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A Variance-Based Importance Index for Systems with Dependent Components

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Our work proposes a variance-based measure of importance for coherent systems with dependent and heterogeneous components. The particular cases of independent components and homogeneous components are also considered. We model the dependence structure among the components by the concept of copula. The proposed measure allows us to provide the best estimation of the system lifetime, in terms of the mean squared error, under the assumption that the lifetime of one of its components is known. We include theoretical results that are useful to calculate a closed-form of our measure and to compare two components of a system. Finally, we illustrate the main results with several examples.

Keywords

Importance measures; coherent systems; dependence; copulas

Classification

Both methodology and application

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