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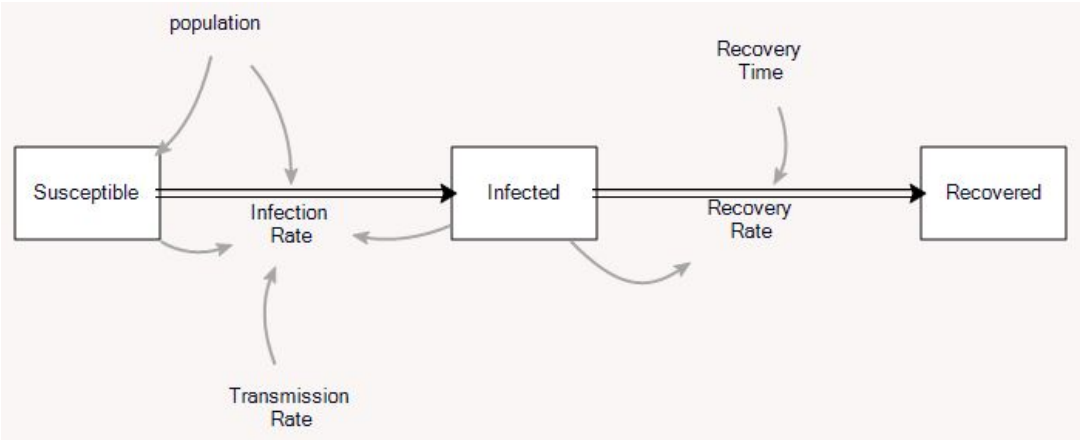
The University of Texas at Austin

# BigData-Hack-2022 Day 4

Let's do this!

**PRESENTED BY:**

# The SIR Model




# ***Task 1*** - Code Joe

**Variables** to hold data

**Mathematical Operations** to do math :)

**Conditionals** to make decisions

**Loops** to repeat our process

**Functions/Subroutines** to reuse code

**Objects or Classes** to define our "things"

Let's meet Joe.

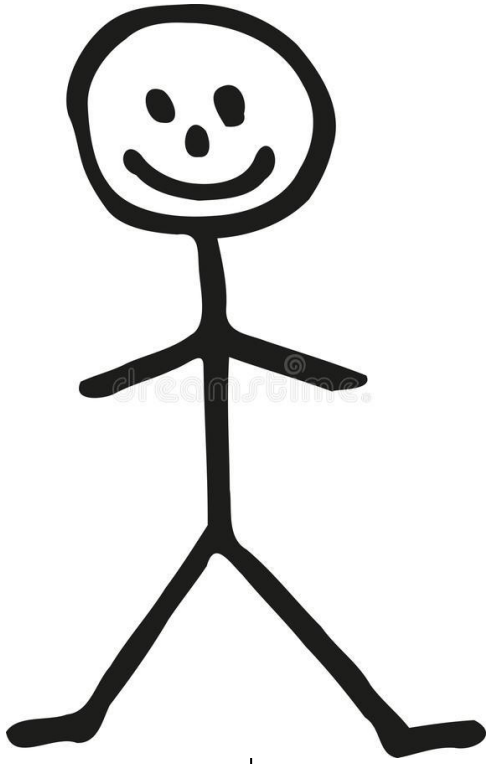
Joe might get sick.

Joe will be sick for 5 days.

After 5 days, Joe gets better.

Once Joe gets better, Joe can no longer get sick.

**Let's "code" Joe.**

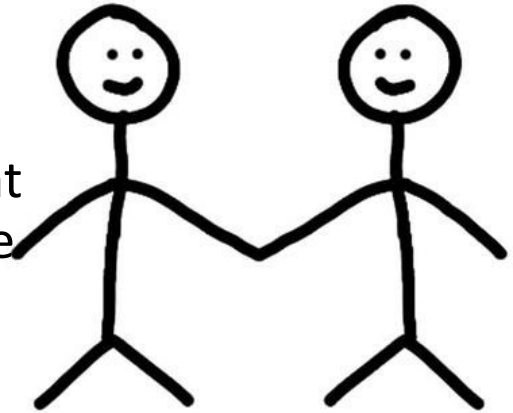


# ***Task 2*** Code Joe and Jane

We met Joe.

Joe has a friend, Jane

If Joe gets sick, Jane might get sick.



Modify your code, so when Joe gets sick that triggers Jane to roll a random number to see if Jane gets sick.

Loop through your code until both Joe and Jane get sick and they each get better.

# ***Task 2*** Code Joe and Jane

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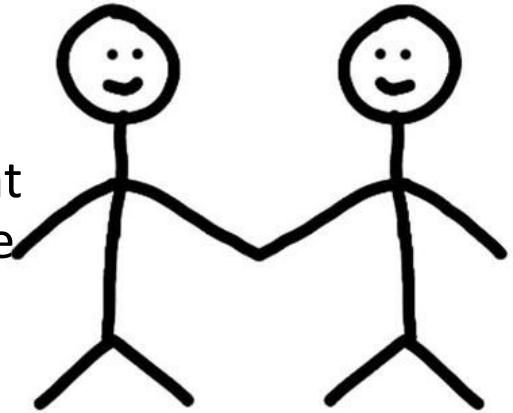
Joe has a friend, Jane

If Joe gets sick, Jane might get sick.



Modify your code, so when Joe gets sick that triggers Jane to roll a random number to see if Jane gets sick.

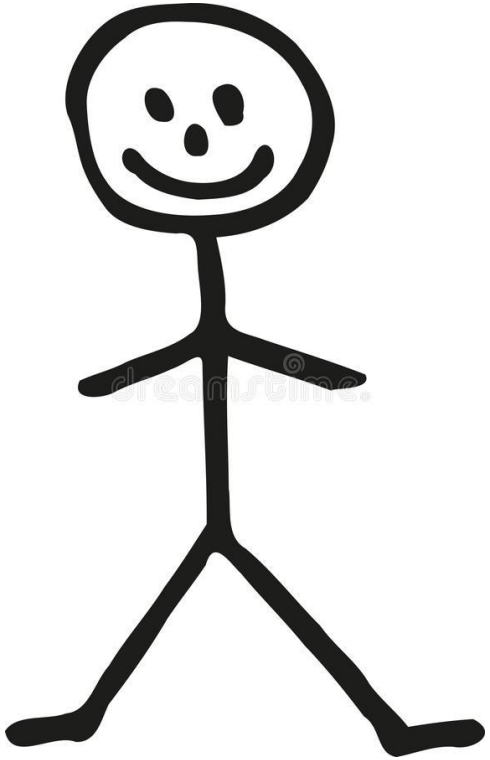
Loop through your code until both Joe and Jane get sick and they each get better.

# ***Task 3*** Code A Person Object.

Joe, is now of type *Person*. In our "world":

- Joe can get infected
- Joe can get sick for certain number of days
- Joe can get better - once better, let's assume Joe can't ever get sick again
- Joe can get vaccinated - let's assume that the vaccine is awesome, so once again, once vaccinated, Joe can't get sick again.

Code a Person object with the above criteria, and "instantiate" Joe. Now, go back to Task 1, and make Joe the Person Object, sick for 5 days using the same algorithm.



# ***Task 4*** Code the Population

We now have a Person object, we now need a Population object

- The Population is basically a Vector of Person objects
- The Population Object will need methods to add a person, return the number of Persons, return the number of sick Persons, well Persons, inoculated Persons
- Your Population will start out at 1000 Persons

# ***Task 5*** Code One Day of Interactions

The Person also interacts with a number of other Persons each day

The Person Object will have a "Interactions" Vector
For each Person, randomly fill the Interactions Vector with 10 other Persons.
The Interactions do not need to be reciprocal, meeting if Person P2 shows up in Person P1's Interaction Vector, P1 doesn't necessarily have to show up in P2's Interaction Vector (it should! but we should keep our simulation simple)

# ***Task 6*** Code the Population
## with full Interactions and a propagating Contagion

We now have a Person object and a Population object. Remember, once a person gets better, they can no longer get sick, they are inoculated

Set a population of 1000 people
Introduce Patient Zero
This is your first sick person
    Day 1. Patient Zero interacts with others, those other may now get sick as well.
As each Day passes
    sick people are interacting with well people, causing the virus to spread
    each day print out the number of sick people, and the number of inoculated people
The simulation ends, when there are no more sick people.

# ***Task 7*** Code an Intervention

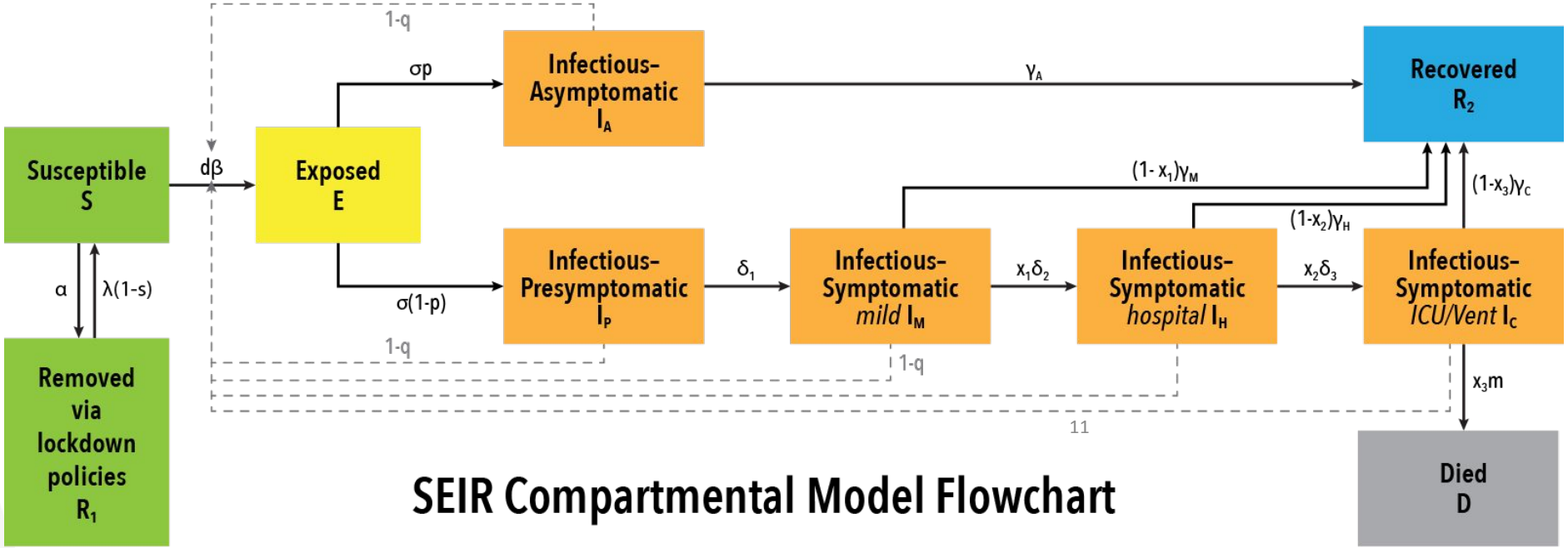
## You see that the Peak in a 40,000 people community is very high

What are the benefits of Masking?

How do Masks affect the infection rate?

Your challenge: Modify your models so that a certain percentage of your Population wears masks, and model the Mask benefits.

# The Covid SEIR Model




SEIR Compartmental Model Flowchart