Abstract:

National boundaries have never prevented infectious diseases from reaching distant territories. However, the speed at which an infectious agent can spread around the world via the global airline transportation network has significantly increased during recent decades. In this talk, we introduce various SIR (susceptible–infected–recovered)-based compartmental epidemic models to investigate the spread of an infectious disease in distant regions that are connected by transportation. We also incorporate the possibility of disease transmission during travel. The model is equivalent to a large system of delay differential equations. The calculation of the basic reproduction number will be detailed. We parametrize our model for influenza, and use real demographic and air travel data for the numerical simulations. To understand the role of the different characteristics of the regions in the propagation of the disease, three distinct origin–destination pairs will be considered. The model will also be fitted to the first wave of the influenza A(H1N1) 2009 pandemic in Mexico and Canada.

Joint work with Gergely Rost (University of Szeged, Hungary) and Jianhong Wu (York University).