

## Accepted Manuscript

Bayesian duality and risk analysis on the statistical manifold of exponential family with censored data

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PII: S0377-0427(18)30224-3  
DOI: <https://doi.org/10.1016/j.cam.2018.03.043>  
Reference: CAM 11626

To appear in: *Journal of Computational and Applied Mathematics*

Received date: 12 May 2017  
Revised date: 16 October 2017

Please cite this article as: F. Zhang, H.K.T. Ng, Y. Shi, Bayesian duality and risk analysis on the statistical manifold of exponential family with censored data, *Journal of Computational and Applied Mathematics* (2018), <https://doi.org/10.1016/j.cam.2018.03.043>

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- The reliability function of the exponential family is defined in a more general form, which may not belong to the exponential family. Based on the general progressive Type-I censored data, the statistical manifold is constructed, where the censoring occurs not any before the observation beginning but also during the observation process.
- The Bregman divergence between two parameter points is studied. The dual coordinate system and dual function are obtained. Then the dualistic structure on the manifold is derived. The results show that the maximum likelihood estimate (MLE) can be obtained by minimizing the Bregman divergence induced from the dual function.
- The Bayesian duality on the manifold is investigated. The Bayesian estimators of the parameter and its dual are provided. We also discuss the prior selection, where both the informative prior (conjugate prior) and non-informative prior (Jeffreys and Reference priors) are considered.
- The Bayesian prediction of the unobserved data is discussed, the prediction is evaluated by using risk function based on different divergence as loss function.
- Take gamma distribution as an example, we give the exact results for the dual coordinate system and dual function. The corresponding estimators are also discussed. A real data set is analysed to confirm the methodologies and experimental designs.

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