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BOOK REVIEW

Neural Networks: A Comprehensive Foundation

Simon Haykin
Prentice-Hall, Inc. 1999
Second Edition

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Professor Haykin has written a very interesting book. This book is a second edition. This deserves merit since second editions are not common within the great quantity of books that are written today. It is easy to find in contemporary literature constant references made to this book; however, the book is not about what the title says since it is not an orthodox book with the known neural network theories and techniques (also known as connectionist systems or neural computational systems) and it is not a book that presents the fundamental or basic theories of neural networks.

The important part of this book is that it presents a very complete panoramic of a large quantity of theories and techniques that go further than the orthodox neurocomputational models. This possibly explains the great triumph that this book has achieved.

As with all neural network books, it begins with a simple description of what the brain is, from a neurophysiological point of view and what a neuron is. It goes on to talk about this metaphor that is usually used in this field of investigation and introduces the classical tools of the theory of graphs and the language of Artificial Intelligence in symbolic type and describes mechanisms of knowledge representation. This chapter, though short, introduces an interesting panoramic of neural networks and also serves as a bridge to understand them from a point of view of knowledge representation.

Chapters 2, 3, 4 and 5 study the different neural network learning processes as well as the great models from this area of investigation in a very clear form, such as what are perceptrons and RBFN networks (Radial-Basis Function Networks). The presentation of these four chapters is excellent.

Chapter 6 describes the theories and techniques of "Support Vector Machines", of which at any moment in its recent history have ever been related with neuron or neurophysiological models. They are presented in their orthodox form with vector type techniques. This presentation is very complete. This chapter marks the most important part of the entire book, which is to introduce not only the orthodox neurocomputational theories and techniques that are supposed to be models inspired by neurophysiology, but there exist a great quantity of theories and techniques of which their objective is the same: the resolution of nonlinear complex problems based on very different theories and techniques.

Chapter 7 discusses what "Committee Machines" are; whose origin lies above all in modern statistics. Chapter 8 presents principal components analysis whose origin lies in factorial analysis since the 1950s and has proved to be very useful in the social sciences.

Chapter 9 describes self-organizing maps of Kohonen, which is part of the traditional classical neurocomputation. Chapter 10 presents information-theoretic models in a very interesting form with special emphasis on the maximum entropy techniques that have been proved to be very useful, especially in physics research in data analysis . Chapter 11 describes stochastic machines and their approximates rooted in statistical mechanics. This presentation is too short to describe the great quantity of techniques that are being researched today; given that the main characteristic of this book is to present all the important techniques, it would be very interesting to dedicate a part of this chapter to evolutionary algorithms.

The last four chapters are dedicated to what is generally known as neurodynamics, which is not to be confused with neurophysiological models. The emphasis in general is the analysis of the dynamics of the processes in study where many different methods and techniques are mixed.

The book is an excellent presentation of a great quantity of theories and techniques to solve nonlinear problems and is complemented with many good exercises for the reader, an excellent bibliography and a constant vision of problems and techniques directed to the creation of "artificial machines".