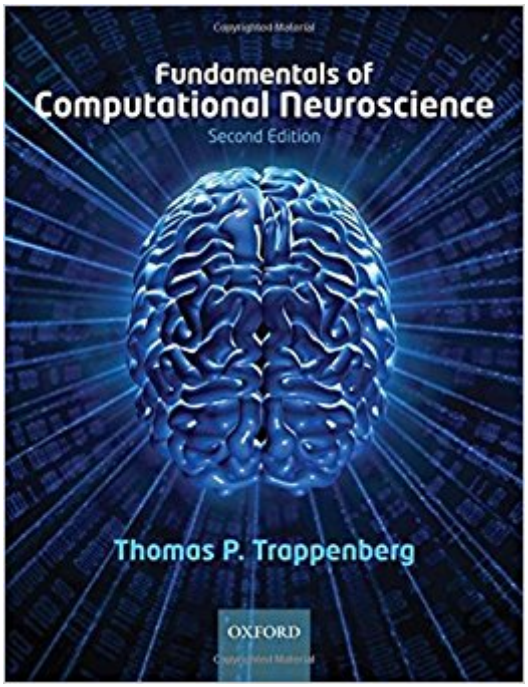
Fundamentals Of Computational Neuroscience



Synopsis

Computational neuroscience is the theoretical study of the brain to uncover the principles and mechanisms that guide the development, organization, information processing, and mental functions of the nervous system. Although not a new area, it is only recently that enough knowledge has been gathered to establish computational neuroscience as a scientific discipline in its own right. Given the complexity of the field, and its increasing importance in progressing our understanding of how the brain works, there has long been a need for an introductory text on what is often assumed to be an impenetrable topic.The new edition of Fundamentals of Computational Neuroscience build on the success and strengths of the first edition. It introduces the theoretical foundations of neuroscience with a focus on the nature of information processing in the brain. The book covers the introduction and motivation of simplified models of neurons that are suitable for exploring information processing in large brain-like networks. Additionally, it introduces several fundamental network architectures and discusses their relevance for information processing in the brain, giving some examples of models of higher-order cognitive functions to demonstrate the advanced insight that can be gained with such studies.Each chapter starts by introducing its topic with experimental facts and conceptual questions related to the study of brain function. An additional feature is the inclusion of simple Matlab programs that can be used to explore many of the mechanisms explained in the book. An accompanying webpage includes programs for download. The book will be the essential text for anyone in the brain sciences who wants to get to grips with this topic.

Book Information

Paperback: 416 pages
Publisher: Oxford University Press; 2 edition (January 18, 2010)
Language: English
ISBN-10: 0199568413
ISBN-13: 978-0199568413
Product Dimensions: 9.6 x 0.9 x 7.4 inches
Shipping Weight: 2.3 pounds (View shipping rates and policies)
Average Customer Review: 4.0 out of 5 starsÂ Â See all reviewsÂ (3 customer reviews)
Best Sellers Rank: #112,420 in Books (See Top 100 in Books) #23 inÂ Books > Textbooks > Medicine & Health Sciences > Medicine > Basic Sciences > Biochemistry #80 inÂ Books > Textbooks > Medicine & Health Sciences > Medicine > Basic Sciences > Neuroscience #104 inÂ Books > Engineering & Transportation > Engineering > Bioengineering > Biochemistry

Customer Reviews

To be fair, I think it impossible to write a CompuNeuro text that is EASY to read, since it requires advanced math AND neuroscience. As a professional neurobiologist needing to understand computational approaches for my research, I struggled mightily with such texts as "Spikes" and "Theoretical Neuroscience". Some older books on the subject helped including The Computational Brain (plus one by Hertz, which had crucial details), but none address the current range of important topics that I need to digest. Discovering Trappenberg's text was like finding gold -- I needed an approachable treatment to bootstrap my learning AND to convey these ideas to students in my new Computational Neuroscience course (if you want to learn something, teach a class in it). One reviewer found it difficult to read, but the problem is not (to my mind) the writing but the subject matter. Certainly, there are things that could be explained better, but this is the "best of the mess" methinks.So, WHY did I give this 5 stars? The organization and content are superb. It has exactly what I needed to bring undergraduates into the computational neuro arena, with enough math to help the biologists (including the appendices) and good problems to interest the engineers/physicists/programmers. It starts with the Hodgkin-Huxley models and builds to current frontiers in this chaotic, dynamic field including integrate and fire networks, self-organizing maps, memory systems, attractors, sparse coding and more. I don't think there are very many who can fully comprehend all the neurobiology and math inherent in these topics (my physicist helpers who do cutting edge Perceptron research could not understand the notation used here and this is not Trappenberg's fault but rather a sign of the field-- this is rough stuff).

Meditation, and Philosophy Buddha's Brain: The Practical Neuroscience of Happiness, Love & Wisdom Subjective Time: The Philosophy, Psychology, and Neuroscience of Temporality (MIT Press) Contemplative Science: Where Buddhism and Neuroscience Converge (Columbia Series in Science and Religion) Neuroscience and Social Work Practice: The Missing Link Neuroscience for the Study of Communicative Disorders (Point (Lippincott Williams & Wilkins)) Neuroscience: Exploring the Brain, 3rd Edition Cognition, Occupation, and Participation Across the Life Span: Neuroscience, Neurorehabilitation, and Models of Intervention in Occupational Therapy, 3rd Edition Concise Text of Neuroscience (Periodicals) Neuroscience: Exploring the Brain