

ϕ -divergence as a measure of the predictability of reliability systems

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Abstract

We extend the Jensen–Shannon divergence to a broader class of divergence measures, referred to as the Jensen ϕ -divergence and denoted by JD_ϕ . An important parametric subfamily of JD_ϕ is the Jensen–Cressie–Read power divergence JD_λ , where the parameter λ provides a flexible scaling mechanism. The proposed divergences quantify predictability of reliability systems, with smaller divergence values indicating higher predictability.

In general, the divergence of a system depends both on the lifetime distribution of its homogeneous components and on the system structure, characterized by its system signature (see, e.g., [2]). To illustrate the practical applicability of the Jensen ϕ -divergence, we examine JD_λ for systems with three components and compare the results with those obtained from the Jensen–Shannon divergence introduced by Asadi et al. [1] and preferable system criterion proposed by Toomaj et al. [3].

Keywords

Reliability systems, Lifetime distribution, Signature, Divergence, Predictability measure.

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References

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