



# The Mind within the Net: Models of Learning, Thinking, and Acting

By Manfred Spitzer

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**The Mind within the Net: Models of Learning, Thinking, and Acting** By Manfred Spitzer

How does the brain work? How do billions of neurons bring about ideas, sensations, emotions, and actions? Why do children learn faster than elderly people? What can go wrong in perception, thinking, learning, and acting? Scientists now use computer models to help us to understand the most private and human experiences. In *The Mind Within the Net*, Manfred Spitzer shows how these models can fundamentally change how we think about learning, creativity, thinking, and acting, as well as such matters as schools, retirement homes, politics, and mental disorders.

Neurophysiology has told us a lot about how neurons work; neural network theory is about how neurons work together to process information. In this highly readable book, Spitzer provides a basic, nonmathematical introduction to neural networks and their clinical applications. Part I explains the fundamental theory of neural networks and how neural network models work. Part II covers the principles of network functioning and how computer simulations of neural networks have profound consequences for our understanding of how the brain works. Part III covers applications of network models (e.g., to knowledge representation, language, and mental disorders such as schizophrenia and Alzheimer's disease) that shed new light on normal and abnormal states of mind. Finally, Spitzer concludes with his thoughts on the ramifications of neural networks for the understanding of neuropsychology and human nature.

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## **Editorial Review**

### **Amazon.com Review**

Is your brain like your computer? Well, (hopefully) it doesn't crash as often, and that's just one of many on the long list of differences. But psychiatrist Manfred Spitzer says neuroscientists have much to learn from the alternative computing architectures called neural nets. His book *The Mind Within the Net* is a look at biological and electronic networks, their similarities, and what each can tell us about the other, with a particular emphasis on his own field. We've known for decades how individual neurons work. It's taken recent advances in neural computing to help us learn how brain systems might take advantage of their unique dynamics to help us see, walk, and keep the trains running on time.

Covering the basics of both neuroscience and neural computing with a user-friendly, but not oversimplified, prose style, Spitzer then moves on to the often striking similarities in function between simple electronic networks and mechanisms within the brain. Keeping in mind the importance of recognizing models as such, he takes pains to point out that there are some aspects of computing for which there is little comparison to biological systems. However, the similarities between different network degradations and such diverse problems as Alzheimer's disease, schizophrenia, and depression are compelling and potentially important. It's not often that we get a new batch of metaphors to help us understand ourselves; this may be the paradigm shift we've been waiting for. --*Rob Lightner*

### **From Publishers Weekly**

In neural network theory, scientists use computers and mathematics to model complex brain functions. Here, Spitzer, professor and chairman of the Psychiatric Hospital of the University of Ulm, Germany, offers lay readers an accessible introduction to the workings of that theory. His goal is not to reduce faculties of higher intelligence, behavior and emotion to the mechanistic. Rather, he hopes to further our understanding of the elaborate, elegant connections between the physical and the cerebral, with an eye toward practical benefits for humanity. Spitzer begins with basics, explaining what neurons are and how they work through electrochemical impulses. He moves on to distinctions between the organic minds of humans and the artificial intelligence of computers. Although computer models of neural networks are valuable tools in comprehending brain mechanics, Spitzer is careful to keep visible the differences between human and machine. And results from the latest experiments in brain chemistry and neural linkages, he reports, contradict some cherished hypotheses on learning and behavior. He explains, for instance, how recent work in the field gainsays widely held linguistic theories concerning deep-seated universal capacities for language. He also explores the relationship of experience to learning and behavior, challenging some contemporary epistemological assertions. Easy-to-follow diagrams and a practical glossary will help readers with limited knowledge of this intriguing yet esoteric realm. Illustrations throughout.

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### **Review**

Spitzer... has written a highly readable introduction to 'traditional' neural-net models....

*(Nature)*

Seductive on-screen views of brain activity open up a closed realm by rendering the mind visible. A new

enlightenment beckons. A new stupidity, too, a new confusion of the moral and mechanical, if we don't listen carefully to sane and discriminating voices like Spitzer's.

*(Daily Telegraph)*

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