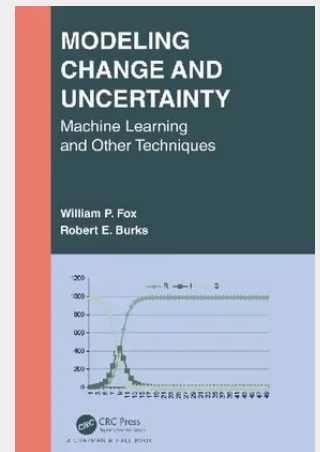


Modeling Change and Uncertainty

Machine Learning and Other Techniques

Mathematical modeling is a powerful craft that requires practice. The more practice the better one will become in executing the art. The authors wrote this book to develop the craft of mathematical modeling and to foster a desire for lifelong learning, habits of mind and develop competent and confident problem solvers and decision makers for the 21st century. This book offers a problem-solving approach. The authors introduce a problem to help motivate the learning of a particular mathematical modeling topic. The problem provides the issue or what is needed to solve using an appropriate modeling technique. Then principles are applied to the problem and present the steps in obtaining an appropriate model to solve the problem. Modeling Change and Uncertainty: - Covers both linear and nonlinear models of discrete dynamical systems. - Introduces statistics and probability modeling. - Introduces critical statistical concepts to handle univariate and multivariate data. - Establishes a foundation in probability modeling. - Uses ordinary differential equations (ODEs) to develop a more robust solution to problems. - Uses linear programming and machine learning to support decision making. - Introduces the reality of uncertainty and randomness that is all around us. - Discusses the use of linear programming to solve common problems in modern industry. - Discusses the power and limitations of simulations. - Introduces the methods and formulas used in businesses and financial organizations. - Introduces valuable techniques using Excel, MAPLE, and R. Mathematical modeling offers a framework for decision makers in all fields. This framework consists of four key components: the formulation process, the solution process, interpretation of the solution in the context of the actual problem, and sensitivity analysis. Modeling Change and Uncertainty will be of interest to mathematics departments offering advanced mathematical modeling courses focused on decision making or discrete mathematical modeling and by undergraduate, graduate students and practitioners looking for an opportunity to develop, practice, and apply the craft of mathematical modeling.

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