Nonparametric predictive reliability demonstration for failure-free periods

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Abstract

We derive sample sizes for testing as required for reliability demonstration, using nonparametric predictive inference for the predicted number of future failures on the basis of test information. We assume that tests lead to zero failures, as e.g. typical for high-reliability testing. Optimisation is in terms of failure free periods for a process after testing, and we also consider total expected cost minimisation, with particular attention to deterministic and Poisson processes. We show that, perhaps surprisingly, the deterministic case is a worst-case scenario with regard to number of tests needed.