Unsupervised Learning

In unsupervised learning, the goal is to build a model that captures the underlying distribution of the dataset. The dataset has no given targets for the input features (see Figure 14-17). So, it is not possible to learn a function that maps a relationship between the input features and the targets as we do in supervised learning.

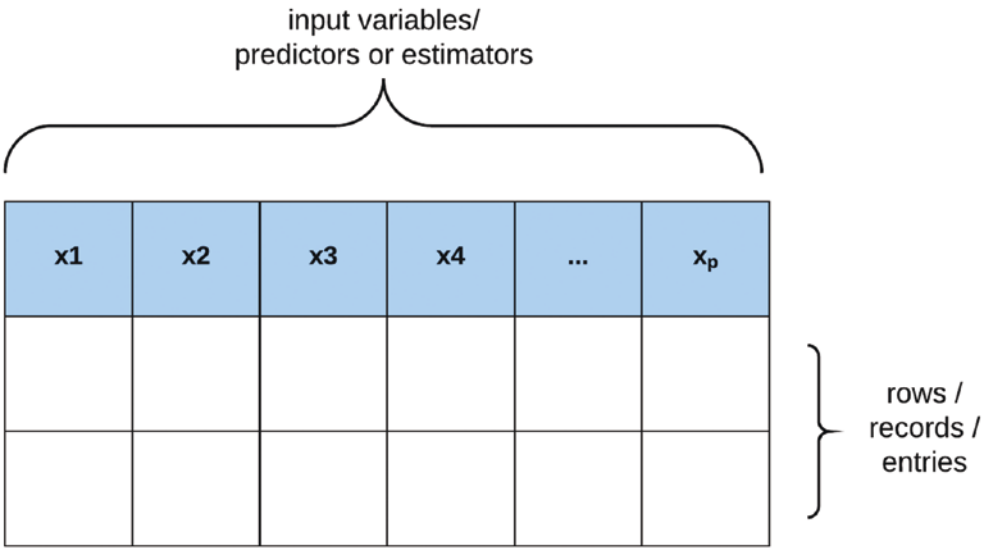

Figure 14-17. *Unsupervised dataset*

Rather, unsupervised learning algorithms attempt to determine the unknown structure of the dataset by grouping similar samples together.

Assume we have a dataset of patients with heart diseases; using unsupervised machine learning algorithms, we can find some hidden sub-groups of patients to help understand more about the disease patterns. This is known as *clustering*.

Also, we can use algorithms like *principal component analysis* (*PCA*) to compress a large number of features into principal components (that summarizes all the other features) for easy visualization. We will talk more about clustering and principal component analysis in later chapters.

Reinforcement Learning

Reinforcement learning presents an approach to learning that is quite different from what we have seen so far in supervised and unsupervised machine learning techniques. In reinforcement learning, an agent interacts with an environment in a feedback configuration and updates its strategy for choosing an action based on the responses it gets from the environment. An illustration of this scenario is shown in Figure 14-18.

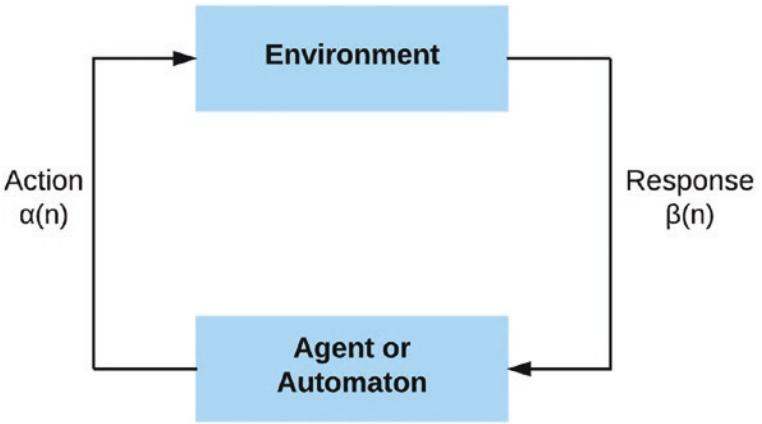

Figure 14-18. *Reinforcement learning model*

This book will not cover reinforcement learning techniques as it presents a different approach to the problem of learning from random environments that is distinct from the approach used in supervised and unsupervised learning problems.

In this chapter, we covered the three main components of machine learning, which are supervised, unsupervised, and reinforcement learning. The chapter largely focused on the principles for performing supervised machine learning such as framing a problem as a regression or classification task; splitting the dataset into training, test, and validation sets; understanding the bias/variance trade-off and consequently issues of overfitting and underfitting; and the evaluation metrics for assessing the performance of a learning model.

In the next chapter, we will briefly look at the differences between batch and online learning.