

# TA 2

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# What's ML?

Machine learning (ML) is a branch of [artificial intelligence \(AI\)](#) and computer science that focuses on the using data and algorithms to enable AI to imitate the way that humans learn, gradually improving its accuracy.

# How does ML work?

- 1. A Decision Process:** In general, machine learning algorithms are used to make a prediction or classification. Based on some input data, which can be labeled or unlabeled, your algorithm will produce an estimate about a pattern in the data.
- 2. An Error Function:** An error function evaluates the prediction of the model. If there are known examples, an error function can make a comparison to assess the accuracy of the model.
- 3. A Model Optimization Process:** If the model can fit better to the data points in the training set, then weights are adjusted to reduce the discrepancy between the known example and the model estimate. The algorithm will repeat this iterative “evaluate and optimize” process, updating weights autonomously until a threshold of accuracy has been met.

# 4 types of ML algorithms

- Supervised
- Unsupervised Learning
- Semi-supervised Learning
- Reinforcement Learning

## Supervised Learning

Supervised learning is a machine learning approach where algorithms learn from labeled data. The algorithm receives input data and corresponding correct output labels in this process. The objective is to train the algorithm to predict accurate labels for new, unseen data.

Examples of supervised learning algorithms include:

- Decision Trees
- Support Vector Machines
- Random Forests
- Naive Bayes

These algorithms can be used for classification, regression, and time series forecasting tasks. Supervised learning is widely used in various domains, including healthcare, finance, marketing, and image recognition, to make predictions and gain valuable insights from data.

## Unsupervised Learning

In this machine learning approach, algorithms analyze unlabeled data without predefined output labels. The objective is to discover patterns, relationships, or structures within the data. Unlike supervised learning, unsupervised learning algorithms work independently to uncover hidden insights and group similar data points together. Common unsupervised learning techniques include clustering algorithms like:

- K-means
- Hierarchical clustering
- Dimensionality Reduction Methods like PCA and t-SNE

## **Semi supervised Learning**

Semi-supervised learning offers a happy medium between supervised and unsupervised learning. During training, it uses a smaller labeled data set to guide classification and feature extraction from a larger, unlabeled data set. Semi-supervised learning can solve the problem of not having enough labeled data for a supervised learning algorithm. It also helps if it's too costly to label enough data.

## Reinforcement Learning

Reinforcement machine learning is a machine learning model that is similar to supervised learning, but the algorithm isn't trained using sample data. This model learns as it goes by using trial and error. A sequence of successful outcomes will be reinforced to develop the best recommendation or policy for a given problem.



Some coding for Linear Regression!