**Branches of Machine Learning**

Four basic branches are discussed in Machine learning:

* Supervised Machine Learning
* Unsupervised Machine Learning
* Self-Supervised Learning
* Reinforcement Learning

**Supervised Machine Learning:**

consists of learning to map input data to known targets (also called annotations), given a set of examples (often annotated by humans). Although supervised learning mostly consists of classification and regression, there are more exotic variants as well, including the following (with examples):

* **Sequence generation**—Given a picture, predict a caption describing it. Sequence generation can sometimes be reformulated as a series of classification problems (such as repeatedly predicting a word or token in a sequence). ϒ Syntax tree prediction—Given a sentence, predict its decomposition into a syntax tree.
* **Object detection—**Given a picture, draw a bounding box around certain objects inside the picture. This can also be expressed as a classification problem (given many candidate bounding boxes, classify the contents of each one) or as a joint classification and regression problem, where the bounding-box coordinates are predicted via vector regression.
* **Image segmentation**—Given a picture, draw a pixel-level mask on a specific object.

**Unsupervised learning**

This branch of machine learning consists of finding interesting transformations of the input data without the help of any targets, for the purposes of data visualization, data compression, or data denoising, or to better understand the correlations present in the data at hand. Unsupervised learning is the bread and butter of data analytics, and it’s often a necessary step in better understanding a dataset before attempting to solve a supervised-learning problem. Dimensionality reduction and clustering are well-known categories of unsupervised learning.

**Self-Supervised Learning**

This is a specific instance of supervised learning, but it’s different enough that it deserves its own category. Self-supervised learning is supervised learning without Licensed to Four branches of machine learning 95 human-annotated labels—you can think of it as supervised learning without any humans in the loop. There are still labels involved (because the learning must be supervised by something, but they’re generated from the input data, typically using a heuristic algorithm.

**Reinforcement learning**

Long overlooked, this branch of machine learning recently started to get a lot of attention after Google DeepMind successfully applied it to learning to play Atari games (and, later, learning to play Go at the highest level). In reinforcement learning, an agent receives information about its environment and learns to choose actions that will maximize some reward. For instance, a neural network that “looks” at a videogame screen and outputs game actions to maximize its score can be trained via reinforcement learning. Currently, reinforcement learning is mostly a research area and hasn’t yet had significant practical successes beyond games. In time, however, we expect to see reinforcement learning take over an increasingly large range of real-world applications: self-driving cars, robotics, resource management, education, and so on. It’s an idea whose time has come or will come soon.