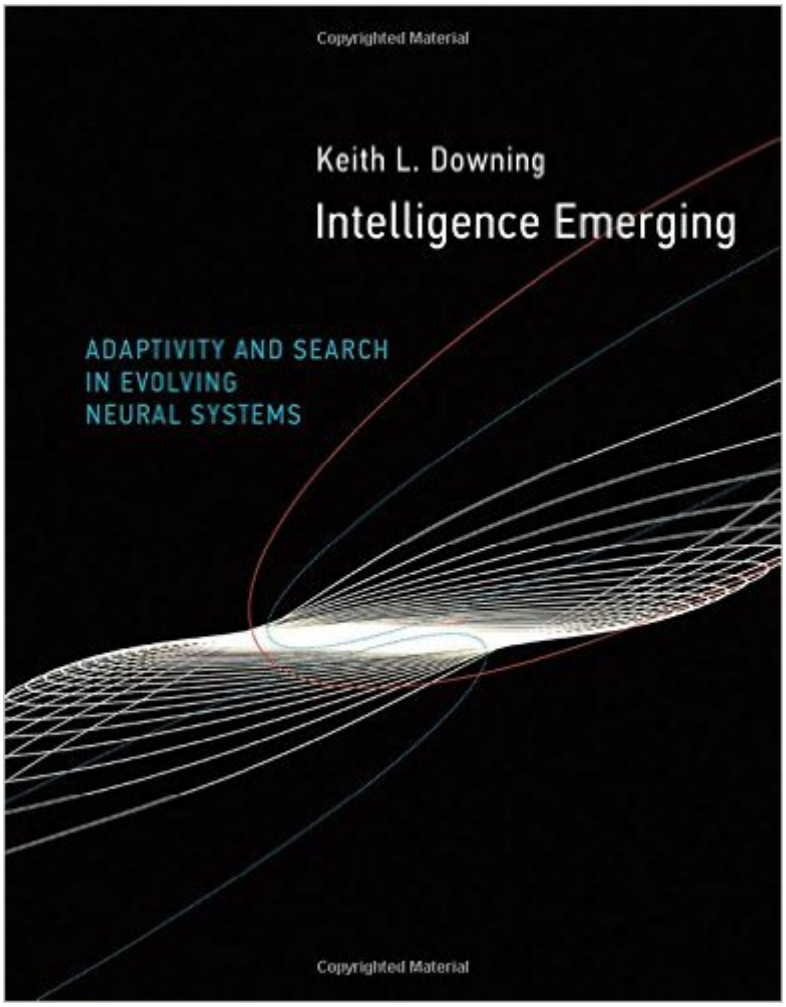
Intelligence Emerging: Adaptivity And Search In Evolving Neural Systems (MIT Press)



Synopsis

Emergence -- the formation of global patterns from solely local interactions -- is a frequent and fascinating theme in the scientific literature both popular and academic. In this book, Keith Downing undertakes a systematic investigation of the widespread (if often vague) claim that intelligence is an emergent phenomenon. Downing focuses on neural networks, both natural and artificial, and how their adaptability in three time frames -- phylogenetic (evolutionary), ontogenetic (developmental), and epigenetic (lifetime learning) -- underlie the emergence of cognition. Integrating the perspectives of evolutionary biology, neuroscience, and artificial intelligence, Downing provides a series of concrete examples of neurocognitive emergence. Doing so, he offers a new motivation for the expanded use of bio-inspired concepts in artificial intelligence (AI), in the subfield known as Bio-AI.One of Downing's central claims is that two key concepts from traditional AI, search and representation, are key to understanding emergent intelligence as well. He first offers introductory chapters on five core concepts: emergent phenomena, formal search processes, representational issues in Bio-AI, artificial neural networks (ANNs), and evolutionary algorithms (EAs). Intermediate chapters delve deeper into search, representation, and emergence in ANNs, EAs, and evolving brains. Finally, advanced chapters on evolving artificial neural networks and information-theoretic approaches to assessing emergence in neural systems synthesize earlier topics to provide some perspective, predictions, and pointers for the future of Bio-AI.

Book Information

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