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Abstract

From the geometrical point of view, a statistical model can be considered as a manifold with parameter plays the role of a coordinate system. In this paper, the geometrical quantities of a statistical model equipped with k-step-stress accelerated life test and progressively Type-II censoring are obtained, where censoring is allowed not only at each stress change time but also at each failure time. As an application of these quantities, the asymptotic expansions of the Bayesian prediction are investigated. Finally, some computation and simulation results are presented to illustrate our main results.

Keywords: Accelerated life testing; Geometry; Progressively Type-II censoring; Prediction; Asymptotic expansion

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1 Introduction

Information geometry introduced by Amari [1] provides a new method applicable to various fields, such as neural networks (see Amari and Wu [2]) and statistical mechanics (see Harsha and Moosath [3]). It has emerged from investigating the geometrical structures of the statistical manifold models and has applied successfully to statistical inference, see Amari et al. [4].

Let $\mathscr{F} = \{f(x;\theta), \theta \in \Theta\}$ be a family of parametric model with respect to some σ-finite reference measure μ, where θ is a parameter vector belonging to a parameter space Θ. For simplicity, a random variable X and its observed value x are unified expressing as x in this paper. Let $x^n = (x_1, \ldots, x_n)$ be n independent observations from a distribution $f(x;\theta) \in \mathscr{F}$. Using $g_{ab}(x)$ and $g_{ab}(x^n)$ denote the Fisher information matric tensors obtained in a single observation x and n independent observations x^n, respectively. Following the α-connection $\Gamma^{\alpha}_{abc}(x)$ and $\Gamma^{\alpha}_{abc}(x^n)$, Amari [1] obtained that

$$g_{ab}(x^n) = ng_{ab}(x), \;\; \Gamma^{\alpha}_{abc}(x^n) = n\Gamma^{\alpha}_{abc}(x),$$

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