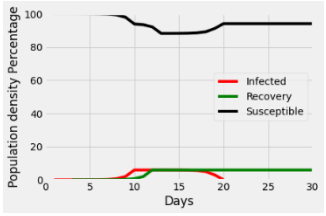
Our code uses data taken from a new York times article that is updated daily, using that data we took the values for the amount of cases in an area as a percentage of the total population of that area, then the values for that percentage were compared to the population density of the area, this was done for the towns across most of the UK and the data collected was then plotted graphically to gain an equation for the average value of the percentage of people infected given a population density. The equation gained from this plot was $y = 0.0133x^{0.2325}$.

The code uses user inputted data and the equation to provide different variables for plotting a graph of a prediction of what would happen given specific values for population density, infectious period and infection spread. For the user inputted values, the population density must be given between 1 and 10000 and the code will only accept integer values, if a value is given outside of that range the input message will repeat and will once again ask for an input for the population density, it will continue to repeat the request for a value until a value is given within the range. For the user input for the infection spread the recommended value is between 1 and 10 as any higher will result in very little data with the graph peaking its values around the first couple days. The code again will only take integer values above 0 any values bellow 0 will result in a message saying, “an infected individual cannot cure others of the virus”. The final user input is the amount of time that a person will remain infected before being considered recovered, on the graphs this presents as the stagger along the x axis that represents days from when the infected cases begin to appear to when the recovered cases start to increase. The recommended value for recovery time is between 2 and 10 days as the total time frame for the data is across a 31-day period.

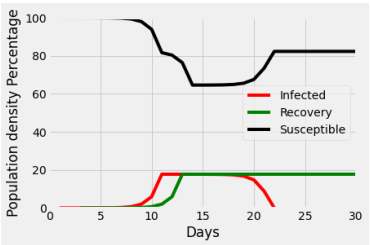
The plots produced by the first part of the code will change the peaks and how quickly they are reached depending on the user inputted values.

For example:

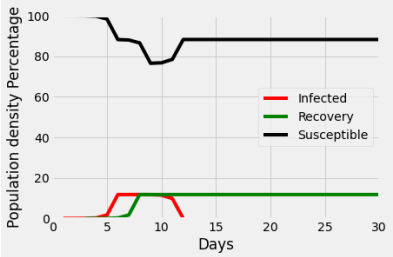
- Population density=500
- Infection time=2
- Infection spread=2



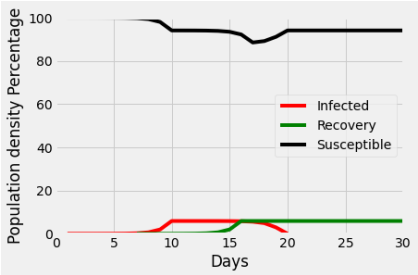
- Population density=9000
- Infection time=2
- Infection spread=2



- Population density=500
- Infection time =2
- Infection spread=6



- Population density =500
- Infection time=6
- Infection spread=2



The other part of the code once again uses the population density equation again however this time takes the actual population density of different UK towns to predict how the virus would spread in different towns this time over a much larger time scale to produce an estimate of how the cases would spike and lower across what is closer to a year time frame.