

**Global sensitivity analysis for time-variant reliability**

IASON, PAPAIOANNOU

DANIEL, STRAUB

*Engineering Risk Analysis Group, Technische Universität München, Arcisstr. 21, 80290 München, Germany*

Time-variant reliability analysis involves the estimation of the reliability of a structural system accounting for the time-varying nature of structural parameters and applied loads. This contribution studies the application of global reliability sensitivity measures to time-variant reliability analysis and discusses the estimation of these sensitivity indices with the first order reliability method (FORM). We focus on time-deteriorating systems and in this context study two approaches for time-variant reliability analysis: one based on approximating the first passage probability with the probability of a series of time interval failure events and another that expresses the failure event through an auxiliary limit state in terms of the conditional failure probability given the structural parameters. Estimation of the reliability sensitivity indices for the two considered approaches can be performed through leveraging the FORM approximations introduced in [1, 2]. We demonstrate the behavior of these approximations through numerical examples involving deteriorating structural systems.

**References :**

[1] Papaioannou, I. and Straub, D., "Variance-based reliability sensitivity analysis and the FORM  $\alpha$ -factors". *Reliab. Eng. Syst. Saf.*, **210**, 107496, 2021.

[2] Papaioannou I. and Straub D., "FORM-based global reliability sensitivity analysis of systems with multiple failure modes", *arXiv preprint arXiv:2403.12822*, 2024.

[ Iason Papaioannou; Engineering Risk Analysis Group, Technische Universität München, Arcisstr. 21, 80290 München, Germany ]

[[iason.papaioannou@tum.de](mailto:iason.papaioannou@tum.de) -<https://www.cee.ed.tum.de/era/team/iason-papaioannou/>]