Bayesian Nonparametric Estimation of Intensity Functions using Markov Chain Monte Carlo Method

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Abstract

Let $N(t)$ be a counting process indicating the failures (and instantaneous repairs) of a repairable system up to time t. We model the probabilistic behaviour of the process by a nonhomogeneous Poisson process (NHHP) with intensity function $\lambda(t)$. In the absence of any grounds in favour of a specific parametric form for $\lambda(t)$ we assume that it is constant between failure epochs and at these epochs receives a jump (the damage-at-failure-model). Again we don't know the heights of these jumps. Therefore we assume a heirarchical Bayes formulation. The heights of the jumps are assumed to have constrained conditional gamma distributions. The hyper-parameters of the gamma distribution are assumed to have known uniform distributions. The exact Bayes solutions are analytically intractable. Hence we provide a scheme of simulation via the Metropolis-Hastings algorithm to estimate the features of the posterior distribution. The methodology is illustrated by applying it to a well known data set.