Hurtado, Jorge E.; **Alvarez, Diego A.**
Neural-network-based realibility analysis: A comparative study. (English) Zbl 1016.74044
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Summary: We summarize a study on the applicability of different kinds of neural networks for the probabilistic analysis of structures, when the sources of randomness can be modeled as random variables. The networks are employed as numerical devices for substituting the finite element code needed by Monte Carlo simulation. The comparison comprehends two network types (multi-layer perceptrons and radial basis function classifiers), cost functions (sum of square errors and cross-entropy), optimization algorithms (back-propagation, Gauss-Newton, Newton-Raphson), sampling methods for generating the training population (using uniform and actual distributions of the variables) and purposes of neural network use (as functional approximators and data classifiers). The comparative study is performed over four examples, corresponding to different types of limit state function and structural behaviors. The analysis indicates some recommended ways of employing neural networks in this field.

MSC:

74K99	Thin bodies, structures
92B20	Neural networks for/in biological studies, artificial life and related topics
62N05	Reliability and life testing

Cited in **11** Documents

Keywords:

neural-network-based reliability analysis; multi-layer perceptrons; probabilistic analysis of structures; random variables; finite element code; Monte Carlo simulation; radial basis function classifiers; cost functions; optimization algorithms; training population

Full Text: DOI

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