Stastical Connectomics: Homework 6

Michelle Chyn

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Introduction In a graph of 3 nodes, $P1$, $P2$, and S, is $P(P2-S|P1-S \cap P1-P2)$ equal or not to $P(P2-S|P1-S)$ (where the subtraction sign denotes connected to)?

Method I was trying to think of a method using SBMs or some type of clustering to show that one block was independent of the other blocks, but since we have connection $P2-S$ is conditioned on $P1-S$ always, it was difficult to come up with a way to partition the SBM.

So instead, I came up with a more specific way to model edge probabilities:

- Edge parameter 1: Assume all connections are independent except for between $P2$ and S: $p_1 = P(P1-S)$, $p_2 = P(P1-P2)$, $p_3 = (P2-S)$, $p_3^{'}(p_3|p_1)$
- We can estimate $\hat{p}_1$, $\hat{p}_2$, $\hat{p}_3$ from data, and guess several paramers for $P(p_3|p_1)$, and $P(p_3|p_1 \cap p_2)$ based on $\hat{p}_3$.
- Edge parameter 2: Then we assume p_1, p_2, and $p_3$are the same again, and set $p_3^{'} = (P2-S|p_1 \cap p_2)$.

Now, if we model two sets of graphs, one using the edge parameter 1 and the other using edge parameter 2, we'll have n x p x 2 graphs (let's say run the code 100 times so n=100 and p is the number of parameters). We can average the graphs over n, so we're left with p x 2 graphs, and compute two sampled t-tests between each of the models' adjacency matrices and the data from the Fino study by comparing rows of the A matrices and determine which model fits best.