Contribution ID: **19** Type: **not specified**

Degradation Model Selection Using Depth Functions

Friday, 20 May 2022 11:30 (20 minutes)

Degradation modeling is an effective way for the reliability analysis of complex systems. For highly reliable systems, in which their failure is hard to observe, degradation measurements often provide more information than failure time to improve system reliability (Meeker and Escobar 2014). The degradation can be viewed as damage to a system that accumulates over time and eventually leads to failure when the accumulation reaches a failure threshold, either random or stipulated by industrial standards (Ye and. Xie 2015). Two large classes of degradation models are stochastic processes and general path models. The stochastic-process-based models show great flexibility in describing the failure mechanisms caused by degradation (Lehmann 2009).

The aim of degradation modeling in presence of degradation data is to select a model from a set of competing models, capturing the features of the underlying degradation phenomenon. An efficient statistical tool is able to discard irrelevant models. The concept of statistical depth could be employed as a statistical tool for model selection. A depth function reflects the centrality of the observation to a statistical population (Staerman et al 2020).

Tukey (1975) introduced a data depth to extend the notion of a median to multi-variate random variables. Depth function have been extended by Frairman and Muniz (2001) and Cuevas et al. (2006, 2007) for functional data, the data which are recorded densely over time with one observed function per subject (Hall et al 2006). An alternative point of view based on the graphic representation of curves is proposed by Lopez-Pintado (2009).

In this paper, stochastic processes such as Lévy processes or stochastic differential equations are considered to model the degradation. After model calibration in presence of data, the models that show high values of depth function are compared and a methodology to exploit and analyze the depth function results is proposed.

Primary authors: Ms FOULADIRAD, Mitra (École Centrale Marseille, Marseille, France, Aix Marseille Université (Aix-en-Provence), Université de Technologie de Troyes); Ms ASADI, Arefe (University of technology of Troyes); Mr RODOLPHO TOMASI, Diego (Biofortis)

Presenter: Ms ASADI, Arefe (University of technology of Troyes)

Session Classification: Statistical inference for degradation models