

Spatio-temporal Point Processes, Partial Likelihood, Foot-and-mouth

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Abstract. Spatio-temporal point process data arise in many fields of application. In this talk, I will make a distinction between empirical point process models, which seek only to describe the observed patterns in the data, and mechanistic models which seek, at least crudely, to represent the underlying scientific processes which generate the observed pattern.

An intuitively natural way to specify a mechanistic model for a spatio-temporal point process is through its conditional intensity at location x and time t , given the history of the process up to time t . Typically, this results in an analytically intractable likelihood. Likelihood-based inference therefore relies on Monte Carlo methods which are computationally intensive and require careful tuning to each application. I will describe a partial likelihood alternative which is computationally straightforward and can be applied routinely.

I will then apply the partial likelihood method to data from the 2001 foot-and-mouth epidemic in the UK, using a previously published model (Keeling et al, 2001) for the spatio-temporal spread of the disease.

Keeling, M.J., Woolhouse, M.E.J., Shaw, D.J., Matthews, L., Chase-Topping, M., Haydon, D.T., Cornell, S.J., Kappey, J., Wilesmith, J. and Grenfell, B.T. (2001). Dynamics of the 2001 UK foot and mouth epidemic: stochastic dispersal in a heterogeneous landscape. *Science*, **294**, 813–7.