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Homework 3

1) Sample Space

We define our sample space as: G_n = (X,Y,Z)

- Adjacency Matrix: $X = (0,1)^{nxn}$ -> this adjacency matrix details the connection of neurons
- $Y = \{0,1\}^n$ -> whether or not the neuron is inhibitory or excitatory
  - Inhibitory = 0
  - Excitatory = 1
- Z represents the orientation of the neuron into four divided regions equally
  - The tuning property
    - $Z = (0,2\pi)^n$

2) The model being implemented is a stochastic block model
   - SBM_n^2(p,B)= $\{P_\theta : \theta \to \vartheta\}$, $\vartheta \Delta_k$ X $(0,1)^{kxk}$

The block model parameters of p(z) and B(z) must be defined in our stochastic block model. Specifically, $p(z) \in \Delta_k$ and $B(z) \in (0,1)^{kxk}$ are the parameters. K is the number of blocks in our model while B, utilizing the Bernoulli distribution, is the model of the edges. In regards to the distribution of choice, the Bernoulli distribution is the simplest for B. The model has no dependence on the orientation of the neurons.

The interval for Z (between 0 and 2π) creates a large variance for the SBM. Interestingly, we must bin the orientation in order to reduce the variance. In the Bock paper, 8 bins were used. However, we can improve upon 8bins by increasing to 18bins taking into account the 0-180degree range. We must notice that decreasing our variance will increase bias due to the bias-variance tradeoff.

Interpreting and analyzing the graph studied would not be optimal. This I due to the initial assumption that the orientation of the neurons changes connectivity.