



Importance Measures in Reliability, Risk, and Optimization: Principles and Applications

Way Kuo, Xiaoyan Zhu

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This unique treatment systematically interprets a spectrum of importance measures to provide a comprehensive overview of their applications in the areas of reliability, network, risk, mathematical programming, and optimization. Investigating the precise relationships among various importance measures, it describes how they are modelled and combined with other design tools to allow users to solve readily many real-world, large-scale decision-making problems.

Presenting the state-of-the-art in network analysis, multistate systems, and application in modern systems, this book offers a clear and complete introduction to the topic. Through describing the reliability importance and the fundamentals, it covers advanced topics such as signature of coherent systems, multi-linear functions, and new interpretation of the mathematical programming problems.

Key highlights:

- Generalizes the concepts behind importance measures (such as sensitivity and perturbation analysis, uncertainty analysis, mathematical programming, network designs), enabling readers to address large-scale problems within various fields effectively
- Covers a large range of importance measures, including those in binary coherent systems, binary monotone systems, multistate systems, continuum systems, repairable systems, as well as importance measures of pairs and groups of components
- Demonstrates numerical and practical applications of importance measures and the related methodologies, including risk analysis in nuclear power plants, cloud computing, software reliability and more
- Provides thorough comparisons, examples and case studies on relations of different importance measures, with conclusive results based on the authors' own research
- Describes reliability design such as redundancy allocation, system upgrading and component assignment.

This book will benefit researchers and practitioners interested in systems design, reliability, risk and optimization, statistics, maintenance, prognostics and operations. Readers can develop feasible approaches to solving various open-ended problems in their research and practical work. Software developers, IT analysts and reliability and safety engineers in nuclear, telecommunications, offshore and civil industries will also find the book useful.

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