

Notes - The Deep Learning Book (Goodfellow, Bengio, Courville)

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Introduction

Computers have quickly been able to solve tasks that humans could easily describe formally but struggled to perform. The real challenge for computers is to solve problems that are humans solve intuitively. These problems are usually harder for humans to describe but a set of rules that computers could follow.

One way to solve this problem is deep learning. The idea behind deep learning is to make computers to learn from experience and understand the world in terms of concepts and abstractions that relate to each other. The hierarchy of concepts form a deep graph of successive layers that computers are expected to learn by itself. This is why this approach is called deep learning.

Different approaches to AI:

1. **Knowledge base:** hard code knowledge about the world and have computers reason using logical inference rules.
2. **Machine learning:** AI systems acquire their own knowledge by recognizing patterns from raw data. The performance of machine learning algorithms heavily rely on the representation of the data they learn from (think same data in Cartesian coordinate system or polar coordinate system).
3. **Representation/feature learning:** a set of machine learning techniques where the algorithms discover the representation of the data itself. K-means clustering and PCA are example of unsupervised feature learning techniques. When designing features or algorithms for learning features, the goal is to isolate factors of variation that will influence the data we obtained (when analyzing speech: person's age, sex, accent). But each piece of data is influenced by many different factors, and the objective is eventually to choose between these factors the ones we are interested in.