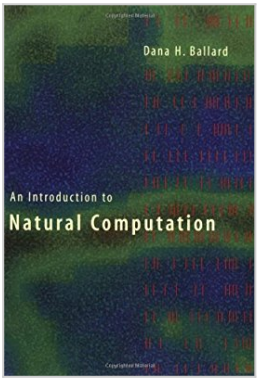

An Introduction to Natural Computation (Complex Adaptive Systems)

By Dana H. Ballard

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It is now clear that the brain is unlikely to be understood without recourse to computational theories. The theme of *An Introduction to Natural Computation* is that ideas from diverse areas such as neuroscience, information theory, and optimization theory have recently been extended in ways that make them useful for describing the brains programs. This book provides a comprehensive introduction to the computational material that forms the underpinnings of the currently evolving set of brain models. It stresses the broad spectrum of learning models -- ranging from neural network learning through reinforcement learning to genetic learning -- and situates the various models in their appropriate neural context.

To write about models of the brain before the brain is fully understood is a delicate matter. Very detailed models of the neural circuitry risk losing track of the task the brain is trying to solve. At the other extreme, models that represent cognitive constructs can be so abstract that they lose all relationship to neurobiology. *An Introduction to Natural Computation* takes the middle ground and stresses the computational task while staying near the neurobiology.

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Editorial Review

Review

This is a wonderful book that brings together in one place the modern view of computation as found in nature. It is well written and has soemthing or everyone from the undergraduate to the advanced researcher.

(Terrence J. Sejnowski, Howard Hughes Medical Institute at The Salk Institute for Biological Studies, La Jolla, California)

Ballard's text offers clear, direct introductions to the key tools and concepts needed in contemporary approached to AI, including state spaces, dynamics, memory models, reinforcement learning, and evolutionary algorithms. All contribute to the book's central aim: to undestand the computations that permit the survival and successful adaptive behavior of natural systems.

(Stewart W. Wilson, International Society for Adaptive Behavior, and The Rowland Institute for Science)

Ballard has writtena a lucid introductory text covering a collection of material that is unusual by present standards but that is likely to form an indispensible core of future advances in what Ballard calls natural computation. The great activity over the last decade in biologically-related computation has overrun some of the old disciplinary boundaries, leaving uncertainty as to what one should know to appreciate-- as well as to participate-- in this active research area. Ballard introduces a collection of topics that would be hard to access without taking a half dozen courses in computer science, applied mathematics, and systems engineering. He shows how these topics all participate in a unified and original view of natural computation. If I had access to this book whn my interest in natural computation was aroused as an undergraduate, it would have saved me a lot of time. I envy today's students chance to study, in one course, this collection of essential material.

(Andy Barto, Professor of Computer Science, University of Massechusetts at Amherst)

An Introduction to Natural Computation could seve as an introductory textbook for undergraduate courses surveying computational aspects of biological systems. It covers a lot of important topics in this area. Ballard is an excellent researcher with a broad, powerful view.

(Richard Sutton, Senior Research Scientist, Department of Computer Science, University of Massechusetts)

I am EXTREMELY enthusiastic about this work. This is the first such book I've seeb that comes even close to covering the topic. I'd love to use it for teahing.

(Alex (Sandy) Pentland, Academic Head, The Media Lab, M.I.T. Toshiba Professor of Media Arts and Sciences)

About the Author

Dana H. Ballard is Professor of Computer Science at the University of Texas at Austin.

Users Review

From reader reviews:

Timothy Parker:

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