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Nota di contenuto	Preface; Acknowledgements; Contents; Chapter 1 Introduction; 1.1 Stability theory revisited; 1.1.1 Noise and metastability; 1.1.2 Linear stability analysis; 1.2 Instabilities and nonlinear events in everyday life; 1.2.1 Arms race; 1.2.2 Distribution of wealth; 1.2.3 Front nucleation and propagation; 1.2.4 Supply chain dynamics; 1.2.5 A hodgepodge of mechanical instabilities; 1.3 Postscript; Chapter 2 Essentials; 2.1 Probabilistic and information theoretic measures; 2.2 Matrix manipulations; 2.2.1 Circulant matrices; 2.2.2 Singular value decomposition; 2.3 Delay-differential equations 2.4 The fluctuation-dissipation theorem2.5 The Fokker-Planck equation; 2.6 Numerical techniques for the simulation of stochastic equations; 2.7 Experimental aspects of generating noise; 2.8 Complex integration; Chapter 3 Noise Induced Temporal Phenomena; 3.1 Escape from metastable states; 3.2 Stochastic resonance in bistable systems; 3.2.1 Double-well potential; 3.2.2 Two state theory; 3.2.3 The diode resonator; 3.2.4 The logistic map; 3.3 Postscript; Chapter 4 Adding Spatial Dimensions; 4.1 Spatiotemporal stochastic resonance; 4.1.1 Array enhancement; 4.1.2 Global vs. local dynamics

4.1.3 Kink nucleation in a O4 model4.1.4 Kink nucleation in the experiment; 4.1.5 Decay rates and kink speeds; 4.1.6 Coupled maps; 4.2 Doubly stochastic resonance; 4.3 Spatial patterns; 4.3.1 Parametric surface waves; 4.4 Postscript; Chapter 5 Stochastic Transport Phenomena; 5.1 Noise-sustained structures in convectively unstable media; 5.1.1 The Ginzburg-Landau equation; 5.1.2 Unidirectionally coupled diode resonators; 5.1.3 Coupled maps; 5.2 Noise sustained front transmission; 5.2.1 Propagation failure in cardiac tissue; 5.2.2 Information theoretic measures revisited: ROC curves; 5.3 Theory 5.3.1 The continuum limit5.3.2 Kink Brownian motion; 5.3.3 The Peierls-Nabarro potential; 5.4 Noise enhanced wave propagation; 5.4.1 Monostable noise enhanced propagation; 5.5 Stochastic ratchets and Brownian motors; 5.6 Postscript; Chapter 6 Sundry Topics; 6.1 Minority game; 6.1.1 The thermal minority game; 6.2 Traffic dynamics; 6.2.1 Time-continuous model; 6.2.2 Discrete time dynamics; 6.3 Dithering; 6.4 Noise in neural networks; Chapter 7 Afterthoughts; Appendix A Normal Matrices; Appendix B Integrating Colored-Noise Coupled SDEs; B.l Exploiting symmetries of coupled differential equations
B.2 Coupled Duffing oscillatorsAppendix C Numerical Implementation of the FPT; Appendix D Absolute and Convective Instabilities; Bibliography; Index

Sommario/riassunto

This book investigates the impact of noise upon the emergence and sustenance of patterns. "Patterns" loosely refers to coherent spatial structures, including fronts, as well as temporal patterns. The crucial role of nonlinearities is highlighted and expanded upon in the context of dynamical system frameworks. The author's familiarity with chaos theory, statistical physics and nonlinear science is reflected in the highly interdisciplinary character of the text. Model equations and experiments taken from fluid dynamics, semiconductor devices, biophysics and statistical mechanics complement theor