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Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	PART I. Cellular Scale -- Chapter 1. Modelling Neurons in 3D at the Nanoscale -- Chapter 2. Modelling Dendrites and Spatially-Distributed Neuronal Membrane Properties -- Chapter 3. A User's Guide to Generalized Integrate-and-Fire Models -- Chapter 4. Neuron-glia Interactions and Brain Circuits -- Chapter 5. Short-term Synaptic Plasticity: Microscopic Modelling and (some) Computational Implications -- PART II. Molecular Scale -- Chapter 6. The Mean Field Approach for Populations of Spiking Neurons -- Chapter 7. Multidimensional Dynamical Systems with Noise -- Chapter 8. Computing Extracellular Electric Potentials from Neuronal Simulations -- Chapter 9. Bringing Anatomical Information into Neuronal Network Models -- PART III. Network Scale -- Chapter 10. Computational Concepts for Reconstructing and Simulating Brain Tissue -- Chapter 11. Reconstruction of the Hippocampus -- Chapter 12. Challenges for Place and Grid Cell Models -- Chapter 13. Whole-Brain Modelling: Past, Present, and Future.
Sommario/riassunto	This volume offers an up-to-date overview of essential concepts and modern approaches to computational modelling, including the use of experimental techniques related to or directly inspired by them. The book introduces, at increasing levels of complexity and with the non-specialist in mind, state-of-the-art topics ranging from single-cell and molecular descriptions to circuits and networks. Four major themes are covered, including subcellular modelling of ion channels and signalling pathways at the molecular level, single-cell modelling at different levels of spatial complexity, network modelling from local microcircuits to large-scale simulations of entire brain areas and practical examples. Each chapter presents a systematic overview of a specific topic and provides the reader with the fundamental tools needed to understand the computational modelling of neural dynamics. This book is aimed at experimenters and graduate students with little or no prior knowledge of modelling who are interested in learning about computational models from the single molecule to the inter-areal communication of brain structures. The book will appeal to computational neuroscientists, engineers, physicists and mathematicians interested in contributing to the field of neuroscience. Chapters 6, 10 and 11 are available open access under a Creative Commons Attribution 4.0 International License via link.springer.com .