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Lifetime Drift Model for Discrete Data for Semiconductor Devices

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Prognostics and health management and calculation of residual useful life are important topics in automotive industry. In the context of autonomous cars, it is imperative to lower the residual risk to an acceptable level. On the semiconductor level, various advanced statistical models are used to predict degradation on the basis of accelerated life time stress tests. The change of electrical parameters over the simulated lifetime is called lifetime drift.
Based on the calculated lifetime drift of the parameters, guard bands, which are tighter-than-usual parameter limits are introduced to guarantee quality levels to the customer over lifetime
Lifetime drift models have to handle a wide variety of degradation patterns and have to be both flexible and light-weight enough to run on edge devices.
We propose a semiparametric stochastic model for parameter drift of discrete parameters, based on interval estimation of Markov transition probabilities from sparse data, which can be used to identify critical parameters and detect gradual degradation. It is compared to an adapted existing model for continuous parameters. Interval predictions for residual useful life are performed using quantile regression methods.
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Keywords

Lifetime Drift Model, Discrete Parameters, Statistical Modeling

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