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Altri autori (Persone)	CecconiFabio VulpianiA
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Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Contents; Preface; Introduction; Historical note; Overview of the book; Hints on how to use/read this book; Introduction to Dynamical Systems and Chaos; 1. First Encounter with Chaos; 1.1 Prologue; 1.2 The nonlinear pendulum; 1.3 The damped nonlinear pendulum; 1.4 The vertically driven and damped nonlinear pendulum; 1.5 What about the predictability of pendulum evolution?; 1.6 Epilogue; 2. The Language of Dynamical Systems; 2.1 Ordinary Differential Equations (ODE); 2.1.1 Conservative and dissipative dynamical systems; BoxB. 1 Hamiltonian dynamics A: Symplectic structure and Canonical Transformations B: Integrable systems and Action-Angle variables; 2.1.2 PoincareMap; 2.2 Discrete time dynamical systems: maps; 2.2.1 Two dimensional maps; 2.2.1.1 The Henon Map; 2.2.1.2 Two-dimensional symplectic maps; 2.3 The role of dimension; 2.4 Stability theory; 2.4.1 Classification of fixed points and linear stability analysis; BoxB. 2 A remark on the linear stability of symplectic maps; 2.4.2 Nonlinear stability; 2.4.2.1 Limit cycles; 2.4.2.2 Lyapunov Theorem; 2.5 Exercises; 3. Examples of Chaotic Behaviors; 3.1 The logisticmap

BoxB. 3 Topological conjugacy 3.2 The Lorenz model; BoxB. 4 Derivation of the Lorenz model; 3.3 The Henon-Heiles system; 3.4 What did we learn and what will we learn?; BoxB. 5 Correlation functions; 3.5 Closing remark; 3.6 Exercises; 4. Probabilistic Approach to Chaos; 4.1 An informal probabilistic approach; 4.2 Time evolution of the probability density; BoxB. 6 Markov Processes; A: Finite states Markov Chains; B: Continuous Markov processes; C: Dynamical systems with additive noise; 4.3 Ergodicity; 4.3.1 An historical interlude on ergodic theory; BoxB. 7 Poincare recurrence theorem 4.3.2 Abstract formulation of the Ergodic theory 4.4 Mixing; 4.5 Markov chains and chaotic maps; 4.6 Natural measure; 4.7 Exercises; 5. Characterization of Chaotic Dynamical Systems; 5.1 Strange attractors; 5.2 Fractals and multifractals; 5.2.1 Box counting dimension; 5.2.2 The stretching and folding mechanism; 5.2.3 Multifractals; BoxB. 8 Brief excursion on Large Deviation Theory; 5.2.4 Grassberger-Procaccia algorithm; 5.3 Characteristic Lyapunov exponents; BoxB. 9 Algorithm for computing Lyapunov Spectrum; 5.3.1 Oseledec theorem and the law of large numbers 5.3.2 Remarks on the Lyapunov exponents 5.3.2.1 Lyapunov exponents are topological invariant; 5.3.2.2 Relationship between Lyapunov exponents of flows and Poincare maps; 5.3.3 Fluctuation statistics of finite time Lyapunov exponents; 5.3.4 Lyapunov dimension; BoxB. 10 Mathematical chaos; A: Hyperbolic sets and Anosov systems; B: SRB measure; C: The Arnold cat map; 5.4 Exercises; 6. From Order to Chaos in Dissipative Systems; 6.1 The scenarios for the transition to turbulence; 6.1.1 Landau-Hopf; BoxB. 11 Hopf bifurcation; BoxB. 12 The Van der Pol oscillator and the averaging technique 6.1.2 Ruelle-Takens

Sommario/riassunto

Chaos: from simple models to complex systems aims to guide science and engineering students through chaos and nonlinear dynamics from classical examples to the most recent fields of research. The first part, intended for undergraduate and graduate students, is a gentle and self-contained introduction to the concepts and main tools for the characterization of deterministic chaotic systems, with emphasis to statistical approaches. The second part can be used as a reference by researchers as it focuses on more advanced topics including the characterization of chaos with tools of information
