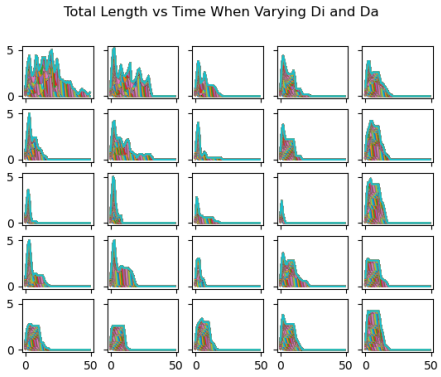
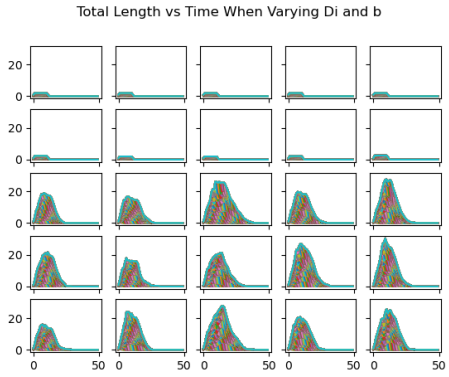
Analysis Report

In order to analyze our model we created a sensitivity analysis on 4 of the model parameters (D_p, v, D_i, D_a). This set of parameters was chosen somewhat arbitrarily however it's worth noting they mostly relate to growth and branching of the model. The metric we used to compare parameter sets is how the length of new fungal hyphae in the model changed over time. We chose this because it's a good summary of the model's growth and we are changing parameters related to growth.

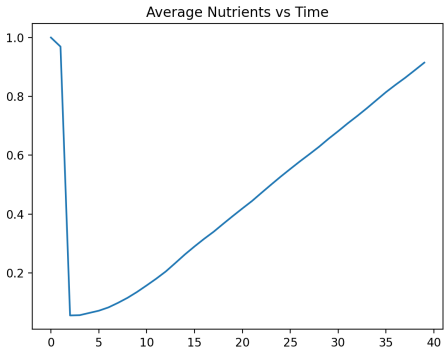


(a) D_i vs D_a

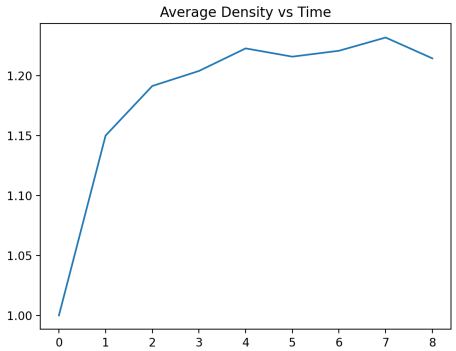


(b) D_i vs b

For each combination of parameters in the set of 4, we looked at how the model behavior changed as we varied the two parameters. The values we varied the parameters along were $\{0.001, 0.1, 1, 1000, 10000\}$. The results we got were mixed. For some combinations, the growth looked remarkably normal (see D_i vs b), while some where very chaotic (see D_i vs D_a). Unfortunately many didn't even grow at all, which shows poor parameter choice on our part. It's hard to say why the data is shaped how it is. It could be noise, as we only ran 10 iterations of each parameter set. But the combinations that worked seemed to work quite well. It would be interesting to do more analysis on the volatility of different parameter combinations.
Another metric we looked at is average nutrient vs. time. From looking at data it seems like this is mostly linear besides dropping off after initiation. This sort of makes sense as it corresponds to the network getting stronger over time.



(a) D_i vs D_a



(b) D_i vs b

The last metric we analyzed is average density vs. time. This is the average over all cells which have hyphae of the number of hyphal segments in a cell. This is related to average degree of nodes (which we also tried to analyze but the code doesn't work) and holds information about how densely the network is structured. The density rises sharply as the model initially proliferates and then levels off at about 1.2 as the model spreads out and spends more time sending out tendrils instead of being interconnected.