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Titolo	A Mathematical Approach to Research Problems of Science and Technology : Theoretical Basis and Developments in Mathematical Modeling // edited by Ryuei Nishii, Shin-ichiro Ei, Miyuki Koiso, Hiroyuki Ochiai, Kanzo Okada, Shingo Saito, Tomoyuki Shirai
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Descrizione fisica	1 online resource (497 p.)
Collana	Mathematics for Industry, , 2198-350X ; ; 5
Disciplina	501.5118
Soggetti	Applied mathematics Engineering mathematics Mathematical models Computer security Mathematical and Computational Engineering Mathematical Modeling and Industrial Mathematics Systems and Data Security
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Part I Algebra -- Mathematics - As An Infrastructure of Technology and Science -- Remarks on Quantum Interaction Models by Lie Theory and Modular Forms via Non-Commutative Harmonic Oscillators -- Introduction to Public-Key Cryptography -- Code-Based Public-Key Encryption -- Gröbner bases and its applications -- Part II Geometry -- Stability Analysis for Variational Problems for Surfaces with Constraint -- Discrete Models of Isoperimetric Deformation of Plane Curves -- Computing Optimal Cycles of Homology Groups -- Singularity Theory of Differentiable Maps and Data Visualization -- Part III Analysis -- Mathematical Analysis for Pattern Formation Problems -- Models and Applications of Organism Transportation -- The Renormalization Group Method for Ordinary Differential Equations -- A Phase Field Approach to Mathematical Modeling of Crack Propagation -- Variational Methods in Differential Equations -- Part IV Probability and Statistics -- Finite

Markov Chains and Markov Decision Processes -- Introduction to The Premium Principle Based on The Wang Transform -- Stochastic Process Models -- Signal Detection and Model Selection -- Regression Analysis and Its Development -- Stochastic Analytical Models in Mathematical Finance -- An Introduction to the Minimum Description Length Principle -- An Introduction to Ergodic Theory -- Part V Applied Mathematics -- Discrete Optimization: Network Flows and Matchings -- Strict Feasibility of Conic Optimization Problems -- Theory of Automata, Abstraction and Applications -- Markov Chain Monte Carlo Algorithms -- Modeling of Fluid Flows by Nonlinear Schrödinger Equation -- Financial Applications of Quasi-Monte Carlo Methods -- Pure Mathematics and Applied Mathematics are Inseparably intertwined - Observation of the Early Analysis of the Infinity -- High Performance Computing for Mathematical Optimization Problem -- Part VI Application of Mathematics -- Modeling of Head-Disk Interface for Magnetic Recording -- Non-Stationary Analysis of Blast Furnace Through Solution of Inverse Problem and Recurrence Plot -- Time-Periodic Nonlinear Steady Field Analysis -- Mathematical Models in First-Principles Calculations for Materials Science -- Mathematics and Manufacturing -the Symbolic Approach- -- Error Correcting Codes based on Probabilistic Decoding and Sparse Matrices.

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### Sommario/riassunto

This book deals with one of the most novel advances in mathematical modeling for applied scientific technology, including computer graphics, public-key encryption, data visualization, statistical data analysis, symbolic calculation, encryption, error correcting codes, and risk management. It also shows that mathematics can be used to solve problems from nature, e.g., slime mold algorithms. One of the unique features of this book is that it shows readers how to use pure and applied mathematics, especially those mathematical theory/techniques developed in the twentieth century, and developing now, to solve applied problems in several fields of industry. Each chapter includes clues on how to use "mathematics" to solve concrete problems faced in industry as well as practical applications. The target audience is not limited to researchers working in applied mathematics and includes those in engineering, material sciences, economics, and life sciences.

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