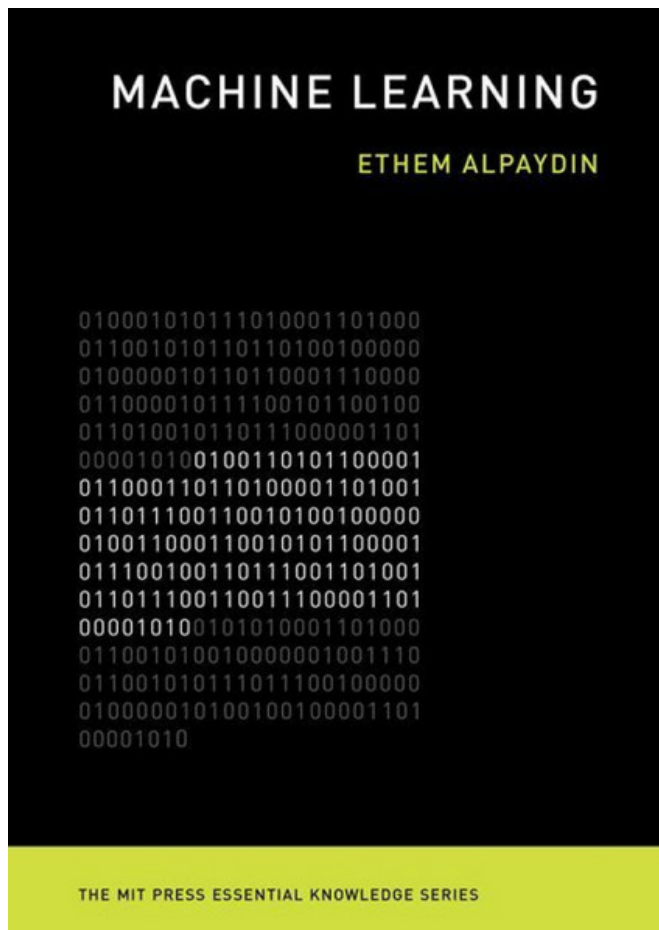


TRANSFORMING OUR LIVES

Alpaydin focuses on artificial intelligence

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“Machine Learning: The New Artificial Intelligence” by Ethem Alpaydin. Cambridge, MA: Massachusetts Institute of Technology Press, 2016, 224 pages, \$15.95 (paperback).



“A quiet revolution has been taking place in computer science for the last two decades,” Ethem Alpaydin explains near the beginning of “Machine Learning: The New Artificial Intelligence,” his new primer on the continuing evolution of the digital architecture constantly shaping and redefining the world. “Nowadays, more and more, we see computer programs that learn – that is, software that can adapt their behavior automatically to better match the requirements of their tasks. We now have programs that learn to recognize people from their faces, understand speech, drive a car or recommend which movie to watch – with promises to do more in the future.”

“Machine Learning” is a deceptively complex book. Consisting of seven relatively concise chapters, the book is a fairly comprehensive summary of the current status of a field that has the potential to transform our culture in ways we only partially understand. A feature I found particularly useful was the glossary Alpaydin includes to help those without an extensive background in the subject matter at hand to get a better handle on the ideas and

concepts he lays out in such an elegant manner. For instance, when I ran across the term “cyber-physical systems,” it was nice to have a resource available that allowed me to decipher exactly what the phrase was referencing without having to look for contextual clues.

Alpaydin is a member of the faculty in the Department of Computer Engineering at Bogazici University in Istanbul, Turkey; he received his Ph.D. from the Ecole Polytechnique Fédérale de Lausanne, Switzerland, in 1990. A Fulbright Senior Scholar during the 1997-98 academic year, he received the Research Excellence Award twice from the Bogazici University Foundation as well as the Young Scientist Award from the Turkish Academy of Sciences in 2001 and the Scientific Encouragement Award from the Turkish Scientific and Technical Research Council in 2002. His resume includes stints as a visiting researcher at MIT, Berkeley, the Idiap Research Institute in Switzerland and the Delft University of Technology in the Netherlands. He has authored a long list

of scholarly contributions; his seminal “Introduction to Machine Learning,” originally published in 2004, is on its third edition, released in 2015.

“Some of the biggest transformations in our lives in the last half century are due to computing and digital technology,” Alpaydin asserts in “Why We Are Interested in Machine Learning,” the inaugural chapter. “The tools, devices and services we had invented and developed in the centuries before have been increasingly replaced by their computerized ‘e-’ versions, and we in turn have been continuously adapting to their new digital environment.”

One aspect of the book I found especially intriguing was his exploration of how the human brain works and the resulting implications for the ongoing development of so-called artificial intelligence. At some point, most of us have wondered what actually constitutes “consciousness” and how what we all experience is connected to the physical realm; i.e., what is the mechanism that translates ions moving across a membrane or other structures into our thoughts and feelings? Although a computer mimics many of the processes we have identified as taking place in the brain, there is a growing sense among many neuroscientists that there are fundamental differences between how our brains function compared to computers programmed to perform analogous operations.

Germane to this discussion is the notion of an algorithm, which Merriam-Webster defines as “a set of steps that are followed in order to solve a mathematical problem or to complete a computer process.” At the heart of Alpaydin’s thesis is an exploration of what constitutes true “learning” and the as yet unresolved question of whether it can be replicated in a machine in much the same way we presume it takes place in the brain. In order to address the problem cogently, it is essential to recognize and appreciate the differences between how we think and how a computer does whatever it does as we are still reluctant to use that term when it comes to anything other than ourselves.

“Neurons in the brain have connections, called synapses, to tens of thousands of other neurons, and they all operate in parallel,” the author notes. “In a computer, the processor is active and the memory is separate and passive, but it is believed that in the brain both processing and memory are distributed together over the network; processing is done by the neurons and memory occurs in the synapses between the neurons.” He then proceeds with a somewhat involved yet inherently fascinating description of how this potentially happens.

In many respects, Alpaydin is as much a philosopher as he is a computer scientist. In attempting to bring the conversation down to the level of the general reader – which he manages to do with very few exceptions – he simultaneously explains the technical basis for modern computing while spurring the imagination about what it ultimately means to be human. Is there something unique about us that defies any attempt to reduce us to nothing more than a complex system which efficiently transforms inputs into outputs? Or is there something more enigmatic about our existence that makes the quest to build a machine truly capable of emulating rational and creative thought (outside the scope of identifying an orderly set of rules governing the process) virtually impossible?

Pretty much since the dawn of the Industrial Age, the idea of an intelligent machine has been the subject of immense speculation and research among the scientific community as well as a mainstay of science fiction writers for more than a hundred years. By shedding some much-needed light on where we are in developing and employing machines capable of truly “learning,” Alpaydin is upping the stakes and taking the dialogue to the next level. If you are interested in what the future may look like, you will definitely want to add this one to your reading list.

Reviewed by Aaron W. Hughey, Department of Counseling and Student Affairs, Western Kentucky University.