Model Rationale:

The model.py file contains the implementation of the system:

```
for today in range( simulationEnd ):
    tomorrow = today+1
    newInfections = delta * virulence * Potential[today]*Infected[today]
    newRecoveries = delta * cureRate * Infected[today]

    Potential[tomorrow] = Potential[today] - newInfections
    Infected[tomorrow] = Infected[today] + newInfections - newRecoveries
    Recovered[tomorrow] = Recovered[today] + newRecoveries
```

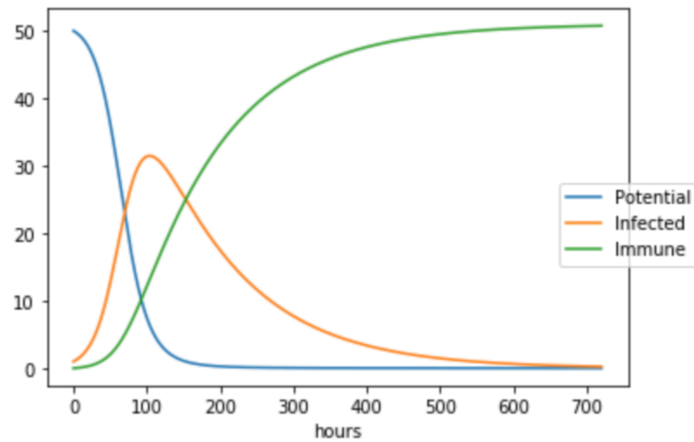
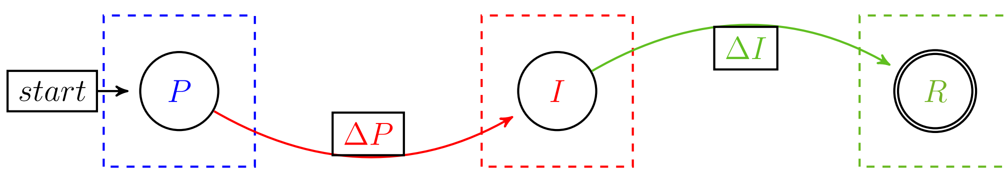


Fig1: Simulation With an Aggressive Quarantine Taken

The model uses a closed system wherein an individual can either be potentially sick, currently infected, or recovered. A person is considered to be recovered if they have been infected and gained immunity from the virus.



The virulence of this disease is modeled by moving individuals from different groups (potential, infected, or recovered). The disease model is known as a compartment model where the participants are shuffled around the different groups. The entire system will never see an increase or decrease in the number of total participants.

As time goes on, more people will inevitably become infected:

$$P(T + \Delta T) = P(T) - (\Delta P \cdot \Delta T)$$

Which is to say that of the number of people that are potentially sick today P(T), a small minority will become infected by the end of the day($\Delta P \cdot \Delta T$). As more individuals become sick, then the probability of exposure increases. Which implies that, ΔP is also affected by ΔI.

$$\boxed{\Delta P = P(T) - \frac{\Delta I}{P(T_Y) \cdot I(T_Y)}} \tag{1}$$

One can see the exchange between the infected and recovered parties in a similar fashion: $R(T + \Delta T) = R(T) + (\Delta I \cdot \Delta T)$

Of the number of people that are infected today I(T), a small minority will become cured by the end of the day($\Delta I \cdot \Delta T$). As I decreases then R will increase as a result. As more individuals become immune to the virus, then the probability of exposure decreases. Which implies that, the change in R is not affected by ΔR but by ΔI.

Therefore, the positive change in P will become a decrease for I. Additionally, the cure rate of I is dependent on the previous day's result (yesterday is denoted as Y).

$$\boxed{\Delta R = R(T) + \frac{\Delta R}{I(T_Y)}} \tag{2}$$

Now that we can see how the dynamics for the Potentially Sick and Recovered populations look like, we can combine those forces and apply them towards the Infected populations to get the interaction:

$$\boxed{\Delta I = I(T) + \frac{\Delta I}{P(T_Y) \cdot I(T_Y)} - \frac{\Delta R}{I(T_Y)}} \tag{3}$$