Biological Networks Project Proposal

Eric Prologo

Ryan Townsend

Repurposing Therapeutics

Background Material:

Our primary background material comes from Peel Et Al’s 2018 article, “Multiscale Mixing Patterns in Networks”, as well as in class material regarding homogenous networks and assortative mixing and Degree-Correlated Stochastic Block Model (DC-SBM). The hope is to use Peel Et Al’s idea of weighting local neighborhoods within networks to accurately categorize a network working from the local level up to the global level. By doing this we hope to capture the nuances within our network that could be missed by beginning with looking at assortative mixing at the global level rather than starting with smaller scale neighborhoods. We also want you use the teachings from lecture on assortative mixing and DC-SBM networks to properly group and cluster our nodes (various therapeutics on the market) and predict where future therapeutics would lie in our model (what other diseases could the drug be repurposed to) for future decision making.

Research Question:

Our research question is as follows: how can we identify and predict other potential uses (repurposing) for therapeutics currently on the market? Our idea to answer this question is to collect data on current therapeutics and their current treatments and symptoms. By eventually categorizing similar therapeutics based on our key criteria which is subject to change as we continue to investigate our project further (examples: disease the drug cures, symptoms it cures, side effects, how it is administered). In order to narrow down this research question, we plan to specifically focus on therapeutics involving dementia. By building a sufficient model for dementia we hope this model could eventually be grown to incorporate more therapeutics and different types of diseases.

Anticipated Findings:

We anticipate finding that therapeutics that share the most common traits will be clustered together indicating that those therapeutics could be used to cure the same disease. We anticipate to find some novel relationships that have not before been considered that could lead to new repurposing for drugs currently on the market. Finally, we anticipate running into some challenges with our model inaccurately categorizing therapeutics based off of certain qualities having more impact on the mixing of our model versus others. In order to prevent this foreseen obstacle, we plan to create a test set of data that can help to validate our model on a smaller scale and help us to comb through any outliers in our clustering before we move our model to larger scales. Overall, we anticipate this model to help identify new relationships currently used to cure dementia and hopefully suggest new uses for those drugs.

Data and Algorithms We Plan to Use: