Modeling of Influenza Using Fuzzy Logic

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The purpose of this project is to efficiently model the epidemic spread of an influenza infection using fuzzy logic and computational methods. Computational models can be based off statistical data from health services, as well as GIS, and set algorithms to model an epidemic. Modeling an epidemic will provide immense knowledge for doctors and scientists concerning vaccination strategies and geographical predictions. This can aid in counteracting the spread of epidemics such as the avian flu or other such contagious diseases.

The model employs the fuzzy logic toolbox of MATLAB to create a fuzzy system. The fuzzy "if-then" rules allow for greater degrees of uncertainty pertaining to set distribution and variable management. The data used to create the trends was acquired from medical records and literature, and the curves for variables immunity, susceptibility, and infectivity were based upon the morphology of the pathogen and its effects on individuals. These curves will vary for different individuals. The variable of distance is used to calculate a final probability of catching an infection depending on the individual's relative distance to another infected individual. A preliminary spatial model was developed to look at interactions between different age groups, with contact rates derived from literature

This model proved to be effective within its context. This efficient model is a foundation for a more complex simulation. This model can be developed further by implementing a system of movement of individuals to different locations, applying contact rates, and differentiating between population densities and clusters to have a more accurate view of how an epidemic will progress in the population.