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1. Explain the following concepts:
1) supervised learning

Supervised learning is the machine learning task of learning a function that maps an input to an output based on example input-output pairs.

2) unsupervised learning

Unsupervised learning is a type of self-organized machine learning that helps find previously unknown patterns in data set without pre-existing labels.

3) online learning

Online machine learning is a method of machine learning in which data becomes available in a sequential order and is used to update our best predictor for future data at each step. In online learning, you train the system incremental by feeding it data instances sequentially, either individually or by small groups called mini-batches. Each learning step is fast and cheap, so the system can learn about new data on the fly, as it arrives.

4) batch learning

Batch learning is a method of machine learning which generate the best predictor by learning on the entire training data set at once. In batch learning, the system is incapable of learning incrementally: it must be trained using all the available data. First the system is trained, and then it is launched into production and runs without learning anymore; it just applies what it has learned.

5) model-based learning

A way to generalize from a set of examples is to build a model of these examples, them use that model to make predictions.

6) instance-based learning

The system learns the examples by heart, then generalizes to new cases using a similarity measure.