Cerebellum

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1 Overview

We posit that the cerebellum as a whole tries to predict the output of the cerebrum, and takes over the performance of activities that are sufficiently predictable. Ito [**?**] posits a similar theory (specifically, the inverse models from his paper).

2 Positive Pathway

Logistic regression.

3 Feature Layer

Learning in the feature layer occurs in an unsupervised manner, and the feature layer together with non-maximal suppression is treated in the chapter on The Granular Layer.

Algorithm 1 *cerebellum*($\mathbf{command}^{(t-1)}, \mathbf{context}^{(t-1)}, \mathbf{train}^{(t-1)}$)

Persistent State: $\mathbf{state}^{(t-1)}$

for $i = 0$ to n **do**

$\mathbf{pos\_state}_i^{(t)} \leftarrow positive\_state\left(\mathbf{state}^{(t-1)}, \mathbf{command}^{(t-1)}, \mathbf{context}^{(t-1)}\right)$

end for

for $j = 0$ to m **do**

$\mathbf{pos\_output}_j^{(t)} \leftarrow positive\_output\left(\mathbf{state}^{(t-1)}, \mathbf{command}^{(t-1)}, \mathbf{context}^{(t-1)}\right)$

end for

// Compute simple features

for $k = 0$ to K **do**

$\mathbf{feat}_k^{(t)} \leftarrow feature\_layer\,()$

end for

// For each cluster of features, compute average activation

for $l = 0$ to L **do**

$\mathbf{cluster\_avg} \leftarrow cluster\_avg\,()$

end for

// All cluster elements are lessened by the cluster average

for $k = 0$ to K **do**

$\mathbf{feat\_nms}_k^{(t)} \leftarrow subtract\_avg\left(\mathbf{feat}_k^{(t)}, \mathbf{cluster\_avg}_l^{(t)}\right)$

end for

// Negative pathway is a collection of perceptrons on **feat_nms**

for $p = 0$ to P **do**

$\mathbf{neg\_output}_p^{(t)} \leftarrow negative\_output\left(\mathbf{feat\_nms}^{(t)}\right)$

end for

// Negative pathway output filters outputs of the positive pathway

for $j = 0$ to m **do**

$$\mathbf{output}_j^{(t)} = \begin{cases} 1 & \mathbf{pos\_output}_j^{(t)} = 1, \forall p \in THING_j \ \mathbf{neg\_output}_p^{(t)} = 0 \\ 0 & \text{otherwise} \end{cases}$$

end for

for $i = 0$ to n **do**

state filtering

end for

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$\mathbf{pstate}_i^{(t)} \leftarrow \sigma\left(\theta_i + \sum_j w_{ij}\mathbf{state}_j^{(t-1)} + \sum_k x_{ik}\mathbf{context}_k^{(t-1)}\right)$

return $\mathbf{output}^{(t)}$

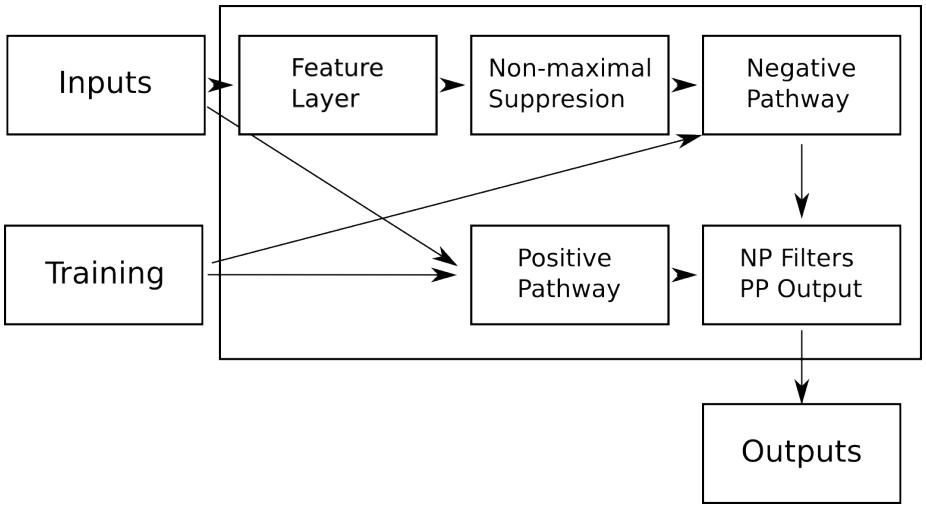

Figure 1: Computations performed by the cerebellum