Bayesian Semi- and Non-parametric Analysis for Spatially Correlated Survival Data

Flexible incorporation of both geographical patterning and risk effects in cancer survival models is becoming increasingly important, due in part to the recent availability of large cancer registries. The analysis of spatial survival data is challenged by the presence of spatial dependence and censoring for survival times. Accurately modeling the risk factors and geographical pattern that explain the differences in survival is particularly of interest. Within this dissertation, the first chapter reviews commonly-used baseline priors, semiparametric and nonparametric Bayesian survival models and resent approaches for accommodating spatial dependence, both conditional and marginal. The last three chapters contribute three flexible survival models: (1) a proportional hazards model with areal-level covariate-adjusted frailties with application to county level breast survival data, (2) a marginal Bayesian nonparametric model for time to disease arrival of threatened amphibian populations and (3) a generalized accelerated failure time model with spatial intrinsic conditionally autoregressive frailties with application to county-level prostate cancer data. An R package spBayesSurv is developed to examine all the proposed models along with some traditional spatial survival models.