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Homework 3

1) Sample Space

Our sample space was defined as $\mathcal{G}_n = (\mathcal{X}, \mathcal{Y}, \mathcal{Z})$
Where $\mathcal{X} = (0,1)^{nxn}$ is the adjacency matrix describing the connection of neurons (nodes),
$\mathcal{Y} = \{0,1\}^n$ describes whether the neuron is excitatory or inhibitory and
$\mathcal{Z} = (0,2\pi)^n$ is the tuning property of the neuron.

2) Model

The chosen model is a stochastic block model, $SBM_n^2(\vec{\rho}, \vec{\beta}) = \{P_\theta: \theta \, \epsilon \, \Theta\}$, $\Theta\Delta_k \times (0,1)^{kxk}$

Defining $\mathcal{Z}$

Instead of defining the tuning over the whole interval $(0,2\pi)$, binning the orientation might be useful in order to reduce the variance (although increasing the bias). Bock et al used 8 bins, but to increase the resolution we could e.g. use 18 bins over the range 0-180° instead.

Defining the block model parameters, $\vec{p}(z)$, $\vec{\beta}(z)$

As defined in class, $\vec{p}(z)\epsilon\Delta_k \; and \; \vec{\beta}(z) = (0,1)^{kxk}$ where k is the number of blocks in our model and β, the distribution of edges in our model is a Bernoulli distribution. This would be the simplest distribution we could use for β. Using k=2, i.e. one cluster for excitatory neurons (showing some orientation preference) and another for inhibitory neurons (not showing any preference), $\vec{p}\epsilon\Delta_2 \; and \; \vec{\beta} = (0,1)^{2x2}$