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Thesis Title: Stochastic Infectious Disease Network Models Can Show the Effectiveness of Prevention Measures

Thesis Abstract: As the speed of disease spread quickens in a progressively connected world, finding accurate models to simulate disease spread and prevention becomes increasingly important. To this end, I have worked to create a stochastic network model to help in testing preventative measure decisions for different diseases. Starting from the well known SIR differential equations, I will introduce a more complex SEIRS model as well as a stochastic equivalent that mimics the behavior of the deterministic solutions, but adds variability that can give us further information on how a policy will work in practice. In addition to adding stochasticity, this model adds further complexity by providing a network that simulates travel of individuals through different nodes. Adding this element makes solving the differential equations difficult, but simulations can offer more realistic predictions of how a disease might spread in an area with an uneven distribution of individuals centered around a subset of points (such as cities or towns). This talk will discuss the creation of this model and some of its assumptions/limitations while also discussing how to interpret the results of simulations.

Plans Upon Graduation: Working as a Quantitative Developer at Arrowstreet Capital in Boston, MA.