

Epidemics, Efficient Inference and Emulation

Like in many other physical processes, the dynamics of an epidemic can be encoded into mathematical simulation models that enable us to learn more about the processes involved. On the basis of observed relevant data, such models can be used to make statistical inference about key epidemic parameters or forecasts for the future of the epidemic. However, the ability to provide such inference can be compromised by the complexity of the initial model, particularly so when there is a need for timely real-time analysis.

Looking at examples in evidence synthesis, I will discuss the use of sequential and approximate inference methods in epidemics to circumvent such difficulties. I will then look more in depth at the potential of an alternative approach, emulation, where the epidemic model can be replaced by a time-evolving Gaussian process trained a priori. I will discuss its application to case estimates from the 2009 A/H1N1pdm in England and offer some pointers for future developments.