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Random Contractions in Global Risk Governance

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Series Editor's Foreword

Undoubtedly, the advances in the information, communication, transport, and energy technologies have led the World into strong interconnection and interdependence at the economic, social, and geopolitical level. At the same time, humanity is now facing challenges and threats (e.g., security, military, health, or environmental threats, but also threats from advances in technologies such as Artificial Intelligence and Data Science) on a global/worldwide scale, which can be addressed only via collaboration among countries and other stakeholders on a matching global/worldwide scale.

Consequently, suitable tools for decision-making need to be made available, which can predict the evolution of complex systems reliably and in sufficient depth. Stochastic modeling research has been devising methodologies that show promise to be particularly useful in the hands of decision-makers, as they have proven to be efficient in the modeling and prediction of complex systems.

In this monograph, Profs. Panagiotis T. Artikis and Constantinos T. Artikis focus on a specific class of stochastic models of complex systems, known as *Random Contractions*. Random Contractions refer to stochastic multiplicative models which are useful for describing, analyzing, and solving significant problems across many scientific disciplines. In more detail, the authors start with a discussion of global risks and their corresponding stochastic modeling and proceed with rigorous formulation of stochastic models and their random contraction representation. At this point, Profs. Artikis and Artikis also introduce eight new random contractions. At the final part of the book, they apply and interpret the random contraction model to global risk governance.

Overall, the book is very well written, starting from introductory concepts and leading the reader to the most advanced and most recent research results in this area. As it is, the book is addressed not only to the expert in the fields of stochastic modeling and global risk governance, but it also appeals to the newcomer who wishes to learn about these fields. Moreover, the book will attract the interest of readers from other areas as well who wish to get versed in these significant scientific disciplines.

As Editor of the *Learning and Analytics in Intelligent Systems* series of Springer, I am happily presenting this book to the research communities worldwide. I congratulate the authors for their great work, in confidence that their book will help its

readers understand the significant research areas of stochastic modeling and random contractions. I am also confident that the approaches and methodologies included in this book will find application in many scientific areas and provide solutions to diverse problems. Finally, I encourage the authors to continue their research work in this area and, perhaps, update the scientific communities with future books of theirs.

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Preface

Global governance gathers a large number of different performing actors at a global level. The main objective of global governance is to provide frameworks, measures, and guidance in global economic markets, social structures, security, and peace. The expansion of organized global markets, development of global communication networks, and the vast number of global organizations has expanded the interconnection among countries by bringing people, groups, and societies closer in a time period with issues and threats call for worldwide collaboration.

A large number of actors characterize and shape the structure of global governance. Current forms of global governance must support adaptability over inflexibility and allow rise of unused activities and concepts.

The formulation, investigation, and application of stochastic models constitute research activities of exceptional theoretical and practical importance, concerning the future behavior and evolution of real-world systems. Stochastic models are considered as suitable tools for the development and the successful application of diverse optimal control plans and the proper instruction for decision-making process.

It is acceptable that stochastic models constitute an extremely important category of models having an exceptional contribution to the precise description, the thorough investigation, and the good performance of many complex real-world systems arising in a wide variety of fast-growing disciplines with particular practical importance.

In particular, random contractions are generally recognized as strong analytical tools of probability theory with significant practical applications in a wide variety of disciplines.

The powerful probabilistic role and the mathematical form of random contractions constitute the main advantages for considering a random contraction as a stochastic model of particular applicability in various important theoretical and practical disciplines.

Random contractions constitute a class of stochastic multiplicative models which comprise a strong analytical tool providing analysts, modelers, decision-makers, and other experts with exceptionally valuable probabilistic information for effectively treating many worldwide complex systems.

The authors would like to thank Profs.-Drs. Maria Virvou and George A. Tsihrintzis of the University of Piraeus, Piraeus, Greece, for their encouragement, fruitful discussions, and comments over the last few years, which have helped to shape this monograph.

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