Bayesian and Non-Bayesian Estimation from Type I Generalized Logistic Distribution Based On Lower Record Values

Abstract

Record values and associated statistics are of great importance in several real-life applications involving weather, economic and sports data "Olympic records or world records in sport". Also in industry, many products fail under stress, for example, a wooden beam breaks when sufficient perpendicular force is applied to it, an electronic component ceases to function in an environment of too high temperature, and a battery dies under the stress of time. But the precise breaking stress or failure point varies even among identical items. Hence, in such experiments, measurements may be made sequentially and only the record values are observed. Thus, the number of measurements made is considerably smaller than the complete sample size. This "measurement saving" can be important when the measurements of these experiments are costly if the entire sample was destroyed. For more examples, see Gulati and Padgett (1994). There are also situations in which an observation is stored only if it is a record value. These include studies in meteorology, hydrology, seismology, athletic events and mining. In recent years, there has been much work on parametric and nonparametric inference based on record values. Among others are Resnick (1987), Nagaraja (1988), Ahsanullah (1993, 1995), Arnold et al. (1992, 1998), Gulati and Padgett (1994), Raqab and Ahsanullah (2001), Raqab (2002) and Soliman et al (2010).

Balakrishnan and Leung (1988) defined the Type I generalized logistic distribution (Type I GLD) as one of the three generalized forms of the standard logistic distribution. Type I generalized logistic distribution has received additional attention in estimating its parameters for practical usage (see Balakrishnan(1992)). For $\alpha > 0$ and $\lambda > 0$ the two-parameter Type I GLD has the probability density function (pdf) given by

$$f(x,\alpha,\lambda) = \alpha\lambda e^{-\lambda x}(1+e^{-\lambda x})^{-(\alpha+1)}, \quad -\infty < x < \infty, \tag{1}$$

and has the cumulative distribution function (cdf) given by

$$F(x,\alpha,\lambda) = (1+e^{-\lambda x})^{-\alpha}, \quad -\infty < x < \infty, \tag{2}$$

where λ is the scale parameter and α is the shape parameter.

This seminar about Bayesian and non-Bayesian analysis in the context of lower record values from the Type I generalized logistic distribution.