Part 4

Deep learning

In the fourth part of the book, we'll introduce deep learning algorithms. Deep learning algorithms are part of supervised learning, which we encountered in part 2 of the book. Deep learning algorithms revolutionized the field of machine learning and enabled several research and business applications that were previously thought to be out of reach with classic ML algorithms.

In chapter 10, we'll begin with fundamentals, such as multilayer perceptron and LeNet convolutional models for MNIST digit classification followed by more advanced applications, such as image search based on the ResNet50 convolutional neural network. We will dive into recurrent neural networks applied to sequence classification using LSTMs and implement a multi-input model for sequence similarity, from scratch. Finally, we'll conduct a comparative study of different optimization algorithms used for training deep neural networks.

In chapter 11, we'll study more advanced deep learning algorithms. We will investigate generative models based on variational autoencoders and implement an anomaly detector for time series data, from scratch. We'll study an intriguing combination of neural networks and probabilistic graphical models and implement mixture density networks, from scratch. Next, we'll describe the powerful transformer architecture and apply it to text classification. Finally, we'll examine graph neural networks and use one to classify nodes in a citation graph. We'll conclude with ML research, focusing on deep learning.