May 21st, 3:10 PM - 3:30 PM

Can Including Time Delay in Epidemic Models Significantly Improve Predictions Concerning Intervention Strategies?

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Modeling the spread of epidemics has been a useful tool in predicting the outcome of an infectious disease. Our focus is how to model the distributions of exposed and infectious time periods. While ordinary differential equations are widely used for their simplicity, they allow high probability of unrealistically short time periods. We propose that extra care must be taken when applying intervention methods such as quarantine, hospitalization, or vaccination to basic models in order to avoid inaccurate predictions. Delay differential equations, which use fixed exposed and infectious periods, can provide more realistic distributions but are more difficult to use and analyze. Our project investigates the magnitude of discrepancies between a simpler ODE model and a more realistic time delay model when an intervention method is also included. This project will provide guidelines for when more realistic time periods must be incorporated in order to limit inaccuracy.