DLI Accelerated Data Science Teaching Kit

Lecture 14.2 - Introduction to Supervised Learning

Machine Learning

It is a branch of artificial intelligence (AI).

It is a scientific discipline concerned with the design and development of algorithms that allow computers to evolve behaviors based on empirical data.

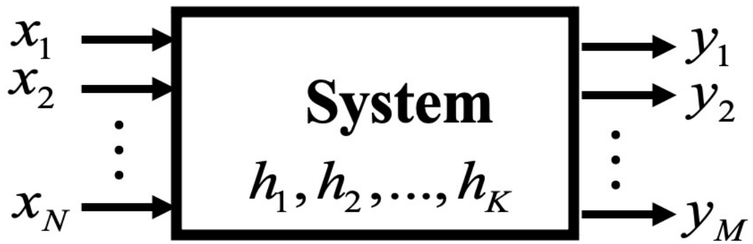
- Behaviors such as recognizing faces, translating, and searching.

Machine Learning is the science of getting computers to act without being explicitly programmed.

It is a technique of data science that helps computers learn from existing data in order to forecast future behaviors, outcomes, and trends.

Machine Learning

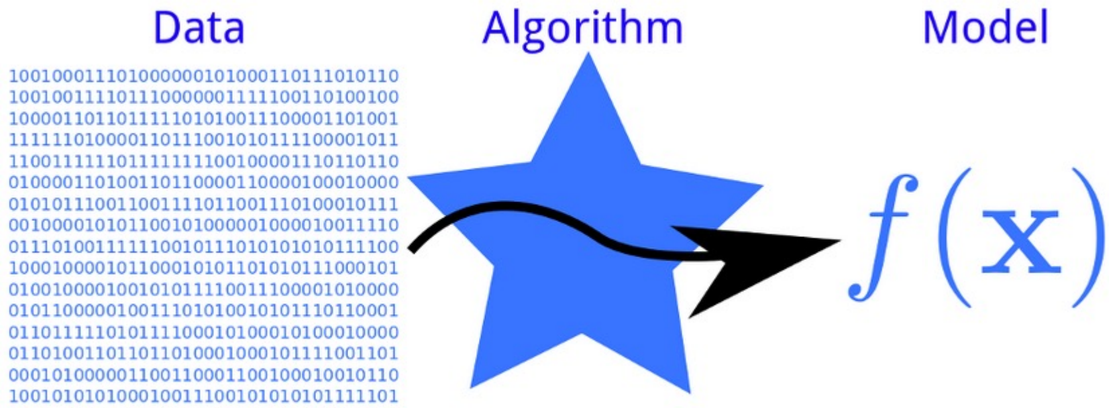
Machine learning systems automatically learn programs from data to generate a model.



Input Variables: $\mathbf{x} = (x_1, x_2, \ldots, x_N)$

Hidden Variables: $\mathbf{h} = (h_1, h_2, \ldots, h_K)$

Output Variables: $\mathbf{y} = (y_1, y_2, \ldots, y_M)$



Source: http://phdp.github.io/posts/2013-07-05-dtl.html

Machine Learning Terminology

Samples: Items or instances used for learning (or training) or evaluation (or testing).

Features: Set of attributes represented as a vector associated with an sample.

Labels: Values or categories assigned to examples.

- For classification, the labels are categories;
- For regression, the labels are real numbers.

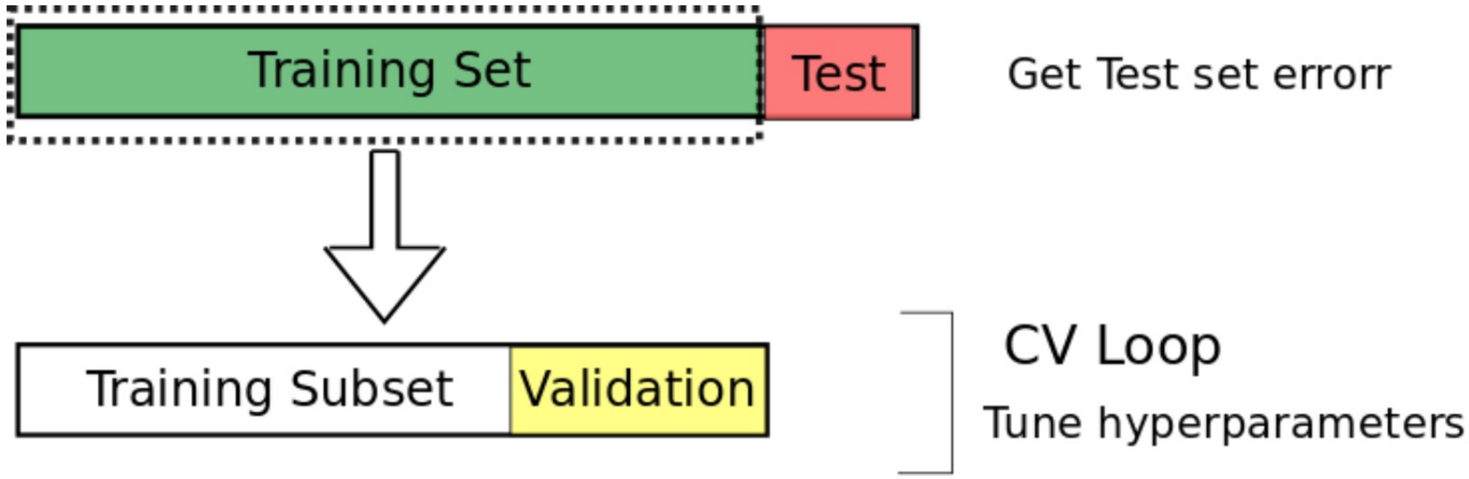
Output: Prediction labels by using a model of the machine learning algorithm.

Model: Information that the machine learning algorithm stores after training. The model is used when predicting labels of new, unseen examples.

Machine Learning Terminology

Training sample: Examples used to train a machine learning algorithm.

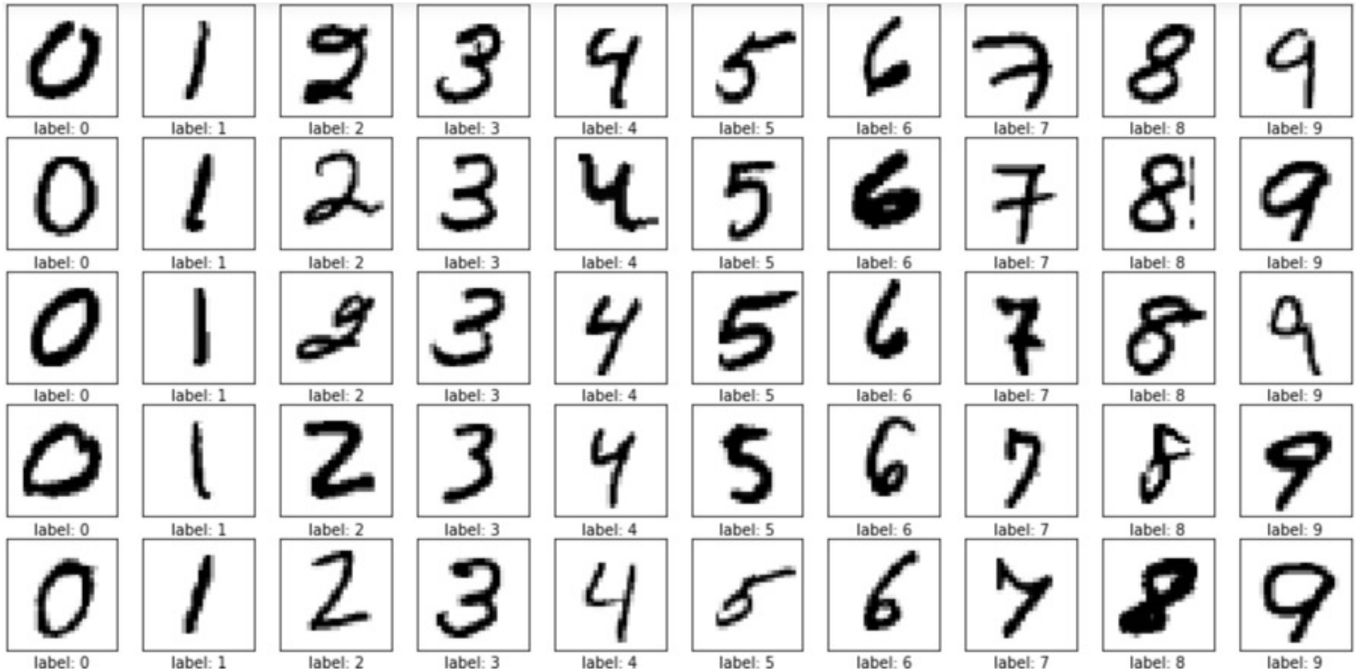
Testing sample: Examples used to evaluate the performance of a learning algorithm. The test sample is not available in the learning stage.



Source: https://medium.com/@fezancs/practical-aspects-deep-learning-ba4f4822641b

Examples of Machine Learning Terminology

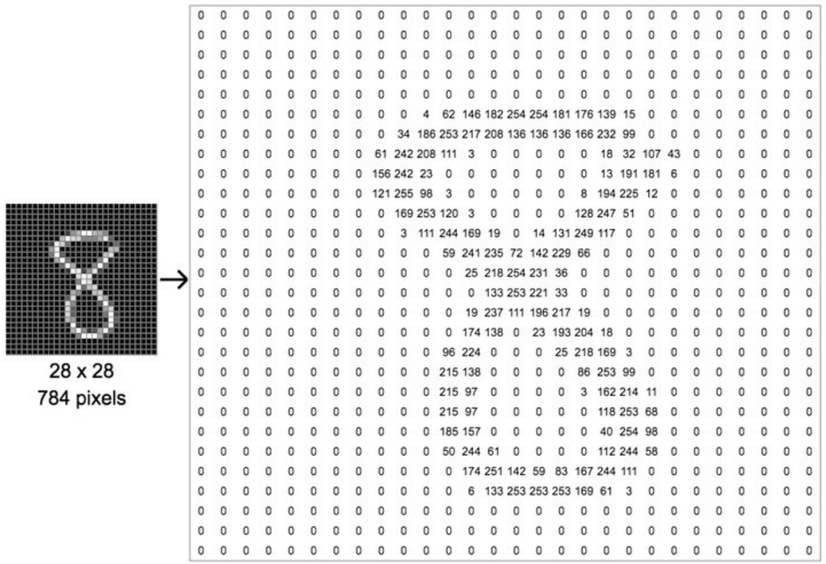
Samples and Labels



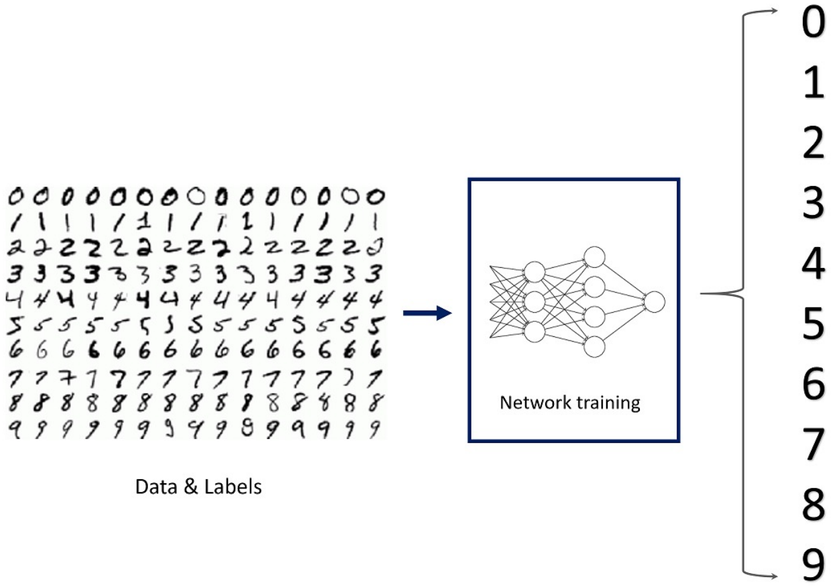
Source: https://m-alcu.github.io/blog/2018/01/13/nmist-dataset/

Examples of Machine Learning Terminology

Features



Model



Source 1: https://towardsdatascience.com/how-to-teach-a-computer-to-see-with-convolutional-neural-networks-96c120827cd1

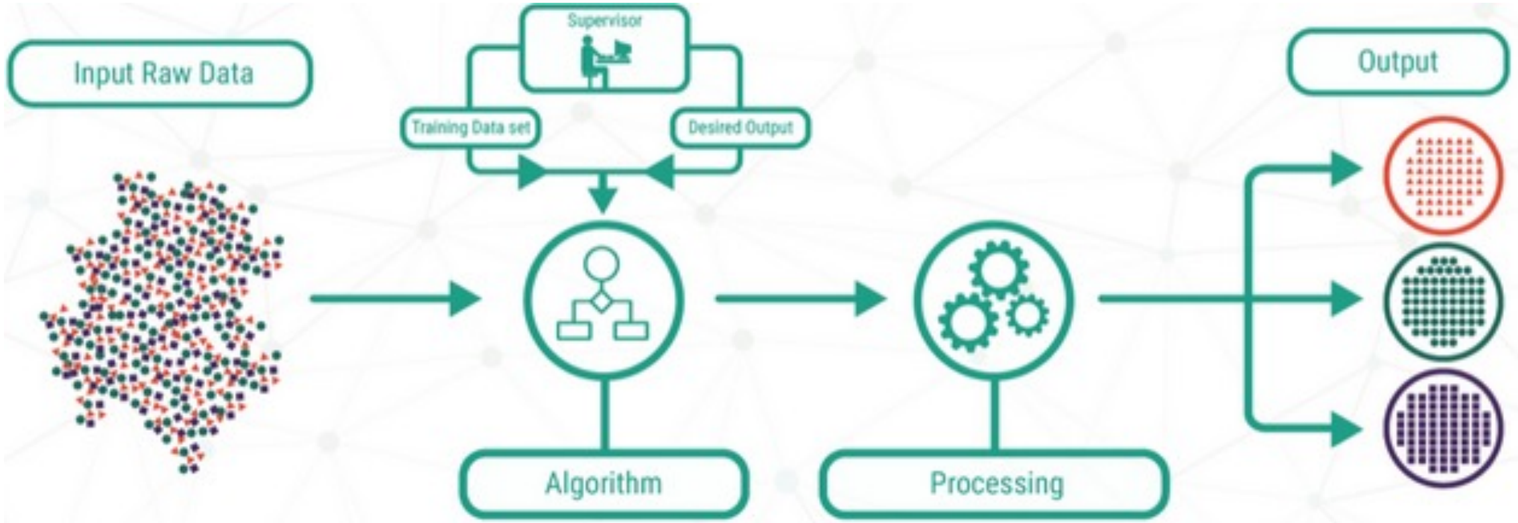
Source 2: https://towardsdatascience.com/image-classification-in-10-minutes-with-mnist-dataset-54c35b77a38d

Supervised Learning

Data: (x, y)

Goal: Learn function to map, discover patterns in the data (samples) that relate data attributes with a target attribute (labels).

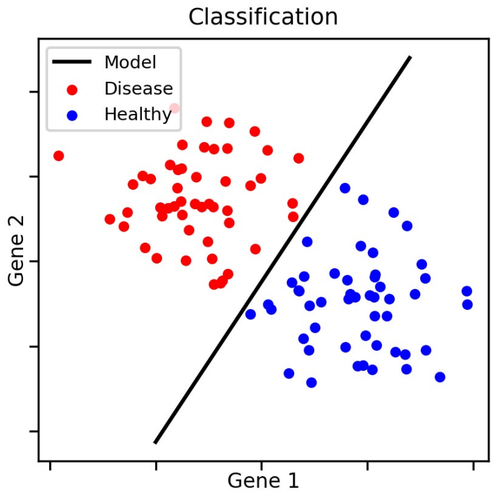
Examples: Classification, Regression, Object detection, Object tracking, etc.

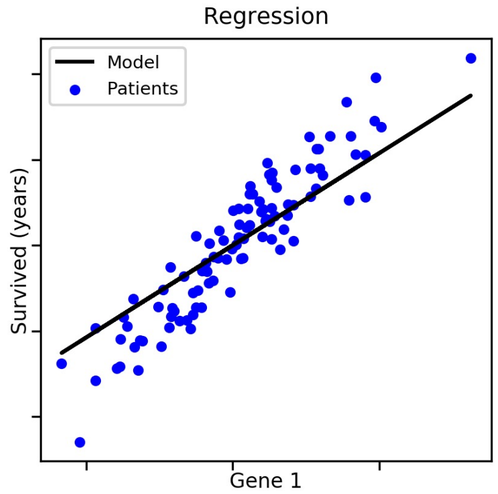


Source: http://bigdata-madesimple.com/machine-learning-explained-understanding-supervised-unsupervised-and-reinforcement-learning/

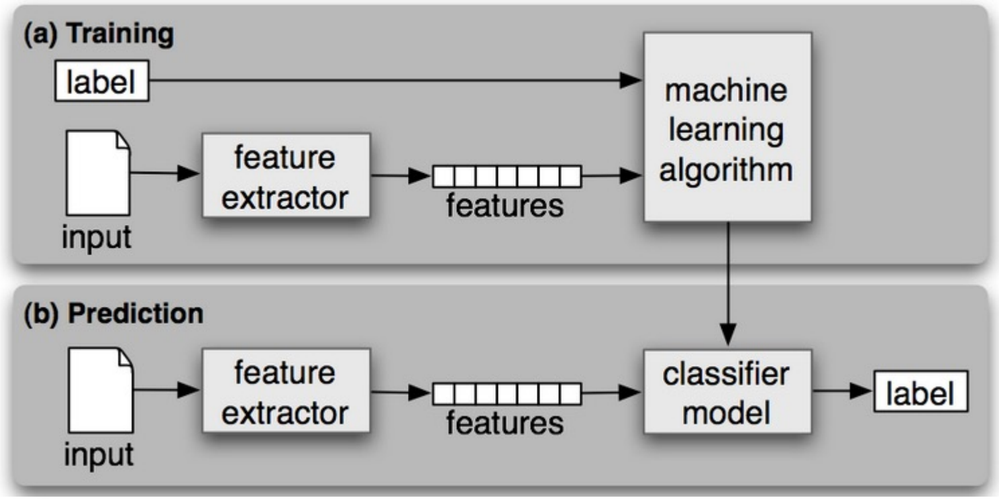
Supervised Learning

Classification: classify the data into predefined classes





Regression: predict a numerical value of samples

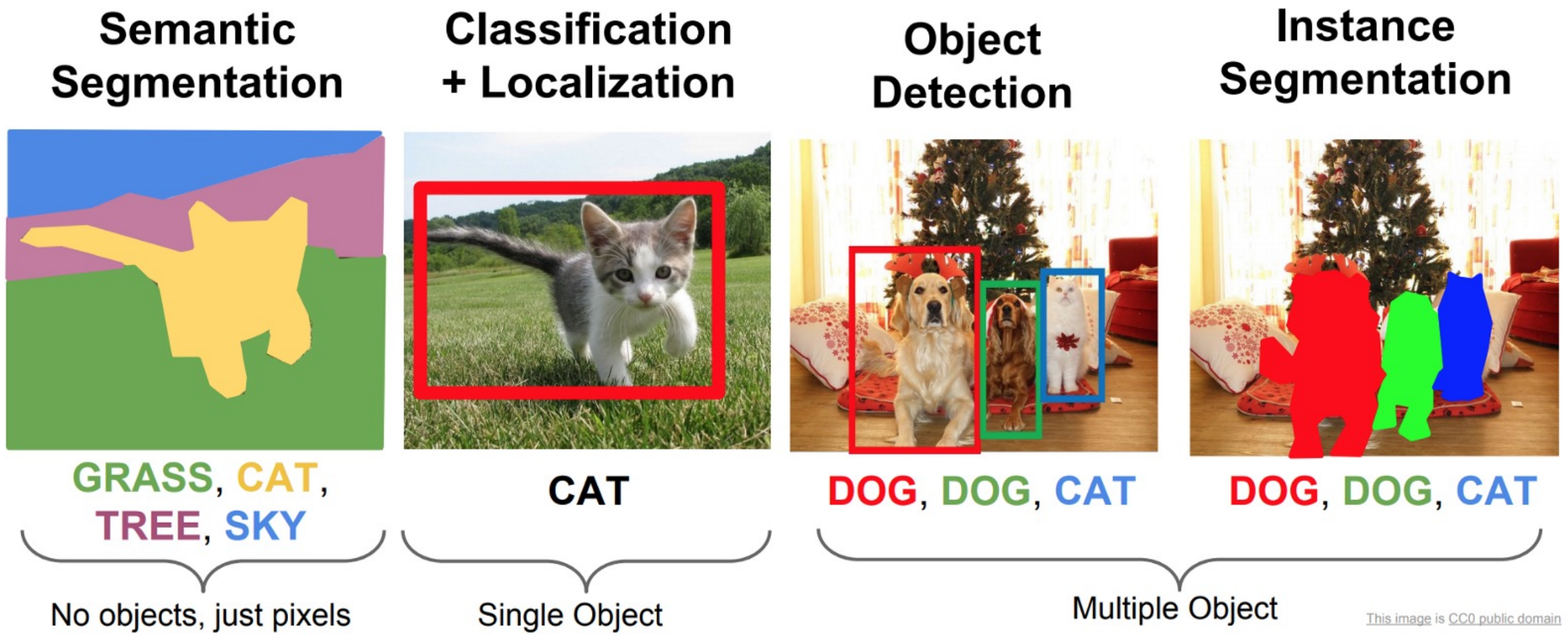


Source 1: https://aldro61.github.io/microbiome-summer-school-2017/sections/basics/

Source 2: http://www.nltk.org/book/ch06.html

Supervised Learning Applications

Computer Vision



Natural Language Processing

Source 1: https://medium.com/ml-research-lab/what-is-object-detection-51f9d872ece7

Source 2: https://analyticsindiamag.com/google-translate-machine-learning/

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Thank You