**Project Proposal:**
*Forecasting the probability of Major Outbreak of a disease*

Brief Context of the project:

In a situation where there is a report of a disease which had infected number of people, in that scenario it would greatly benefit if we are able to forecast whether outbreaks of infectious disease will be major among a population. Infectious disease outbreaks have a reasonable chance of either fading out at an early stage or, in the absence of intervention, spreading widely within the population.
If major outbreaks were predictable in the earliest stages of an outbreak, reactive control strategies could be implemented, such as vaccination, quarantine, or culling. However, such measures are costly, time-consuming, inconvenient, and potentially reduce support for future interventions, thus it is not feasible to implement them for every outbreak.
If it were possible to predict when fadeout was likely to occur, the need for costly precautionary control strategies could be minimized.

We will conduct simulations of data for given possible conditions of a fatal disease outbreak and explore the possibility of predicting a certain range or limit which might be useful for predicting major outbreaks and introduce intervention at the optimum time thus saving life as well as keeping expensive control strategies minimized.

Technical Details:
For disease X, a major outbreak would be considered when
Outbreak Probability, P > 0.4 (threshold value)
P is defined as
No. of patient in red-zone/total no. of patient

A patient infected with disease X will be considered in red-zone when total_score >150
Disease X can infect a patient with three possible viruses with different survival/aggression rate. For the sake of this project will consider that the conditions whether the disease is a major outbreak or not are based on the below factors:

Timing (Time between the patient getting infected from the last known patient)
if t<=7days, Score_time = 100
if t>=14days, Score_time = 30
if 7<t<14,days Score_time = 100-10*(t-7)

Distance (Distance between the patient getting infected from the last known patient)
if d<1km, Score_dist = 100
if d>8km, Score_dist = 30
if 1km<d<8km, Score_dist = 100-10*(d-1)

Type of virus (patient got infected with)
Aggressive, Score_virus = 100
Average, Score_virus = 50
Mild, Score_virus = 10

total_score = Score_time + Score_dist + Score_virus
if total_score > 150 then the patient would be considered in red-zone.

If at any time, more than 40% of the patients are in red-zone (with at least no. of red-zone patients>=10) it will be declared as a major outbreak, and intervention is required, else it's a minor outbreak and no intervention is required.

Since all the above conditions are described as chance/probability we will perform Monte Carlo simulation to find the steady-state value of the total number of patients when the Outbreak Probability, P is just about to cross the threshold value. Based on the findings in future we don't have to rely on the uncertainty of the outbreak and can safely apply intervention when the number touches threshold value.