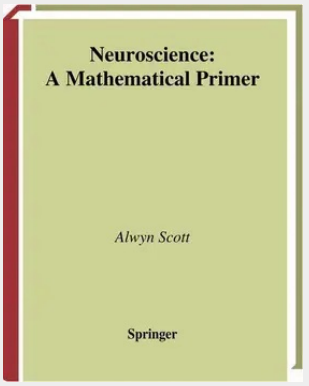
Scott

Neuroscience

A Mathematical Primer

Arguably the most intricate dynamic object in the universe, the human brain is an unsounded source of wonder for the scienti?c community. The primary aim of this book is to provide both students and established - vestigators in the growing area of neuroscience with an appreciation of the roles that mathematics may play in helping to understand this en- maticorgan.
Alongwithdiscussionsofresultsobtainedbytheneuroscience community, emphasis is placed on suggesting fruitful research problems for those planning to embark on mathematical studies in neuroscience. To make the overall perspectives understandable to philosophers and psychologists, essential features of the discussions are presented in ordinary English, with more detailed mathematical comments in appendices and footnotes. Although it attempts to maintain both clarity and biological relevance, this is not a text on the anatomy of nerve systems; thus readers should bring some knowledge of neurophysiology through other courses, associated studies, or laboratory research. It is a guiding theme throughout the book that the brain is organized into several quite di? erent levels of dynamic activity. As will be seen, these levels are hierarchically structured, beginning with the molecular dynamics
ofintrinsicmembraneproteinsandproceedingupward,throughtheswit- ing properties of active membrane patches and synapses, the emergence of impulses on active ?bers, overall properties of individual neurons, and the growth of functional assemblies of interacting neurons, to the global - namics of a brain. At each level of description, reality turns di?erent facets of her mystery to us, and diverse phenomena make their contributions to the brain's collective behavior.

This book will be of interest to anyone who wishes to know what roles mathematics can play in attempting to comprehend the dynamics of a human brain. It also aims to serve as a general introduction to neuromathematics for other interested people. The book gives the reader a qualitative understanding and working knowledge of useful mathematical applications to the field of neuroscience. The book is readable by those who have little knowledge of the mathematics that is relevant for neuroscience, but with a desire to begin acquiring such knowledge.



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