Assignment #12: An Agent-Based Model for COVID-19 Intervention Policies (100 Points)

(1) (10 pts) What is the epidemic model used as the basis for the ABM.
The epidemic model used as the basis for the ABM of this article is the Susceptible, Exposed, Infected, and Recovered (SEIR) model.

(2) (10 pts) The COVID-19 progression parameters contain a Markov chain. Write this Markov chain in matrix format. Note that it may be easiest to make the matrix in Excel and paste it into the template. Be sure to label the states on the transition matrix.

	Exposed	Mild	Severe	Critical	Deceased	Recovered
Exposed	0	0.88	0.12	0	0	0
Mild	0	0	0.4	0	0	0.6
Severe	0	0	0	0.4	0	0.6
Critical	0	0	0	0	0.6	0.4
Deceased	0	0	0	0	1	0
Recovered	0	0	0	0	0	1

(3) (10 pts) Which states are considered to be contagious states?
Agents are considered to be contagious while in the mild, severe, and critical states.

(4) (10 pts) How many agents are simulated in each county?
Each county is modeled using 10,000 agents.

(5) (10 pts) What is model verification?
Model verification is verifying that a model has been created correctly, meaning it does what it is intended to do, the code is correct.

(6) (10 pts) What is model validation?
Model validation is validating that a model accurately reflects reality in the way it is intended to, done by comparing model results to real data.

(7) (10 pts) What is the primary research question in the experiment design?

The primary research question of this article is '*what is the impact of a given percent of the population being tested and a given level of participation in contact tracing if NPIs are lifted 70 days after the onset of the pandemic?'*

(8) (10 pts) What are the three simulation scenarios defined by the experiment design?

1. No non-pharmaceutical interventions (NPIs).
2. NPIs starting after 10 days and partially lifting after 70.
3. NPIs starting after 10 days and partially lifting after 70 with a random testing strategy.

(9) (10 pts) What are the two variables that account for the variation found in the results in Figure 8 and Table 5?

Counties are modeled as varying by social contact as described by US Census data and population density.

(10) (10 pts) What are the demographic variables that define the variation in the contact network?

The contact network of each county contained 10,000 agents distinguished by age, then connected by household and occupation. The distribution of ages, households, and occupations were derived from the American Community Survey (ACS), which contains 'county level information on characteristics of the population such as households, household size, school enrollment, occupation, and age distribution.'