Natural hazards, impact assessment and eco-engineering through Artificial Intelligence
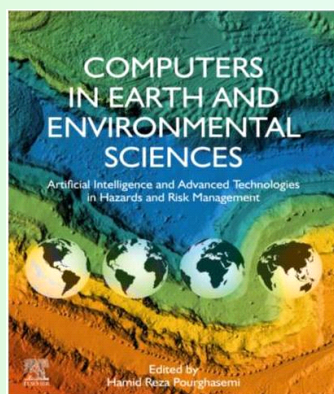
Tirumalesh Keesari

With a commanding experience in spatial modeling and multi-criteria decision-making methods and being an author of over 150 peer reviewed journal articles, the editor Dr. Hamid Reza, has compiled this thoughtful book with chapters pertaining to natural and environmental hazards and role of machine learning techniques. The book is well organized and covers three main themes; i) natural and environmental hazards, ii) advanced tools and technologies in risk management and iii) future challenges in computer applications. These themes are detailed through 48 diligently written chapters mostly contributed by researchers, faculty and scientist who have sound knowledge on the current advancements in the respective fields. Even though most of the chapters describe current research in Iran, the editor could successfully expand the coverage of the book by including research works of over 20 countries both developed and developing. By maintaining a proper blend of basic and applied research, the editor has also made sure that the book won't look monotonous and readers are encouraged to read through all chapters.
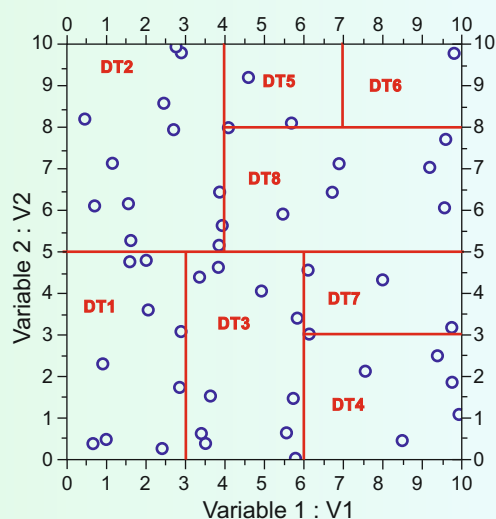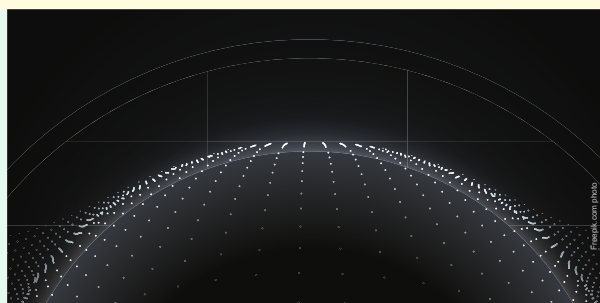
Basic research chapters that caught my eye include those by Hamidreza Mosaffa et al. on "Application of machine learning algorithms in hydrology". This chapter presents an overview on the application of machine learning and deep learning in the subfields of hydrology, including flood, precipitation estimation, water quality, and groundwater. It is not always easy to monitor the contaminant in situ with the available instrumentation in an economically viable manner. In this respect the chapter on "Application of data driven approach" is a useful and timely contribution by D. Saha and K. Tirumalesh (self). Here we discussed how electrical conductivity of water samples can be used as a potential proxy for obtaining Cl- concentration through decision tree model. The chapter also informs about the limitations of such estimations and suggests methods for betterment. In addition, there are many interesting chapters on the application of Long - short term memory, neural networks, spatial modeling, analytical hierarchy process (AHP) and meta-heuristic techniques, and also chapters on some basic aspects of erosion and land degradation, and multi-fractal analysis of basin drainage.

Hazard prediction has been covered extensively in this book. Many chapters were dedicated to evaluation of natural hazards, like landslides, forest fires, soil degradation, soil erosion and impact of land use changes, etc. Other chapters of interest are drought hazard assessment using random forest method and environmental impacts assessment using spatial multi-criteria decision analysis. Apart from natural hazard prediction, the book also contains chapters dealing with application of advanced tool to evaluate the eco-engineering practices for restoration of soil health as well as other natural resources. There are two chapters on the COVID related research, one of them by Abdullah Kaviani et al., which highlights the direct linkage with human activities and global warming gas emission with a soft caution to reduce emission of global warming gases. Another chapter

Sample schematic details of decision tree - model domain split

by Soheila Pouyan et al., draws parallels related to COVID-19 pandemic impacts between Iran and the world averages using polynomial curve fitting. The authors admit there is a lack of information on the protocols to contain the virus spread.

This book is a good medium to create awareness among the upcoming researchers who are new to data treatment through machine learning and other data handling algorithms. Researchers and professionals in earth and environmental sciences who require the latest technologies and advances multi-hazard assessments, natural and manmade hazards, risk management in hazards, remote sensing and spatial modeling, restoration of natural resources will find this book to be a valuable source of information.

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