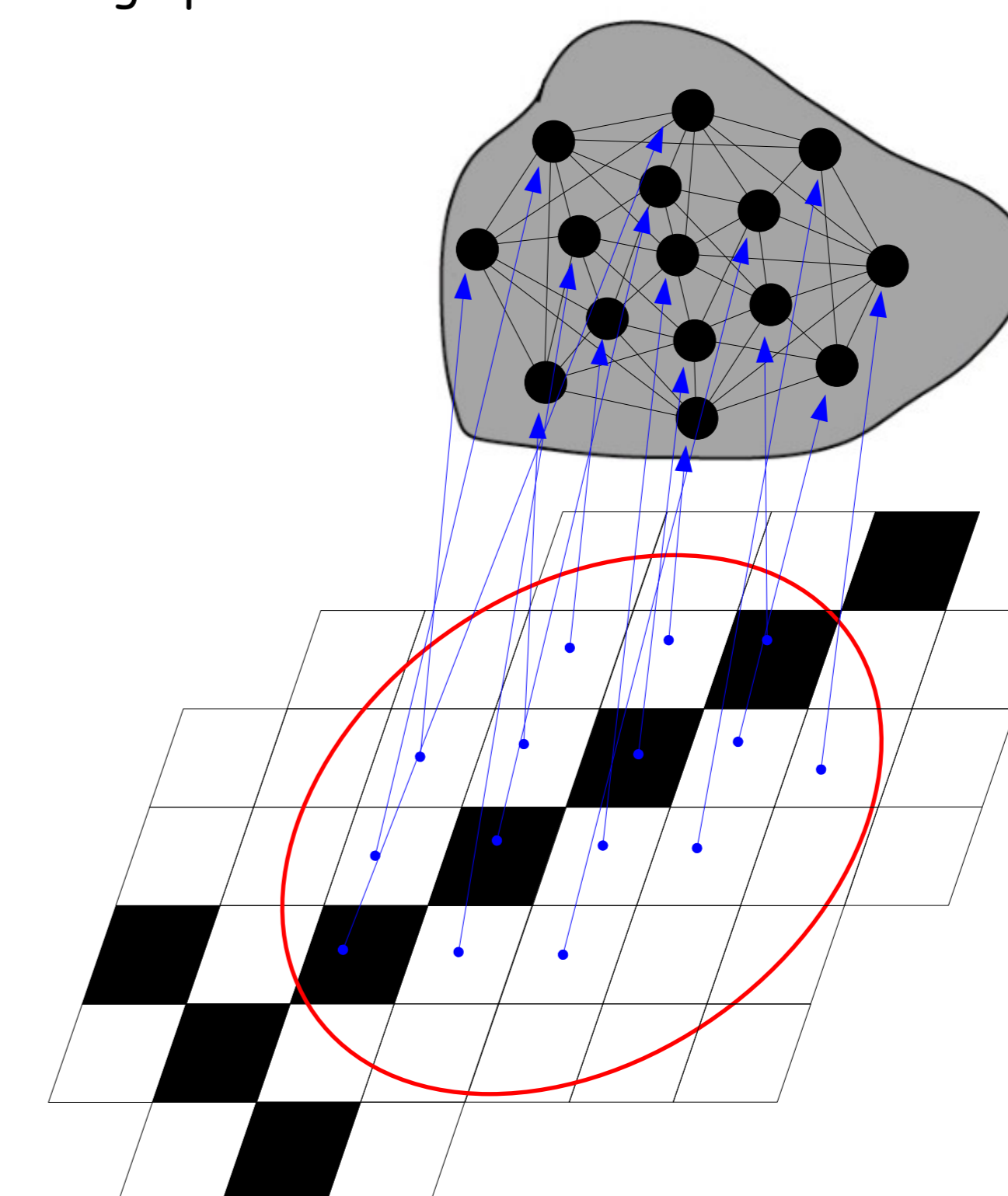
Architecture: A hierarchical network of thousands of associative networks. Layers of networks are stuck on top of each other forming a multilayer or hierarchical processing scheme depending on the connectivity pattern we deploy.



Connectivity: Neural networks are interconnected by hetero-associations. Partial view of the network assemblies that are formed by associative links that spring from two of these networks.



Unit: The auto-associative attractor neural network is an abstraction of a cortical column that becomes selective to local receptive fields and forms associative memories of the respective image patches.



Stimuli: Preprocessed versus actual

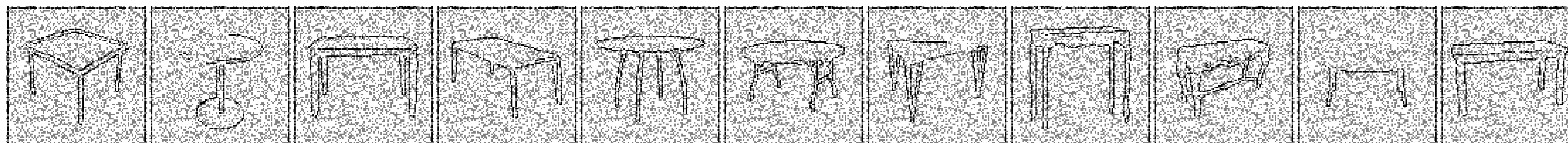


Dynamics: All constituent networks function with the exact same principle as non-linear dynamical systems described by this equation

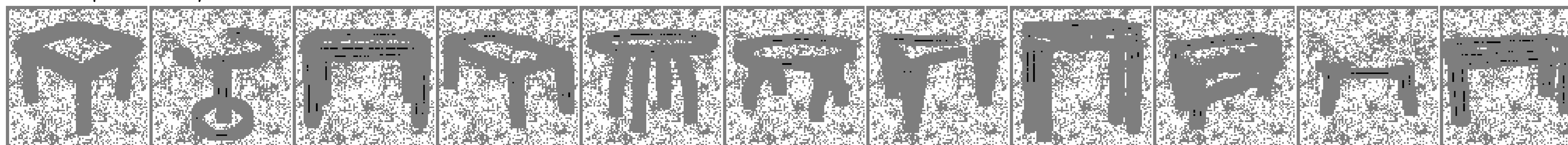
$$\vec{x}_i(t+1) = f_1 \left[\alpha A_i \vec{x}_i(t) + \beta f_2 \left(\sum_j^N H_{i,j} \vec{x}_j \right) + \gamma \vec{x}_i(t) + \delta \vec{x}_i(0) \right]$$

Example of visual processing: Recognition of ablated stimuli

Test stimuli with 30% erosion



Output of the system after 20 iterations



Temporal aspect of processing

iterations 1-20

