

1.2.1 The Many Names and Changing Fortunes of Neural Networks

We expect that many readers of this book have heard of deep learning as an exciting new technology, and are surprised to see a mention of “history” in a book about an emerging field. In fact, deep learning dates back to the 1940s. Deep learning only *appears* to be new, because it was relatively unpopular for several years preceding its current popularity, and because it has gone through many different names, and has only recently become called “deep learning.” The field has been rebranded many times, reflecting the influence of different researchers and different perspectives.

A comprehensive history of deep learning is beyond the scope of this textbook. However, some basic context is useful for understanding deep learning. Broadly speaking, there have been three waves of development of deep learning: deep learning known as **cybernetics** in the 1940s–1960s, deep learning known as **connectionism** in the 1980s–1990s, and the current resurgence under the name deep learning beginning in 2006. This is quantitatively illustrated in figure 1.7.

Some of the earliest learning algorithms we recognize today were intended to be computational models of biological learning, i.e. models of how learning happens or could happen in the brain. As a result, one of the names that deep learning has gone by is **artificial neural networks** (ANNs). The corresponding perspective on deep learning models is that they are engineered systems inspired by the biological brain (whether the human brain or the brain of another animal). While the kinds of neural networks used for machine learning have sometimes been used to understand brain function ([Hinton and Shallice, 1991](#)), they are generally not designed to be realistic models of biological function. The neural perspective on deep learning is motivated by two main ideas. One idea is that the brain provides a proof by example that intelligent behavior is possible, and a conceptually straightforward path to building intelligence is to reverse engineer the computational principles behind the brain and duplicate its functionality. Another perspective is that it would be deeply interesting to understand the brain and the principles that underlie human intelligence, so machine learning models that shed light on these basic scientific questions are useful apart from their ability to solve engineering applications.

The modern term “deep learning” goes beyond the neuroscientific perspective on the current breed of machine learning models. It appeals to a more general principle of learning *multiple levels of composition*, which can be applied in machine learning frameworks that are not necessarily neurally inspired.