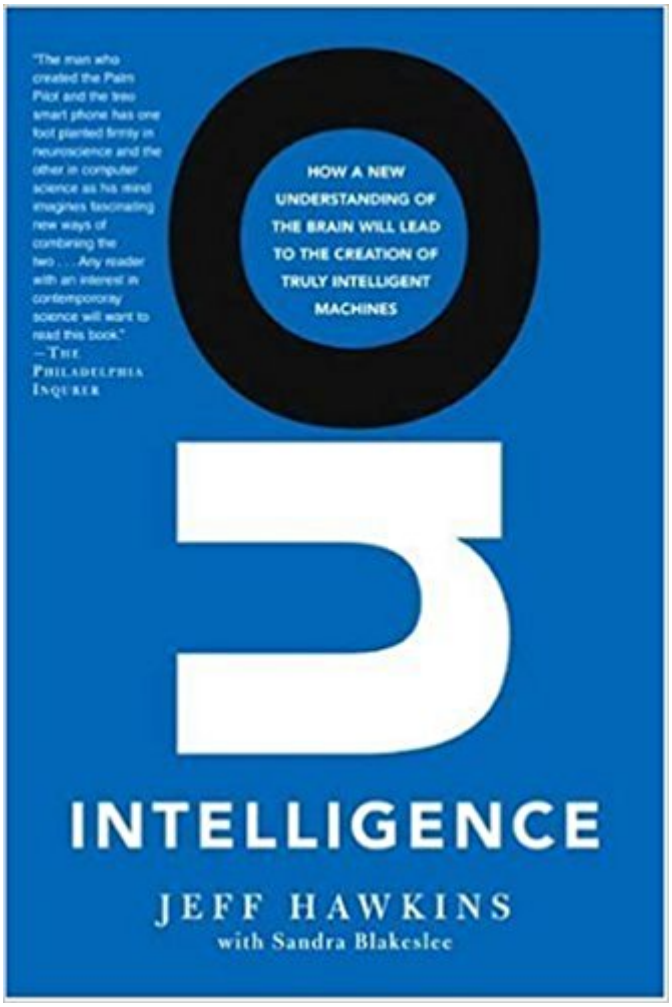
On Intelligence: How A New Understanding Of The Brain Will Lead To The Creation Of Truly Intelligent Machines



Synopsis

From the inventor of the PalmPilot comes a new and compelling theory of intelligence, brain function, and the future of intelligent machinesJeff Hawkins, the man who created the PalmPilot, Treo smart phone, and other handheld devices, has reshaped our relationship to computers. Now he stands ready to revolutionize both neuroscience and computing in one stroke, with a new understanding of intelligence itself.Hawkins develops a powerful theory of how the human brain works, explaining why computers are not intelligent and how, based on this new theory, we can finally build intelligent machines.The brain is not a computer, but a memory system that stores experiences in a way that reflects the true structure of the world, remembering sequences of events and their nested relationships and making predictions based on those memories. It is this memory-prediction system that forms the basis of intelligence, perception, creativity, and even consciousness.In an engaging style that will captivate audiences from the merely curious to the professional scientist, Hawkins shows how a clear understanding of how the brain works will make it possible for us to build intelligent machines, in silicon, that will exceed our human ability in surprising ways.Written with acclaimed science writer Sandra Blakeslee, On Intelligence promises to completely transfigure the possibilities of the technology age. It is a landmark book in its scope and clarity.

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Customer Reviews

Jeff Hawkins, the high-tech success story behind PalmPilots and the Redwood Neuroscience

Institute, does a lot of thinking about thinking. In On Intelligence Hawkins juxtaposes his two loves--computers and brains--to examine the real future of artificial intelligence. In doing so, he unites two fields of study that have been moving uneasily toward one another for at least two decades. Most people think that computers are getting smarter, and that maybe someday, they'll be as smart as we humans are. But Hawkins explains why the way we build computers today won't take us down that path. He shows, using nicely accessible examples, that our brains are memory-driven systems that use our five senses and our perception of time, space, and consciousness in a way that's totally unlike the relatively simple structures of even the most complex computer chip. Readers who gobbled up Ray Kurzweil's (The Age of Spiritual Machines and Steven Johnson's Mind Wide Open will find more intriguing food for thought here. Hawkins does a good job of outlining current brain research for a general audience, and his enthusiasm for brains is surprisingly contagious. --Therese Littleton --This text refers to an out of print or unavailable edition of this title.

Hawkins designed the technical innovations that make handheld computers like the Palm Pilot ubiquitous. But he also has a lifelong passion for the mysteries of the brain, and he's convinced that artificial intelligence theorists are misguided in focusing on the limits of computational power rather than on the nature of human thought. He "pops the hood" of the neocortex and carefully articulates a theory of consciousness and intelligence that offers radical options for future researchers. "[T]he ability to make predictions about the future... is the crux of intelligence," he argues. The predictions are based on accumulated memories, and Hawkins suggests that humanoid robotics, the attempt to build robots with humanlike bodies, will create machines that are more expensive and impractical than machines reproducing genuinely human-level processes such as complex-pattern analysis, which can be applied to speech recognition, weather analysis and smart cars. Hawkins presents his ideas, with help from New York Times science writer Blakeslee, in chatty, easy-to-grasp language that still respects the brain's technical complexity. He fully anticipatesÃ¢â ¬â •even welcomesÃ¢â ¬â •the controversy he may provoke within the scientific community and admits that he might be wrong, even as he offers a checklist of potential discoveries that could prove him right. His engaging speculations are sure to win fans of authors like Steven Johnson and Daniel Dennett. --This text refers to an out of print or unavailable edition of this title.

In this very well written book, Hawkins and Blakeslee describe a new model of how our human

intelligence has evolved, how it "works" and what it means to have a ÃƒÂ¢Ã â ¬Ã Å“massiveÃƒÂ¢Ã â ¬Ã Â• cerebral cortex. Much of the description of the brain's neuronal structure will be familiar to those who follow developments in neuroscience. However, what's new here is a working model of how the brain uses extensive feedback loops to complete the complex task of information processing.The authors assert that, "The brain uses the same process to see as to hear. The cortex does something universal that can be applied to any type of sensory or motor system." And, "The idea that patterns from different senses are equivalent inside your brain is quite surprising, and although well understood, it still isnÃƒÂ¢Ã â ¬Ã â„¢t widely appreciated." Further, the way the brain processes information is consistently applied to all that sensory data. This common processing algorithm and sensory input processing helps our brains to adapt to an ever changing environment. That is why we can live and function in this modern world. A world in which change, and our need to adapt, has certainly outstripped evolutionary time scales.The hypothesis put forward in this book rings true to me based on my understanding of complex systems and from observing the actions of my fellow human beings. This model (new to me but not necessarily new to the neuroscience world) doesn't negate my understanding from other reading how the human brain is "wired." Rather, it explains more fully how the system "hangs together" and accomplishes the incredible feats we witness every day. It also lays the foundation for a better understanding of human consciousness.Once again the fact that we can understand our material world only in a "second hand" manner is driven home by this model. We work only with a representation of the world, and it is represented by a limited number of sensory inputs. From the standpoint of how we deal with our fellow human beings, this challenging and interesting book makes it clear that we should all be a lot lesscertain that what we "know to be true" is actually a true representation of reality.In the authors' words: "Finally, the idea that patterns are the fundamental currency of intelligence leads to some interesting philosophical questions. When I sit in a room with my friends, how do I know they are there or even if they are real? My brain receives a set of patterns that are consistent with patterns I have experienced in the past. These patterns correspond to people I know, their faces, their voices, how they usually behave, and all kinds of facts about them. I have learned to expect these patterns to occur together in predictable ways. But when you come down to it, itÃƒÂ¢Ã â ¬Ã â„¢s all just a model. All our knowledge of the world is a model based on patterns. Are we certain the world is real? ItÃƒÂ¢Ã â ¬Ã â„¢s fun and odd to think about. Several science-fiction books and movies explore this theme. This is not to say that the people or objects arenÃƒÂ¢Ã â ¬Ã â„¢t really there. They are really there. But our certainty of the worldÃƒÂ¢Ã â ¬Ã â„¢s existence is based on the consistency of patterns and how we interpret

them. There is no such thing as direct perception. We donÃƒÂ¢Ã â ¬Ã â„¢t have a ÃƒÂ¢Ã â ¬Ã Å“peopleÃƒÂ¢Ã â ¬Ã Â• sensor. Remember, the brain is in a dark quiet box with no knowledge of anything other than the time-flowing patterns on its input fibers. . . Your perception of the world is created from these patterns, nothing else. Existence may be objective, but the spatial-temporal patterns flowing into the axon bundles in our brains are all we have to go on."What does all this mean to our daily lives? To me it simply means that there are solid reasons to make sure we always question our assumptions, work to find as much objective empirical data as possible and allow for other people to have a different view of the patterns they discern. Our individual perspective is all we have, but it isn't necessarily the only one nor is it necessarily the most accurate representation.

This book was a great read, very accessible and might prove to be a very important book one day. It's concise and to the point and if you have any interest whatsoever in AI you simply can not miss this it. It's a quick read that will without a doubt have a significant impact on how you view the future of artificial intelligence.As a testament to it's relevancy today (I'm writing this Sept 2012, seven years after the book was published) he predicts three technological applications that may become available in the short term (5-10 years) due to breakthroughs in the kind of trainable AI this book discusses:Computer vision and teaching a computer to tell the difference between a cat and a dog (this was successfully demonstrated in a study published in June 2012 - the paper is called "Building High-level Features Using Large Scale Unsupervised Learning" and is available online, or just search for "computer learns to recognize cats" for articles)PDAs (as they were called back then) will understand naturally spoken instructions like "Move my daughter's basketball game on Sunday to 10 in the morning" (this kind of sentence, copied from the book verbatim, is exactly where Apple's AI application SIRI shines)Smart/autonomous cars - in Aug 2012, Google announced that their self driving cars have logged 300 K accident free miles in live traffic on public roads, exceeding the average distance a human drives without accident.The thing to note here is that when he wrote the book these three things had hurdles that we did not know how to solve, and at the time there was no clear linear progression of existing solutions that would guarantee they would be solved. His prediction is that we'll be able to train computers to recognize patterns by themselves which will allow us to eventually solve the problems (and this is exactly how the computer learned to recognize cat faces from youtube videos)Furthermore, he predicts that AI will become one of the hottest fields within the next 10 years - and with the current explosion of interest in Big Data, Machine Learning, and applications like SIRI it is hard to deny that it lookslike we're right in the midst of seeing just this

happen.The grander implications of the model of this book won't be known for another 10-20 years or more, but 7 years in his general predictions about the field of AI have been very accurate.

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