**What is machine learning?**

Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

Machine learning is a field of inquiry devoted to understanding and building methods that 'learn', that is, methods that leverage data to improve performance on some set of tasks. It is seen as a part of artificial intelligence.

**Types Unsupervised ML**

1. Clustering
2. Exclusive and Overlapping
3. K-means Clustering
4. Hierarchical Clustering
5. Ward’s Linkage
6. Average Linkage
7. Complete (or Maximum) Linkage
8. Single (or Minimum) Linkage
9. Probabilistic Clustering
10. Gaussian Mixture Models
11. Association Rules
12. Apriori Algorithms
13. Dimensionality Reduction
14. Principal Component Analysis
15. Singular Value Decomposition
16. Autoencoders

**Unsupervised Learning** is a machine learning technique in which the users do not need to supervise the model. Instead, it allows the model to work on its own to discover patterns and information that was previously undetected. It mainly deals with the unlabeled data.

**Unsupervised Learning Algorithms** allow users to perform more complex processing tasks compared to supervised learning. Although, unsupervised learning can be more unpredictable compared with other natural learning methods. Unsupervised learning algorithms include clustering, anomaly detection, neural networks, etc.

**Example:** Let’s, take an example of Unsupervised Learning for a baby and her family dog. She knows and identifies this dog. Few weeks later a family friend brings along a dog and tries to play with the baby. Baby has not seen this dog earlier. But it recognizes many features (2 ears, eyes, walking on 4 legs) are like her pet dog. She identifies the new animal as a dog. This is unsupervised learning, where you are not taught but you learn from the data (in this case data about a dog.) Had this been [supervised learning](https://www.guru99.com/supervised-machine-learning.html), the family friend would have told the baby that it’s a dog as shown in the above Unsupervised Learning example.

Why Unsupervised learning?

1. Unsupervised machine learning finds all kind of unknown patterns in data.
2. Unsupervised methods help you to find features which can be useful for categorization.
3. It is taken place in real time, so all the input data to be analyzed and labeled in the presence of learners.
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**Use cases**

Some use cases for unsupervised learning — more specifically, clustering — include:

1. Customer segmentation, or understanding different customer groups around which to build marketing or other business strategies.
2. Genetics, for example clustering DNA patterns to analyze evolutionary biology.
3. Recommender systems, which involve grouping together users with similar viewing patterns in order to recommend similar content.
4. Anomaly detection, including fraud detection or detecting defective mechanical parts (i.e., predictive maintenance).

**Types of Supervised ML models**

Supervised learning uses a training set to teach models to yield the desired output. This training dataset includes inputs and correct outputs, which allow the model to learn over time. The algorithm measures its accuracy through the loss function, adjusting until the error has been sufficiently minimized.

Supervised learning can be separated into two types of problems when data mining—classification and regression:

* **Classification** uses an algorithm to accurately assign test data into specific categories. It recognizes specific entities within the dataset and attempts to draw some conclusions on how those entities should be labeled or defined. Common classification algorithms are linear classifiers, support vector machines (SVM), decision trees, k-nearest neighbor, and random forest, which are described in more detail below.
* **Regression** is used to understand the relationship between dependent and independent variables. It is commonly used to make projections, such as for sales revenue for a given business. [Linear regression](https://www.ibm.com/analytics/learn/linear-regression), [logistical regression](https://www.ibm.com/analytics/learn/logistic-regression), and polynomial regression are popular regression algorithms.

**Supervised learning Algorithms**

1. Neural Networks
2. Naïve Bayes
3. Linear Regression
4. Logistic Regression
5. Support Vector Machine (SVM)
6. K-nearest Neighbor
7. Random Forest

**Supervised Machine Learning** is an algorithm that learns from labeled training data to help you predict outcomes for unforeseen data. In Supervised learning, you train the machine using data that is well “labeled.” It means some data is already tagged with correct answers. It can be compared to learning in the presence of a supervisor or a teacher.

Supervised machine learning uses training data sets to achieve desired results. These data sets contain inputs and the correct output that helps the model to learn faster.

**For example**, you want to train a machine to help you predict how long it will take you to drive home from your workplace.

Here, you start by creating a set of labeled data. This data includes:

* Weather conditions
* Time of the day
* Holidays

All these details are your inputs in this Supervised learning example. The output is the amount of time it took to drive back home on that specific day.

**Use cases**

**Marketing and Sales**

Digital marketing and online-driven sales are the first application fields that you may think of for machine learning adoption. People interact with the web and leave a detailed footprint to be analyzed. While there are tangible results in unsupervised learning techniques for marketing and sales, the largest value impact is in the supervised learning field. Let’s have a look.

1. **Lifetime Value.**A customer lifetime value that we mentioned before is usually measured in the net profit this customer brings to a company in the longer run.
2. **Churn.**The churn rate defines the number of customers who cease to complete target actions (e.g. add to cart, leave a comment, checkout, etc.) during a given period.
3. **Sentiment analysis.**Skimming through thousands of feedback posts in social media and comments sections is painstaking work, especially in B2C after a new product or feature rollout

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**Time-series market forecasting**

Time-series forecasting is a specific branch of machine learning and statistics that addresses predicting time-dependent events. These may be seasonal or cyclic fluctuations in any market figures. In the general case, time-series forecasting considers such time-dependent changes as holidays, seasons, or other events that impact sales, prices, and customer activities.

**Security**

Most cyber-security techniques revolve around unsupervised learning, especially the methods that address anomaly detection, i.e. finding outlying data items that may pose a threat. However, there are several use cases where mostly supervised learning is used.

1. Spam filtering. According to Statista, 56.87 percent of all emails were spam in March 2017. This number actually keeps dropping – in April 2014 the share of spam was 71.1 percent – as increasingly more email services have adopted spam-filtering algorithms backed by ML models. The abundance of spam examples provides enough both textual and metadata to sort out this type of correspondence.
2. Malicious emails and links. Detecting phishing attacks becomes critical for all IT departments in organizations, considering the recent case of the Petya virus, which was distributed among corporate infrastructures through email attachments. Currently, there are many public datasets that provide labeled records of malware or even URLs that can be used directly to build classifying models to protect your organization.
3. Fraud detection. As fraudulent actions are very domain-specific, they mostly rely on private datasets that organizations have. For example, many banks that have fraud cases in their data use supervised fraud detection techniques to block potentially fraudulent money transactions accounting for such variables as transaction time, location, money amounts, etc.