Machine Learning: brief overview

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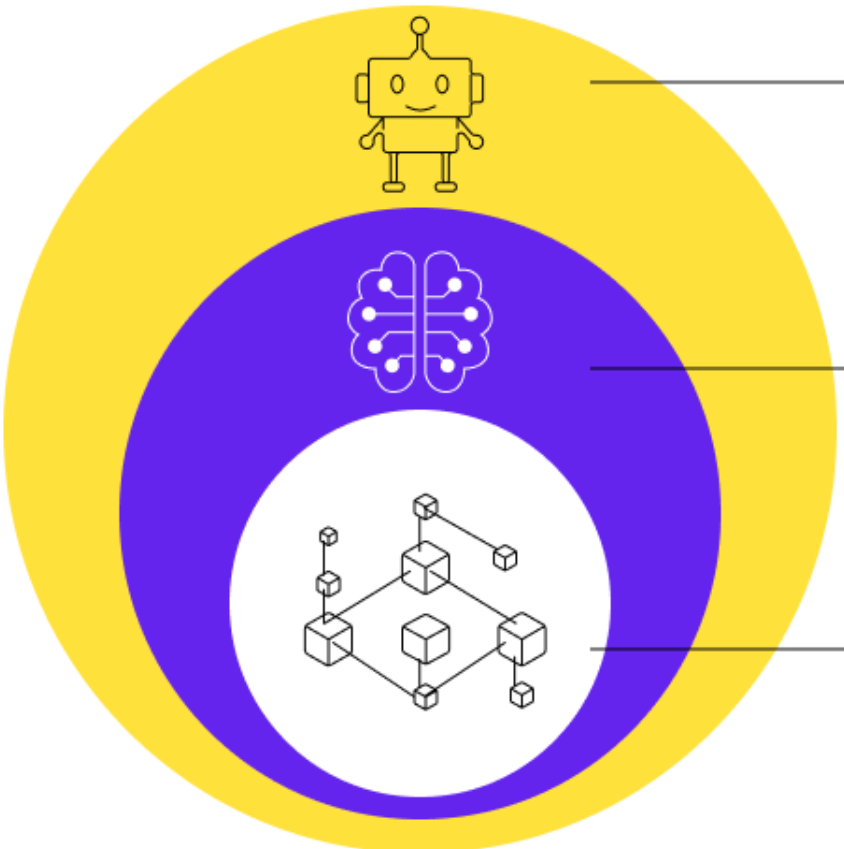
Artificial Intelligence, Machine Learning and Deep Learning



Artificial Intelligence

Computers that can imitate human intellect and behavior.

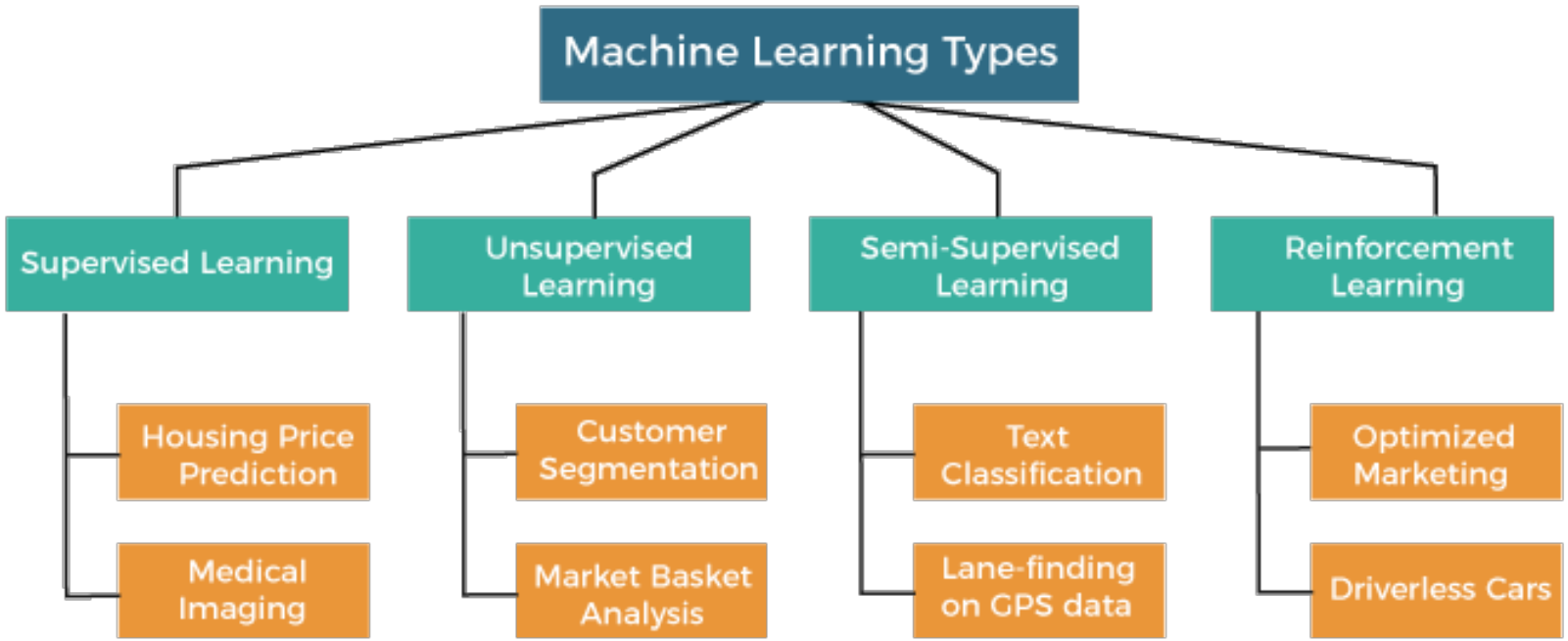
Machine Learning

Statistical algorithms that enable AI implementation through data.

Deep Learning

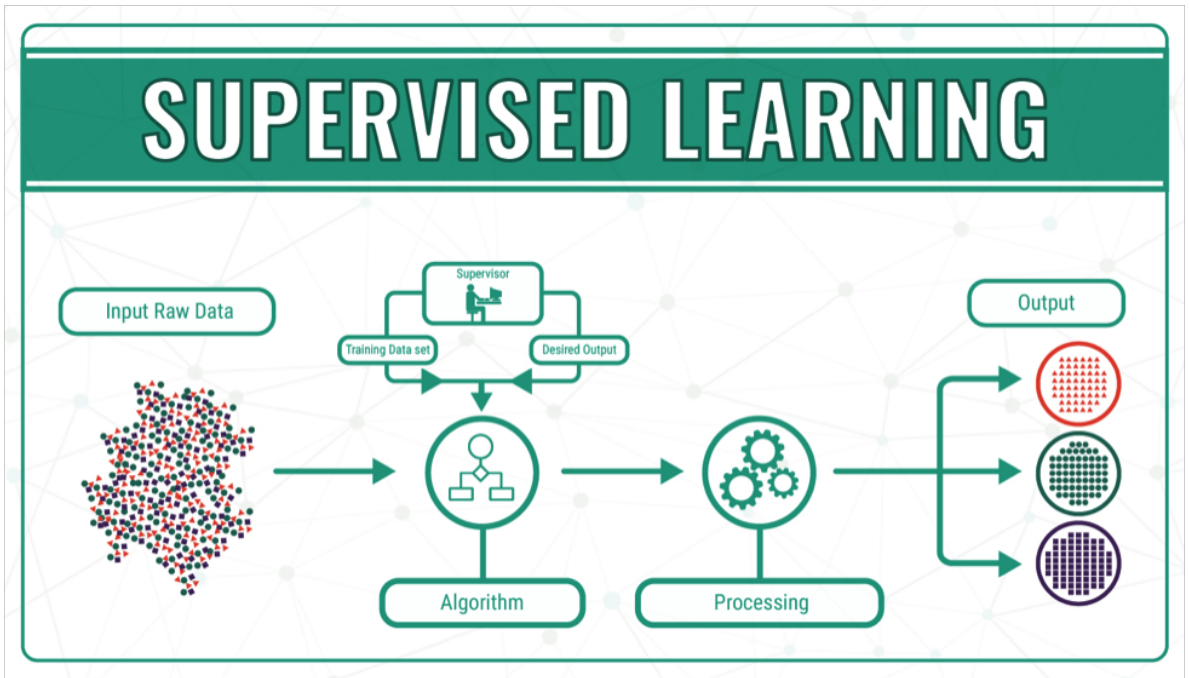
Subset of machine learning which follows neural networking.

Learning Methods (1)



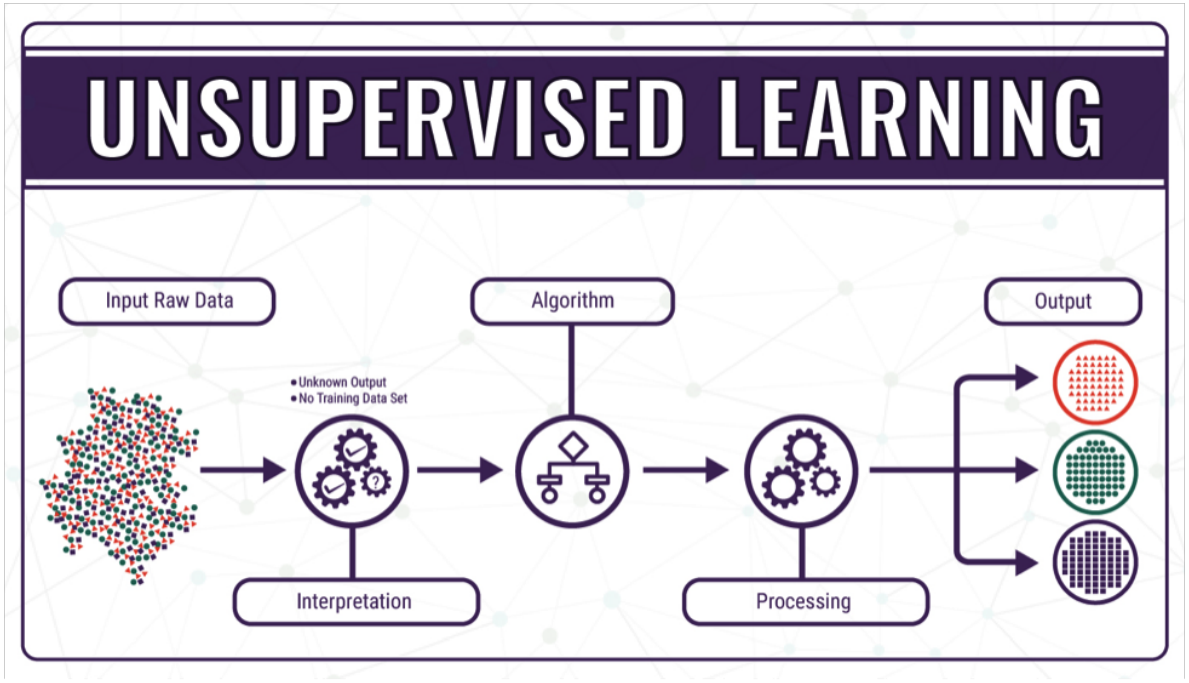
Learning Methods (2)

Supervised Learning: is characterised by a function $f(x)$ that maps the input data x to the desired output Y: $f(x) \rightarrow Y$. It is called supervied because x and Y are know, during the learning process, the model prediction are corrected with Y until f is able to produce acceptable results.



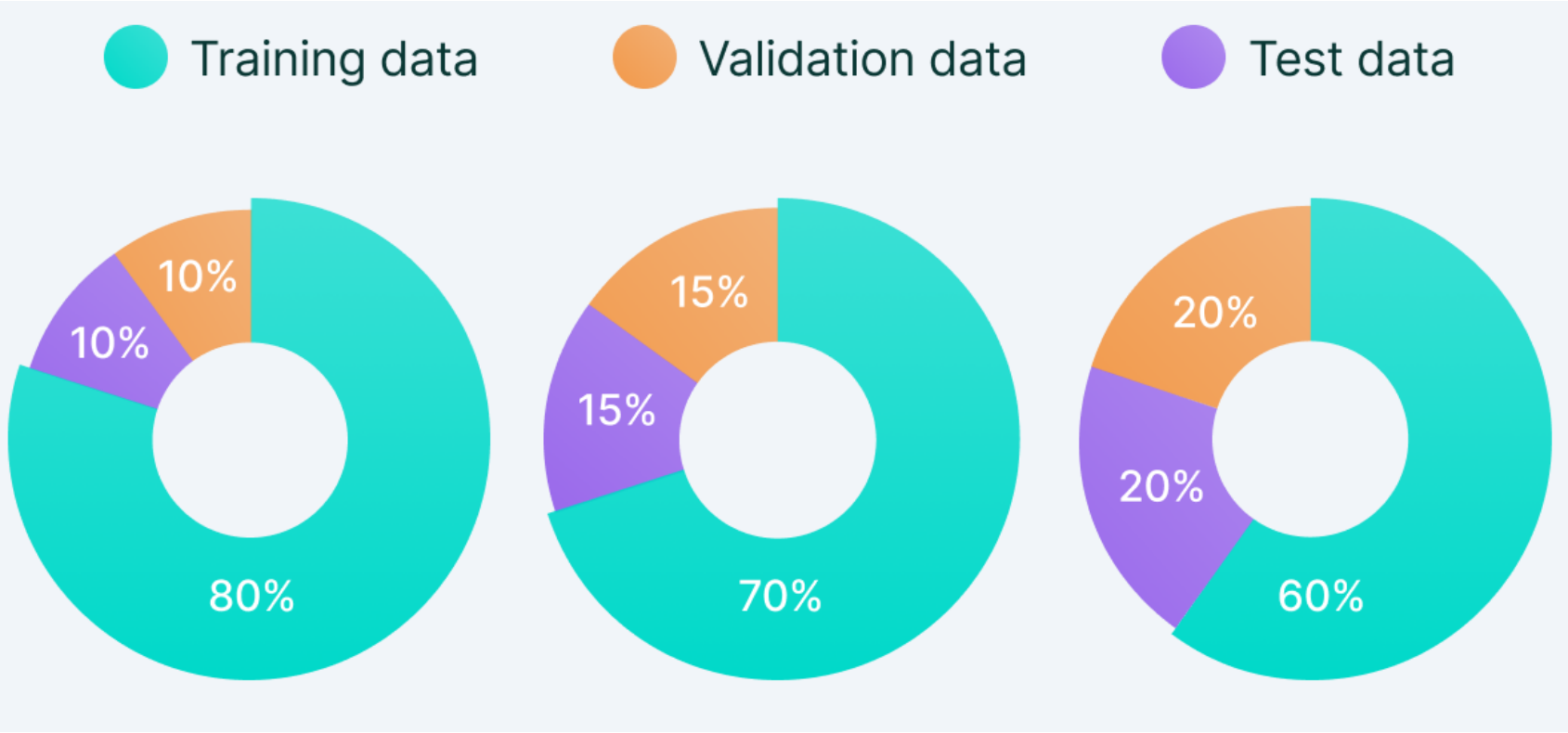
Learning Methods (3)

Unsupervised Learning: or self-organisation is a type of ML that looks for previously undetected patters in a dataset with no pre-existing labels and with a minimum human supervision.



Dataset

A possible definition: *Dataset contains a lot of separate pieces of data that can be used to train an algorithm with the goal of finding predictable patterns inside the whole dataset.*[1]



[1] shorturl.at/prE05

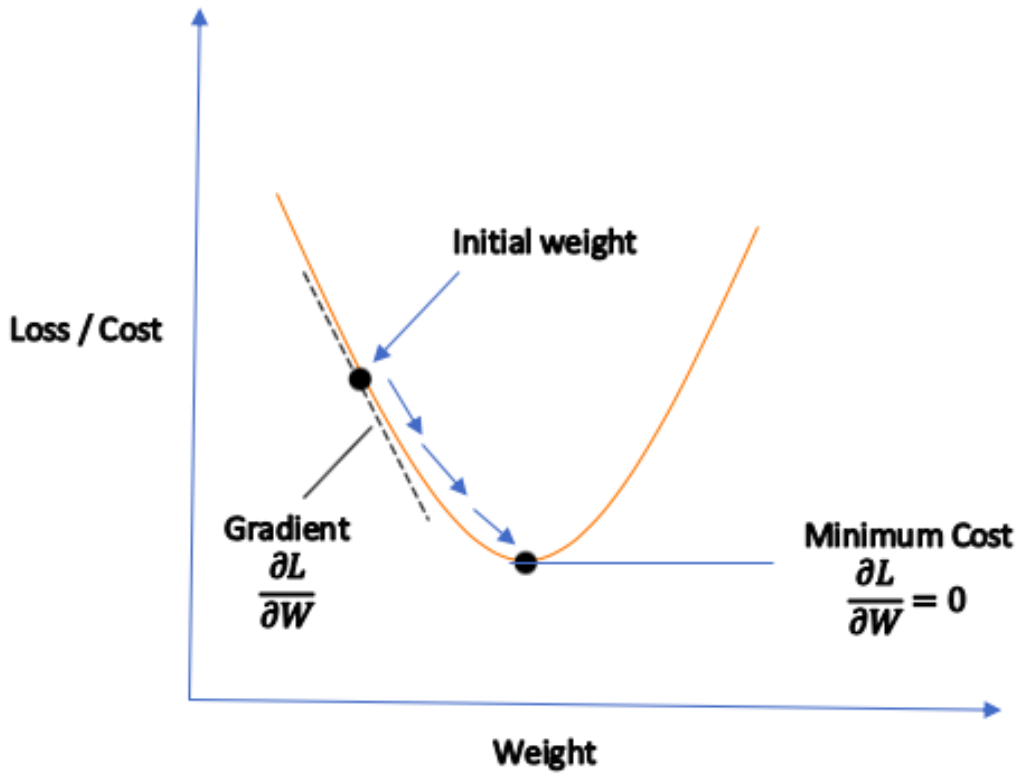
Training - Gradient Descent (1)

Let's consider the ML / DL model as a black box, to understand the training let's focus on the input, the output, the ground truth and the loss function.

The input and the ground truth are inside the dataset, the prediction is obtained by applying the model to the input and the loss function, commonly selected by the user, measure the error between the ground truth and the model output.

Training - Gradient Descent (2)

Typically we want to minimize the loss function in order to have an output as much as possible closer to the ground truth. This can be reached by adjusting the "weights" of the model through specific algorithm like the gradient descent. Gradient descent is a first-order iterative optimisation algorithm for finding the minimum of a function.



During the exercises we will analyze in details:

- Categorical Boosting
- Convolutional Neural Networks
- Autoencoders
- K-means clustering