

# Posterior Propriety and Computation for the Cox Regression Model with Applications to Missing Covariates

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## Summary

In this paper, we carry out an in-depth theoretical investigation for Bayesian inference for the Cox regression model (Cox, 1972, 1975). Specifically, we establish necessary and sufficient conditions for posterior propriety of the regression coefficients,  $\beta$ , in Cox's partial likelihood, which can be obtained as the limiting marginal posterior distribution of  $\beta$  through the specification of a gamma process prior for the cumulative baseline hazard and a uniform improper prior for  $\beta$  (Kalbfleisch, 1978, Sinha, Ibrahim, and Chen, 2003). We also examine necessary and sufficient conditions for posterior propriety of the regression coefficients,  $\beta$  using full likelihood Bayesian approaches in which a gamma process prior is specified for the cumulative baseline hazard. We examine characterizations of posterior propriety under completely observed data settings as well as for missing covariates. Latent variables are introduced to facilitate a straightforward Gibbs sampling scheme in the Bayesian computation. A real dataset is presented to illustrate the proposed methodology.

*Key words and phrases.* Missing at random (MAR), Gamma process prior, Latent variable, Markov chain Monte Carlo, Necessary and sufficient conditions, Partial likelihood, Proportional hazards model, Propriety of posterior distribution.

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