**DESCRIPTION**

Gain a new perspective on how the brain works and inspires new avenues for design in computer science and engineering

This unique book is the first of its kind to introduce human memory and basic cognition in terms of physical circuits, beginning with the possibilities of ferroelectric behavior of neural membranes, moving to the logical properties of neural pulses recognized as solitons, and finally exploring the architecture of cognition itself. It encourages invention via the methodical study of brain theory, including electrically reversible neurons, neural networks, associative memory systems within the brain, neural state machines within associative memory, and reversible computers in general. These models use standard analog and digital circuits that, in contrast to models that include non-physical components, may be applied directly toward the goal of constructing a machine with artificial intelligence based on patterns of the brain.

Writing from the circuits and systems perspective, the author reaches across specialized disciplines including neuroscience, psychology, and physics to achieve uncommon coverage of:

- Neural membranes
- Neural pulses and neural memory
Circuits and systems for memorizing and recalling

Dendritic processing and human learning

Artificial learning in artificial neural networks

The asset of reversibility in man and machine

Electrically reversible nanoprocessors

Reversible arithmetic

Hamiltonian circuit finders

Quantum versus classical

Each chapter introduces and develops new material and ends with exercises for readers to put their skills into practice. Appendices are provided for non-experts who want a quick overview of brain anatomy, brain psychology, and brain scanning. The nature of this book, with its summaries of major bodies of knowledge, makes it a most valuable reference for professionals, researchers, and students with career goals in artificial intelligence, intelligent systems, neural networks, computer architecture, and neuroscience.

A solutions manual is available for instructors; to obtain a copy please email the editorial department at ialine@wiley.com.
JOHN ROBERT BURGER taught at the University of the Pacific in Stockton, California; California State University, Northridge; and the Oregon Institute of Technology, where he developed a course in artificial neural networks. Dr. Burger and his students have designed and fabricated many CMOS integrated circuits over the years. He is interested in the propagation of electrical wavefronts in conductors, neural and otherwise, an interest he has enjoyed since his boyhood telegraph inventions.

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