Readings in Neuroinformatics

Slaven Cvijetic, 30.11.2018

Self-Organization of Orientation Sensitive Cells in the Striate Cortex, Chr. vonder Malsburg, Kybernetik 14, 85--100 (1973).

Abstract

The visual cortex has several layers of organization for information processing. Orientation sensitive cells organized in functional columns reside in the striate cortex, which respond optimally to specific orientations of bars. Its organization is determined by genetics to some extent. However, genetics alone cannot account for the totality of all afferent axons terminating on cortical neurons nor for the plasticity of the system. In this paper, we address the questions to what end the striate cortex is organized and what its underlying mechanisms of the circuitry are. We show that a self-organizing system based on synaptic plasticity can resolve the issue of genetics and we introduce a computational model to simulate the circuitry of the striate cortex. The model consists of excitatory and inhibitory cells that are wired in a 2-dimensional manner forming a cortical plane. The connections of these cells are weighted, which are modified during a learning process, thus changing synaptic strengths across the network. An excitatory cell will excite its neighbours and the inhibitory cells, which in turn, inhibit its immediate neighbouring excitatory cells. This results into clusters of cells firing together that respond optimally to a stimulus even if it appears to be non-structured or random. The system is also stable to arbitrary changes of some connections since it can readapt to an optimal state. Thus, it is enough to make a few simple assumptions to explain some very important functional properties of the striate cortex.

1 2 3 4 5

(words: 240)

(Is it okay, to introduce the problem with: "in this paper, we address the question/problem...")

1	1
2	0.5 / 1
3	1
4	0.5
5	0.5
6	1

Feedback on Abstract

Session 11, 2018 – Slaven Cvijetic

1.) Introduction / Background

- Just a general advice (In your current abstract this is not a problem at all, but I've seen this in some other student's abstract and thought it might also be a helpful advice to you at some point): In general, try to make sure that your sentences are connected and relate to each other so that the reader is nicely guided through the story of the paper and the abstract is not just a collection of sentences.

2.) Problem Definition

- It is not completely clear that this organization is determined by genetics, it is just proposed.
- You can introduce the problem with "In this paper we address the problem ...". However, I think it becomes more clear if you separate the two concepts/statements: 1) "this-and-this is the current problem". And then: 2) "In this work we are proposing the following solution to this problem".

3.) Proposed Solution

4.) Methods

- Your explanation of excitatory/inhibitory is rather too much. However, if you would want to keep it, you'd have to explain this when you first mention excitatory/inhibitory so that the reader understands the terms immediately and you are not jumping back and forth in your abstract.

5.) Results & Impact

- Your last sentence puts things a bit too simple. The authors mainly want to state that it gives rise to hopes that such simple assumptions help to improve the current understanding.
- Don't forget to also indicate the impact of the presented work.

6.) Style / Understanding / words count