A SPATIO-TEMPORAL SUSCEPTIBLE-INFECTED MODEL FOR LONGITUDINAL BINARY DATA

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Motivated by repeated observations of the disease status of farm animals in Tanzania, this talk develops binary-valued spatio-temporal stochastic model for a susceptible-infected process. As the disease in question is spread between cattle by ticks, there is believed to be spatial dependence in the data with neighbouring animals likely to have a similar infection status. As a diseased animal will remain infected for a random amount of time, a sample taken from an animal which was infected on the previous visit is more likely to be infected than an animal which was previously healthy. Further, information on the age of the animal and its living conditions are also known and believed to affect the rate of infection.
In order to assess the duration of an infection and the range of spatial transmission of the disease, a susceptible-infected-susceptible stochastic process is used, with the rate of infection depending on covariates and a latent spatial process. The chief complication is that the times of infection and recovery are not known, though assuming exponentially distributed durations of infections leads to the model being Markov and tractable. Inference is performed in a Bayesian setting using Winbugs.