Readings in Neuroinformatics

Slaven Cvijetic, 9.11.2018

Analyzing Cooperative Systems, Hinton Geoffrey E., Sejnowski Terrence J., Proc. 5th annual conf. of the Cognitive Science Society, Rochester NY, May 1983

Abstract

1 The computational analysis of perception has been most successful with cooperative systems, where an objective is achieved by several dynamic actors sharing information together. However, how can
2 one find a search procedure that identifies the optimal interpretation of a data input? Such a cross-coupled, non-linear system was believed to have simulations as its only tool for study. In this paper,
3 we show that a mathematical approach is reasonable and advantageous. We begin by introducing a deterministic framework for cooperative search and develop a mathematical theory. We then develop
4 a probabilistic decision rule. This overcomes the problem of only identifying local minima, since its probable nature allows to change the output despite a constant input. Furthermore, it allows us to apply methods from statistical mechanics as it makes the cooperative search easier to analyse. Another
5 consequence of the probabilistic decision rule is its feature to internalize the constraints needed for the weights, which are per se no constant variables. Such a system can update its weights based on how well it is doing which translates into to process of learning. This model does not account for the whole complexity of information processing found in the cerebral cortex, however, it allows the study of a class of probabilistic parallel processing devices to understand its fundamental properties.

(214 words)

1) 0.5
2) 1
3) 1
4) 0.5
5) 0.5
6) 0.5

Feedback on Abstract

Session 08, 2018 – Slaven Cvijetic

1.) Introduction / Background

- Try to write a bit more “accessible”. It is hard to understand what “computational analysis of perception” actually is and what an objective is in this context. If possible it is nice to keep the introduction less abstract.

2.) Problem Definition

3.) Proposed Solution

4.) Methods

- You have to be more careful in what exactly was the paper’s contribution and what are concepts which are just mentioned in *this* paper but are actually taken from *another* paper. (e.g. “This overcomes the problem of only identifying local minima, since its probable nature allows to change the output despite a constant input.” → This has been introduced by Metropolis (1953): “An algorithm with this property was introduced by Metropolis et al (1953) ...”). It is important to state clearly what the new contributions of the presented work are and what methods they used.

5.) Results & Impact

- Their result is also the result of their mathematical analysis which is that they can prove : … that, provided d is sufficiently small, each application of this learning procedure is guaranteed reduce the Euclidean distance, D, between the current set of weights, w_{ij} and the ideal ones, w'_{ij}. Here again, you have to focus more on what are the results of this particular paper.

6.) Style / Understanding / words count

- Be careful keep the story more consistent, e.g. if you say the problem is the mathematical analysis and this is what they provide in this paper, then this should also be continued/explained in the later sections.