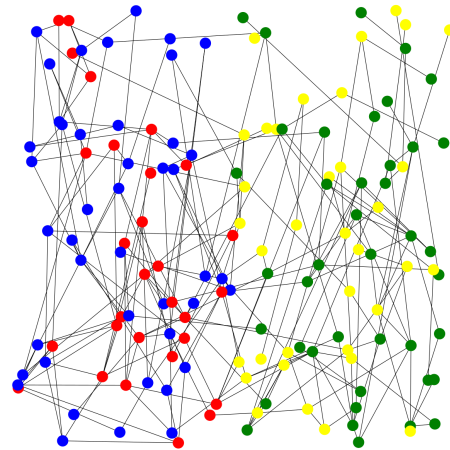


Learning and Forgetting of an Image in a Homeostatic Neuron Model

Motivation

Learning and memory are key components in our thinking process. Earlier work showed that neuron models based on a Hebbian learning rule can learn an image and slowly forget it over time. While learning is explained usually with synaptic plasticity and Hebbian learning as used in this earlier work, recent work has shown that homeostatic structural plasticity – which is the creation and deletion of synapses based on the network activity – is capable of forming simple silent memories. However, if a homeostatic model can learn more complicated memories and how it decays, remains to be investigated.



Neurons as representation of colors

Task

Our group developed a scalable homeostatic neuron model called Model of Structural Plasticity (MSP). Your task is to develop a stimulation algorithm that trains the MSP on a single image. For it, each neuron represents a pixel and the connectivity of the neuron represents its color. Then, you should show that the MSP learned the image by developing an appropriate visualization method for the learned network. Finally, you should visualize how the MSP is forgetting the image.

- Develop a stimulation algorithm to train the Model of Structural Plasticity on a single image
- Implement a visualization algorithm for the trained model to retrieve the image
- Analyze if the image can be recalled from the network and how it decays

Requirements

- C++
- Python

Contact

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References

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2. Fauth, M., Wörgötter F. & Tetzlaff C. (2017) Long-Term Information Storage by the Interaction of Synaptic and Structural Plasticity. In Van Ooyen, A., & Butz-Ostendorf, M. (Eds.). (2017). *The rewiring brain: a computational approach to structural plasticity in the adult brain* (pp. 355 – 357). Academic Press.

