JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

Department of Biostatistics

BIOSTATISTICS SEMINAR

Inference with Implicit Likelihoods for Infectious Disease Models

Roman Jandarov
The Pennsylvania State University

ABSTRACT

Probabilistic models for infectious disease dynamics are useful for understanding the mechanism underlying the spread of infection. When the likelihood function for these models is expensive to evaluate, traditional likelihood-based inference may be computationally intractable. Furthermore, traditional inference may lead to poor parameter estimates and the fitted model may not capture important biological characteristics of the observed data.

In this talk, I describe a novel approach for resolving these issues that is inspired by recent work in emulation and calibration for complex computer models. Using our motivating example, the! gravity time series susceptible-infected-recovered (TSIR) model for measles dynamics, I demonstrate that the new approach is computationally expedient, provides accurate parameter inference, and results in a good model fit. The approach focuses on the characteristics of the process that are of scientific interest. We find a Gaussian process approximation to the gravity model using key summary statistics obtained from model simulations. The method is widely applicable to problems where traditional likelihood-based inference is computationally intractable or produces a poor model fit. It is also an alternative to approximate Bayesian computation (ABC) when simulations from the model are expensive. I will also discuss how our methodology is useful for inference in mixed membership random graph models for affiliation networks.

At the end of the talk I will briefly describe two other projects I have worked on, one on modeling meningitis transmission and! the other on estimating periodicities in gypsy moth outbreaks! .

The Johns Hopkins Bloomberg School of Public Health
Department of Biostatistics, Wednesday, February 1, 2012
Room W2030 School of Public Health, 4:00-5:00pm (Refreshments: 3:30)