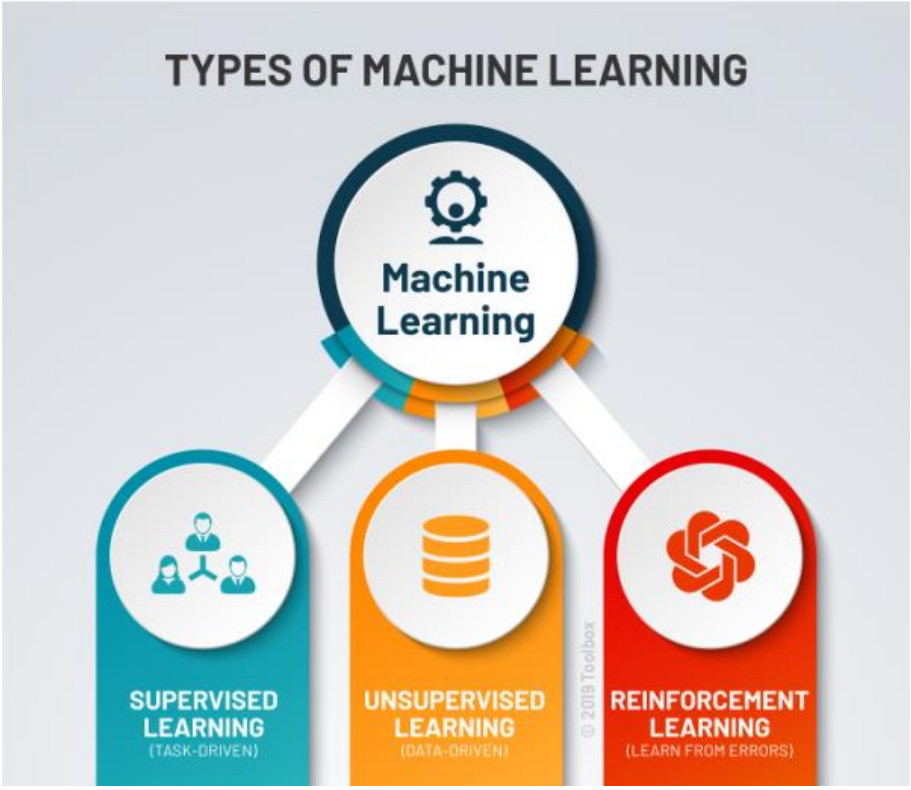
TYPES OF MACHINE LEARNING TECHNIQUES

The three primary types of machine learning techniques are typically categorized based on the learning paradigm they employ, which in turn depends on the type of "signal" or "feedback" accessible to the learning system. They are **Supervised Learning, Unsupervised Learning, Reinforcement Learning.**



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1. ***SUPERVISED LEARNING***

   Supervised learning is a fundamental type of machine learning that involves training a model on labeled data. Despite the need for accurate labeling, it can be highly effective in the right contexts. During supervised learning, an ML algorithm is provided with a small training dataset, which gives the algorithm a basic understanding of the problem and the associated data. The algorithm identifies relationships between the parameters in the dataset and establishes a cause-and-effect relationship between the input and output variables. After the initial training, the algorithm is applied to the final dataset, from which it continues to learn and improve. As it trains on new data, it discovers new patterns and relationships, leading to further improvements in its performance.

   Supervised learning has a wide range of applications in various industries. Some of the most common applications are Image classification, Speech recognition, Fraud detection, Sentiment analysis etc.

2. ***UNSUPERVISED LEARNING***

Unsupervised machine learning has the advantage of working with unlabeled data, which eliminates the need for human labor to make the dataset machine-readable. As a result, unsupervised learning can handle larger datasets than supervised learning. In contrast to supervised learning, where labeled data is used to establish exact relationships between data points, unsupervised learning identifies hidden structures in the data without the aid of labels. This allows unsupervised learning algorithms to perceive relationships between data points in an abstract manner, without any input from humans. The creation of these hidden structures makes unsupervised learning algorithms more versatile. Unlike supervised learning, which requires a well-defined problem statement, unsupervised learning algorithms can dynamically change hidden structures to adapt to the data. This offers more post-deployment development than supervised learning algorithms.

Some of the applications of Unsupervised learning are Clustering (grouping similar data points together), Market basket analysis, Recommendation systems: suggesting products or services to users based on their behavior or preferences, Natural language processing: clustering and analyzing text data, Image and object recognition: identifying patterns and objects in images without human input, Generative models (creating new data from existing data without explicit instructions) etc.

3. ***REINFORCEMENT LEARNING:***

Reinforcement learning is a machine learning technique that utilizes trial-and-error to learn from new situations and improve upon itself. It is based on the psychological concept of conditioning, where the algorithm is placed in a work environment with an interpreter and a reward system. During each iteration, the algorithm's output is evaluated by the interpreter and rewarded if the outcome is favorable, while non-favorable outcomes are discouraged. The reward system is directly tied to the effectiveness of the result, so the algorithm is trained to give the best possible solution for the best possible reward. Reinforcement learning is commonly used in scenarios where the solution is not an absolute value but rather a score of effectiveness expressed in a percentage.

A popular use-case for reinforcement learning is finding the shortest route between two points on a map. Reinforcement learning has numerous applications, including Robotics, Autonomous vehicles, Game playing etc.

References:

[1] Potentia Analytics. "What Is Machine Learning: Definition, Types, Applications and Examples." *Potentia Analytics*, 19 Dec. 2019, <https://www.potentiaco.com/what-is-machine-learning-definition-types-applications-and-examples/.>

[2] "Machine Learning." *Wikipedia*, Wikimedia Foundation, 16 Feb. 2023, <https://en.wikipedia.org/wiki/Machine_learning.>