

School Nova Computer Science 201
Homework 12/12/2021

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

TASK 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()`). Hint: Draw a variable between 0 and 1. If the variable is less than 0.05 that corresponds to an outcome with 0.05 probability (5% likelihood). Test your code (for example, try different *pr_trans* rates).

TASK 2

Replace the probabilistic transmission above with an alternative approach using numpy. Use `np.random.binomial()`. If you forgot how to use this function, please, check the relevant documentation:

<https://numpy.org/doc/stable/reference/random/generated/numpy.random.binomial.html>. (Do not delete the previous Task code; simply put comment `#` in front of the previously used code).

TASK 3

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 4*

Optionally, feel free to add another relevant assumption to the model, implement it, and examine how it affects the SIR dynamics.