

ECE 341 - Homework #12

Markov Chains and Corona Virus. Due Tuesday, June 9th

Simulate a disease outbreak.

Assume there are four groups of people

- Healthy: not infected yet but can be infected
- Carrier: infected and can transmit the disease
- Cured: infected and cannot catch the disease again and cannot transmit the disease
- Dead: Cannot catch the disease and cannot transmit the disease

Assume that each person who is a carrier interacts with N other people each day (k).

- The person is selected at random from all people still alive
- If a carrier interacts with a healthy person, the person has an $X\%$ chance of being infected

$$\text{New Infections} = (\# \text{infected}) (N) \left(\frac{\# \text{healthy}}{\text{total population}} \right) (X)$$

Also assume that each person who is infected has a

- 10% chance of being cured (10 day incubation time on average)
- 0.1% chance of dieing

Assume the initial condition is

- 990 healthy people
- 10 carriers
- 0 cured
- 0 dead

1) Simulate the disease spread for 300 days if

- $N = 5$ (each person is in close contact with 5 people each day)
- $X = 20\%$ (20% chance of the catching if exposed)

2) Simulate the effect of self isolation:

- $N = 1$ (each person interacts with 1/5th as many people each day)
- $X = 20\%$ (20% chance of the catching if exposed)

3) Simulate the effect of social distancing and wearing masks:

- $N = 1$ (each person interacts with 1 persone each day)
- $X = 4\%$ (chance of being infected is 1/5th what it was before)

