Comp 3710

Project Proposal

Fact:

The COVID-19 pandemic has led to a dramatic loss of human life worldwide and presents an unprecedented challenge to public health, food systems and the world of work. The economic and social disruption caused by the pandemic is devastating: tens of millions of people are at risk of falling into extreme poverty, while the number of undernourished people, currently estimated at nearly 690 million, could increase by up to 132 million by the end of the year.

Goal:

We aim to simulate the spread of Covid 19 using a simple covid simulation tool. The tool can help facilitate more effective and faster-paced decision-making, leading to positive impacts on the evolution of COVID-19. The analysis that we will be getting, will show how much time can have a huge impact on the trajectory of the disease. This is an open-sourcing toolset for researchers and data scientists to better model and understand the progression of COVID-19 in a given community over time.

Agents:

We plan to include the following agents in our model-

1. Healthy-unvaccinated
2. Healthy-vaccinated
3. In-Treatment
4. Infected
5. Recovered
6. Dead

Motivation:

The problem is interesting because this includes multiple agents constantly shifting their states.

Covid-19 is causing such a dramatic socioeconomic change to our society the likes of which has never been seen before. For over a year this virus spread all over the globe, killing millions and infecting hundreds of millions of people. We want to simulate the spread of the disease with the help of agents. We are curious to see how this virus spread, how is the vaccine working on people and how are people recovering. This simulation will help us to study this disease and hopefully help in reducing its impact going forward.

Ideas:

We are going to use Repast Simphony that is a agent-based modeling toolkit and cross platform Java-based modeling system. Repast supports the development of extremely flexible models of interacting agents for use on workstations and computing clusters. Repast Simphony models can be developed in several different forms including the ReLogo dialect of Logo, point-and-click statecharts, Groovy, or Java, all of which can be fluidly interleaved.

Summary of the reading list:

An agent-based model to evaluate the COVID-19 transmission risks in facilities: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7237380/

The rapid spread of the coronavirus disease (COVID-19) has become a global threat affecting almost all countries in the world. Under such circumstances, the use of mathematical models to evaluate the transmission risk of COVID-19 in various facilities represents an important tool in assisting authorities to make informed decisions.

On the other hand, agent-based modeling is a relatively new approach to model complex systems composed of agents whose behavior is described using simple rules. In this paper, an agent-based model to evaluate the COVID-19 transmission risks in facilities has been presented. In the model, the behavior of each individual is characterized by a set of simple rules that considers its basic interactions inside the facility. The model is flexible and allows testing several hypotheses. Under this role, it is possible to test different scenarios considering distinct hypothetical conditions that are impossible to analyze under real circumstances.

COVID-19 Intervention Scenarios for a Long-term Disease Management:
https://www.ijhpm.com/article_3866.html

COVID-19 has become a global threat affecting almost all countries in the world. The public health consequences of acquiring COVID-19 have led many governments to impose a set of control measures. This second phase of the epidemics is expected to last until a vaccination is available or herd immunity is reached. Long-term management strategies thus need to be developed. In this paper they present a new agent-based simulation model “COVID-19 ABM” with which they simulate 4 alternative scenarios for the second “new normality” phase that can help decision-makers to take adequate control and intervention measures.