

School Nova Computer Science 202
Homework 9 (due 12/05/2020)

Please, do not create multiple versions of your code for different tasks! Instead modify your existing code as instructed. If necessary use comments to “disable” the previously used code. There should be no multiple declarations of the same class!

We continue working on a basic SIR (Susceptible-Infected-Recovered) model. Start with the posted classwork code (classwork #9).

TASK 1

Replace the code below with list and dictionary comprehensions, respectively:

```
A = []
for i in range(len(G_nodes)):
    A.append(agent(i, G_nodes[i]))

GA_dict = {}
for i in A:
    GA_dict[i.grid_loc] = i
```

TASK 2.1

So far we assumed that the probability of disease transmission is 1. Create a variable *pr_trans* describing the probability of transmission (for example, $p = 0.2$). Implement the probabilistic transmission in your code using the random module (for example, using `random.uniform()`).

TASK 2.2

Replace the probabilistic transmission from 2.1 with an alternative approach using `np.random.binomial()`. (Do not delete Task 2.1 code; simply put comment # in front of the previously used code). Test your code and explore different values for *time_to_recover* and *pr_trans*: does a lower probability of transmission change anything? (note: this is not a simple question)

TASK 3.1

Add another instance attribute to your class agent, which describes whether or not the agent wears a mask. Assume that wearing a mask reduces your chance of getting sick by 70% if Susceptible. Moreover, wearing a mask reduces your change of getting someone else sick by 70% as well if Infected. (In other words, the likelihood of transmission is lowest when BOTH the Susceptible and Infected agents wear masks). How do you need to update the disease transmission code to reflect these assumptions?

TASK 3.2

Create an initial probability of wearing a mask, *pr_mask*, which determines whether or not an agent wears a mask when created (hint: you may want to utilize `np.random.binomial()` here). Test your code and see if/how the variable *pr_mask* affects the SIR dynamics (note: again, this is not a trivial question as it may require some exploration).