Shaw, Lucas R., A Computational Framework for Modeling the Spread of Pathogens and Generating Effective Containment Strategies in Weakly Connected Island Models, M.S., Department of Computer Science, April, 2007.

We present a framework for modeling the spread of pathogens throughout a population and generating policies that minimize the impact of those pathogens on the population. The framework combines agent-based simulation, mathematical analysis, and an Evolutionary Algorithm (EA) optimizer. This framework is used to study the spread of human viruses between cities via airplane travel. We extend the model to include a vaccine supply to be optimally distributed. We develop plausible benchmark vaccine allocation policies, comparing them to policies found by the EA trying to minimize sick days in the simulation. Analysis of the EA policies indicates that the vaccine is generally distributed to the city of origin, frequently visited cities, and smaller cities. We design a new benchmark policy that uses these observations and is superior to our previous policies. If the model changes sufficiently, the EA can aid the researcher to find new policies that work for the model.