

Bayesian Statistical Process Control: An application to Syndromic Surveillance

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Abstract

Protecting the US population against bioterrorism has been an important task facing US officials, policy makers, health care providers and the Center for Disease Control (CDC) following September 2001. The period after September 11 has raised the level of awareness of incorporating medical based intelligence functions such as Influenza-Like-Illnesses (ILI) observed during visits to emergency rooms (ER). Developing a control technique for ILI however is a complex process which involves the unpredictability of the time of emergence of influenza, the severity of the outbreak and the effectiveness of influenza epidemic interventions. Furthermore the need of detecting the epidemic in an on-line fashion makes any influenza-based control even more challenging. This complexity and uncertainty around influenza have kept many scientists away from tackling preparedness based on ILI. In this work, we present a Bayesian model for the course of ILI. This model uses a recursive and sequential update method by finding the posterior distribution at each stage and setting it as a prior distribution of the next stage to chart the discrepancy between the observed and the predicted percentage of ILI. Issues regarding inference and predictions will be addressed and an application to real epidemic data will be demonstrated.

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