

Kinetic and macroscopic models for epidemic dynamics

Mattia Zanella

University of Pavia

`mattia.zanella@unipv.it`

We introduce a mathematical description of the impact of sociality in the spread of infectious diseases by integrating epidemiological dynamics with a kinetic modeling of population-based contacts. The kinetic description leads to study the evolution over time of Boltzmann-type equations describing the number densities of social contacts of compartmental models in epidemiology. Explicit calculations show that the spread of the disease is closely related to moments of the contact distribution. Motivated by the COVID-19 pandemic, part of the talk will be dedicated to the calibration of the proposed model based on data of the Province of Pavia thanks to an ongoing collaboration with the regional health agency. We conduct numerical experiments which confirm the ability of the model to describe different phenomena characteristic of the rapid spread of an epidemic.