

PART

Machine learning and deep learning networks

3

Part 3 covers the understanding and use of Machine Learning, including the very recent subject of Deep Learning networks. It starts in Chapter 13, Basic classification concepts, by introducing the subject of abstract pattern classification—or “pattern recognition” as it was originally known—the word “abstract” being intended to convey the idea that whatever the nature of the

input data, the output will be a much more compact description of the input data: in the simplest case, optical character recognition yields the ASCII codes of the characters, and face recognition provides the names of the people being viewed.

Over the years, the subject of pattern classification has matured and its more modern form—Machine Learning—aims to provide a probabilistic framework for interpreting patterns, giving the exact probabilities for all possible interpretations (and thus indicating reliability as well as the most probable interpretation). Machine Learning is introduced in Chapter 14, Machine learning: probabilistic methods, and concentrates on two prime areas: one is the rigorous “expectation maximization” approach; and the other is “boosting,” which aims at high speed and efficiency by combining the outputs of many weak classifiers in order to generate powerful high accuracy combined classifiers.

Chapter 15, Deep-learning networks, goes on to examine how the concept of “Deep Learning” arose from the earlier artificial neural networks outlined in Chapter 13, Basic classification concepts. In particular, it follows the huge advances in accuracy and speed obtained by deep learning architectures, and shows how much has been achieved in this area since the explosive advances that took place around 2012.

Finally, note that Chapter 21, Face detection and recognition: the impact of deep learning, (the first chapter in Part 5) continues the study of deep learning, describing how it has been applied in the important area of face detection and recognition.