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Collana	Artificial Intelligence (R0) Series
Disciplina	006.31
Soggetti	Machine learning Dynamics Nonlinear theories Algebras, Linear Algorithms Mathematics - Data processing Machine Learning Applied Dynamical Systems Linear Algebra Dynamical Systems Design and Analysis of Algorithms Computational Mathematics and Numerical Analysis
Lingua di pubblicazione	Inglese
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Livello bibliografico	Monografia
Nota di contenuto	1. Background Information -- 2 Gradient Neural Network (GNN) and their Modifications -- 3 Zeroing Neural Network (ZNN) -- 4 From iterations to ZNNs and vice versa, 5 Modified ZNN dynamical systems.
Sommario/riassunto	This book presents a comprehensive exploration of the dynamical system approach in numerical linear algebra, with a special focus on computing generalized inverses, solving systems of linear equations, and addressing linear matrix equations. Bridging four major scientific domains—numerical linear algebra, recurrent neural networks (RNNs), dynamical systems, and unconstrained nonlinear optimization—this book offers a unique, interdisciplinary perspective. Generalized Matrix

Inversion: A Machine Learning Approach explores the theory and application of recurrent neural networks, particularly continuous-time recurrent neural networks (CTRNNs), which use systems of ordinary differential equations to model the influence of inputs on neurons. Special attention is given to CTRNNs designed for finding zeros of equations or minimizing nonlinear functions, with detailed coverage of two important classes: Gradient Neural Networks (GNN) and Zhang (Zeroing) Neural Networks (ZNN). Both time-varying and time-invariant models are examined across scalar, vector, and matrix cases. Based on the authors' research that has been published in leading scientific journals, the book spans a variety of disciplines, including linear and multilinear algebra, generalized inverses, recurrent neural networks, dynamical systems, time-varying problem solving, and unconstrained nonlinear optimization. Readers will find a global overview of activation functions, rigorous convergence analysis, and innovative improvements in the definition of error functions for GNN and ZNN dynamic systems. Generalized Matrix Inversion: A Machine Learning Approach is an essential resource for researchers and practitioners seeking advanced methods at the intersection of machine learning, optimization, and matrix computation.
