



ASMBI DISCUSSION PAPER SESSION

ORGANISER: FABRIZIO RUGGERI, NATIONAL RESEARCH COUNCIL (CNR), ITALY

TALK: CUMULATIVE DAMAGE DISTRIBUTIONS: NEW DEVELOPMENTS AND GOODNESS-OF-FIT

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Cumulative damage models have been popularly considered in engineering for evaluating the failure of products. Fatigue is recognized as one of the main causes associated with these failures. Originally, fatigue cumulative damage models reported in the literature focused on deterministic principles, such as the Miner law. However, current models are based on stochastic principles. This has led to the need for developing new distributions to more accurately predict the reliability and service life of products, which are subjected to fatigue cumulative damage. The literature shows that fatigue life data can follow gamma, log-normal and Weibull distributions. More recent research has reported other distributions more suitable to describe such data. For example, Birnbaum-Saunders and inverse Gaussian distributions, as well as some of their generalizations, have been considered. In this paper, first, we discuss about new developments in cumulative damage distributions related to fatigue processes. Generalized Birnbaum-Saunders and inverse Gaussian type distributions are studied. Second, goodness-of-fit tests for cumulative damage distributions describing fatigue processes are addressed to detect their suitability. These distributions do not belong to the location-scale family. Then, their applicability is not direct from the existing tests. We consider several goodness-of-fit test statistics available in the literature and adapt them to cumulative damage distributions when censored and non-censored data are present. In addition, when possible, we link the goodness-of-fit tests to probability plots for having a graphical tools supporting the decision. We study the comparative power and nominal level of the considered goodness-of-fit tests. Real-world data sets from the industrial area are analyzed to show the potential of the proposed results. Joint work with C. Castro-Kuriss.

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