Statistical Connectomics HW 3

David Lee

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1 Introduction

In the Bock paper, the sample space was defined as $\mathscr{G}_n = (\mathscr{X}, \mathscr{Y}, \mathscr{Z})$ where $\mathscr{X} = (0,1)^{n\times n}$ is the set of nodes (i.e. neurons) in the graph, $\mathscr{Y} = (0,1)^n$ determines whether the neuron is excitatory or inhibitory and $\mathscr{Z}$ describes the preferred orientation of the neuron. The tuning property of the neuron can range from 0 to 2π, which would give us $\mathscr{Z} = (0, 2\pi)^n$. However, since the neurons must be categorized in to discrete blocks, the Bock paper defined $\mathscr{Z}$ by partitioning it into 8 blocks, which gives us $\mathscr{Z} = [8]^n$. In this assignment, we will try to redefine this definition of $\mathscr{Z}$ to (hopefully!) come up with a better model and also define the structure of the block model parameters, ρ and β, used in this model

2 Redefining $\mathscr{Z}$

Rather than defining $\mathscr{Z}$ into 8 partitions, we decided to use 18 partitions instead for two reasions. 1) The range of orientation sensitivity for a neuron is around 10 degrees, so this may be a more biologically accurate representation of neurons in the brain and 2) More blocks allow a more detailed categorization of neurons and could prevent oversimplifying our model.

3 Structure of Block Model Parameters ρ and β

For ρ and β we will use the following definitions we learned from class: $\rho : \mathscr{Z} \in \Delta_k$ and $\beta = (0,1)^{k\times k}$. Now we just have to define k. We propose to define k=18, since there will be 18 blocks in our model due to how we partitioned $\mathscr{Z}$ in the previous section above. Therefore, $\rho : \mathscr{Z} \in \Delta_{18}$.