

Informative Bayesian Survival Analysis to Handle Heavy Censoring in Lifetime Data

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Relevance to the Centre

Developing a fixed time replacement policy requires reliable estimates of the lifetime of an asset. Estimation of the lifetime is conventionally performed by fitting a Weibull distribution to historical lifetime data using maximum likelihood. However, in industries such as mining and mineral processing, data are often heavily censored. This censoring results in biased parameter estimates that can mislead a replacement policy which the analysis informs. In this paper, we demonstrate for practitioners how high levels of censoring in lifetime data affect inference about the Weibull parameters and how a Bayesian approach can be used to constrain the parameter estimates to more sensible values by using domain expert knowledge. Furthermore, we elaborate on a previous method from the literature which elicits domain expert knowledge on the outcome space in order to construct a joint prior for the Weibull distribution; we also show how this method is more effective at reducing bias caused by high levels of censoring compared to other informative Bayesian approaches in the reliability literature. Finally, we present a small simulation study to show that the bias reducing effect of the informative joint prior is reproducible.

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