BAYESIAN INFERENCE OF HIDDEN GAMMA WEAR PROCESS MODEL FOR SURVIVAL DATA WITH TIES

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Abstract: Real-life survival data often contain tied event times. Inference without careful treatment of the ties may lead to biased estimates. This paper develops Bayesian analysis of a stochastic wear process model to fit survival data that may have a large number of ties. Under a general wear process model, we derive the likelihood of parameters. When the wear process is a Gamma process, the likelihood has a semi-closed form, which allows posterior sampling to be carried out for the parameters, hence achieving model selection using Bayesian deviance information criterion. An innovative simulation algorithm via direct forward sampling and Gibbs sampling is developed to sample event times that may have ties in the presence of arbitrary covariates, which provides a tool to assess the precision of inference. An extensive simulation study is conducted and a real data set is used to further illustrate the proposed methodology.

Key words and phrases: direct forward sampling; Gibbs sampling; jump process; latent variables; proportional hazards model; tied event times.