

Artificial Intelligence (Machine Learning)

With: Youssef, Jamal, Elmahdi



What is Machine Learning?

Machine Learning is a branch of **Artificial Intelligence** that gives systems the ability to learn automatically and improve themselves from the experience without being explicitly programmed or without the intervention of human.

its main aim to make computers learn automatically from the experience.

Requirements of creating good machine learning systems.

So what is required for creating such machine learning systems?

DATA: Input data is required for predicting the output.

ALGORITHMS: ML is dependent on certain statistical algorithms to determine data patterns.

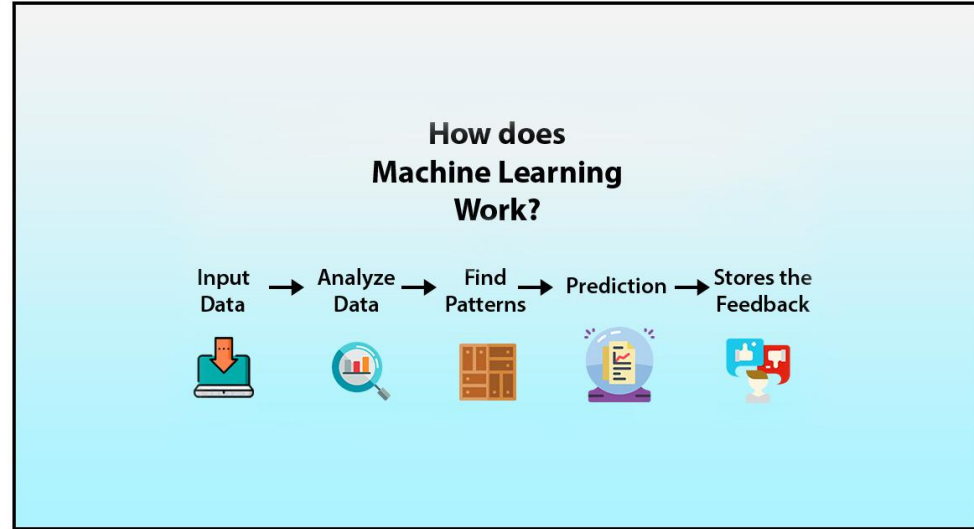
AUTOMATION: It is the ability to make systems operate automatically.

ITERATION: The complete process is iterative i.e. repetition of process.

SCALABILITY: The capacity of the machine can be increased or decreased in size and scale.

MODELING: The model are created according to the demand by the process of modeling.

How does Machine Learning work?



Les catégories de machine learning

1. Machine learning avec supervision

Le machine learning avec supervision est une technologie élémentaire mais stricte. Les opérateurs présentent à l'ordinateur des exemples d'entrées et les sorties souhaitées, et l'ordinateur recherche des solutions pour obtenir ces sorties en fonction de ces entrées. Le but recherché est que l'ordinateur apprenne la règle générale qui mappe les entrées et les sorties.

- **Classification** – La variable de sortie est une catégorie.
- **Régression** – La variable de sortie est une valeur spécifique.

Les catégories de machine learning

2. Machine learning sans supervision

Dans le machine learning sans supervision, l'algorithme est laissé à lui-même pour déterminer la structure de l'entrée (aucun label n'est communiqué à l'algorithme). Cette approche peut être un but en soi (qui permet de découvrir des structures enfouies dans les données) ou un moyen d'atteindre un certain but. Cette approche est également appelée « apprentissage des caractéristiques » (feature learning).

- **Clustering** – L'objectif consiste à trouver des regroupements dans les données.
- **Association** – L'objectif consiste à identifier les règles qui permettront de définir de grands groupes de données.

Les catégories de machine learning

3. Machine learning par renforcement

Dans le machine learning par renforcement, un programme informatique interagit avec un environnement dynamique dans lequel il doit atteindre un certain but, par exemple conduire un véhicule ou affronter un adversaire dans un jeu. Le programme-apprenti reçoit du feedback sous forme de « récompenses » et de « punitions » pendant qu'il navigue dans l'espace du problème et qu'il apprend à identifier le comportement le plus efficace dans le contexte considéré.

- **Monte Carlo** – Le programme reçoit ses récompenses à la fin de l'état « terminal ».
- **Machine learning par différence temporelle (TD)** – Les récompenses sont évaluées et accordées à chaque étape.

Les types d'algorithmes de machine learning

Algorithmes avec arbre décisionnel

Un arbre décisionnel est un type d'algorithme qui peut être appliqué à de nombreux contextes : grande distribution, finance, produits pharmaceutiques, etc. La machine se contente d'établir l'arborescence de divers résultats qui peuvent ou ne peuvent pas se produire, et suit chaque événement jusqu'à sa conclusion naturelle tout en calculant toutes les probabilités des événements pouvant se produire.

Les types d'algorithmes de machine learning

Algorithmes des forêts aléatoires

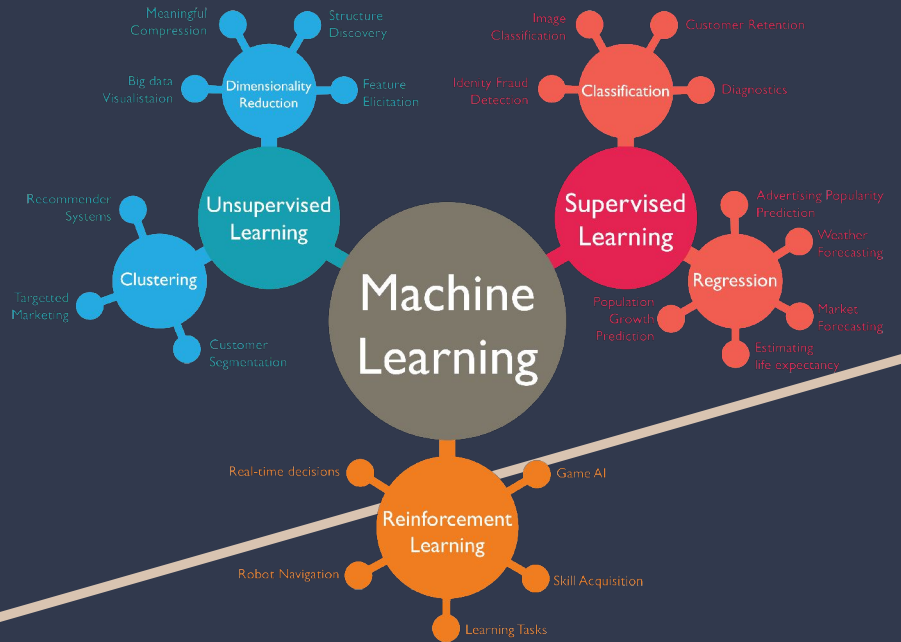
La forêt aléatoire est un autre algorithme utilisé très couramment. Cet algorithme construit plusieurs arbres de classification et de régression (CART, Classification and Regression Tree), chaque arbre étant associé à différents scénarios et différentes variables initiales. L'algorithme est randomisé, ce qui n'est pas le cas des données. Ce type d'algorithme est utilisé pour la modélisation prédictive de classification et de régression.

Les types d'algorithmes de machine learning

Algorithmes K-Means

Les K-Means sont des algorithmes de machine learning sans supervision qui sont utilisés pour résoudre des problèmes de clustering. Ils divisent et classent un ensemble de points de données non affectés d'un label (sans classification externe) en un groupe appelé « cluster » (sans rapport avec les clusters de serveurs). Chaque itération de l'algorithme assigne chaque point à un groupe présentant des caractéristiques similaires. Les points de données peuvent être suivis dans le temps pour détecter les changements qui se produisent dans les clusters.

Benefits of machine Learning.



Decision making is faster: ML provides the best possible outcomes by prioritizing the routine decision-making processes.

Adaptability: The ML provides the ability to adapt to new changing environment rapidly.

Innovation: ML uses advanced algorithms that improve the overall decision-making capacity.

Insight: ml helps in understanding unique data patterns and based on which specific actions can be token.

Business growth: With machine learning overall business process and workflow will be faster and hence this would contribute to the overall business growth and acceleration.

Outcome will be good: With machine learning the quality of the outcome will be improved with lesser chances of error.

Branch of Machine Learning

Computational Learning Theory:

subfield of machine learning for studying and analyzing the algorithms of machine learning.

Adversarial Machine Learning:

AML deals with the interaction of ML and computer security.

The main aim of this technique is to look for safer methods in machine learning to prevent any form of spam and malware.

Quantum ML:

This area of machine learning deals with quantum physics.

Predictive analysis:

PA uses statistical techniques from data modeling, machine learning and data mining to analyze current and historical data to predict the future.

Branch of Machine Learning

Robot Learning:

This area deals with the interaction of machine learning and robotics.

Grammar Introduction:

It is a process in machine learning to learn formal grammar from a given set of observations to identify characteristics of the observed model.

Meta Learning:

In this process learning algorithms are applied on metadata and mainly deals with automatic learning algorithms.

Best Machine Learning Tools

- ★ ai-one
- ★ Protege
- ★ IBM Watson
- ★ DiffBlue
- ★ TensorFlow
- ★ Amazon Web Services
- ★ Open NN
- ★ Apache Spark
- ★ Veles

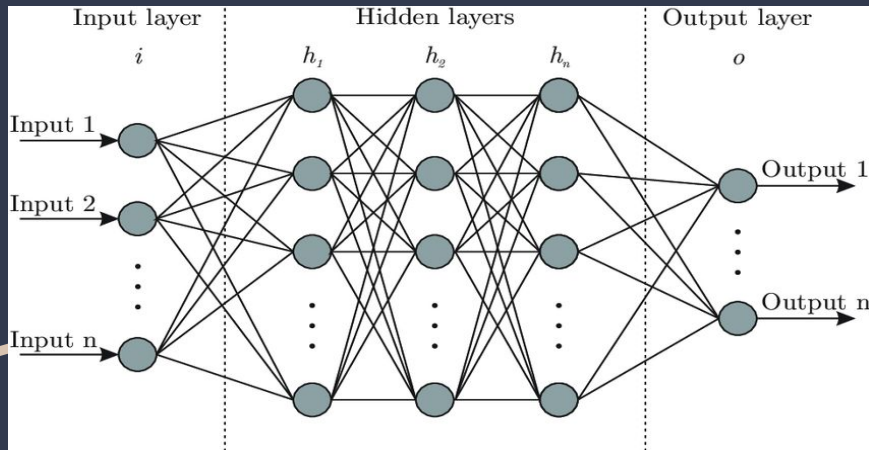
Deep Learning vs Machine Learning

In practical terms, deep learning is just a subset of machine learning. In fact, deep learning technically *is* machine learning and functions in a similar way (hence why the terms are sometimes loosely interchanged). However, its capabilities are different.

While basic machine learning models do become progressively better at whatever their function is, but they still need some guidance. If an AI algorithm returns an inaccurate prediction, then an engineer has to step in and make adjustments. With a deep learning model, an algorithm can determine on its own if a prediction is accurate or not through its own neural network.

How Does Deep Learning Work?

A deep learning model is designed to continually analyze data with a logic structure similar to how a human would draw conclusions. To achieve this, deep learning applications use a layered structure of algorithms called an **artificial neural network**. The design of an artificial neural network is inspired by the biological neural network of the human brain, leading to a process of learning that's far more capable than that of standard machine learning models.

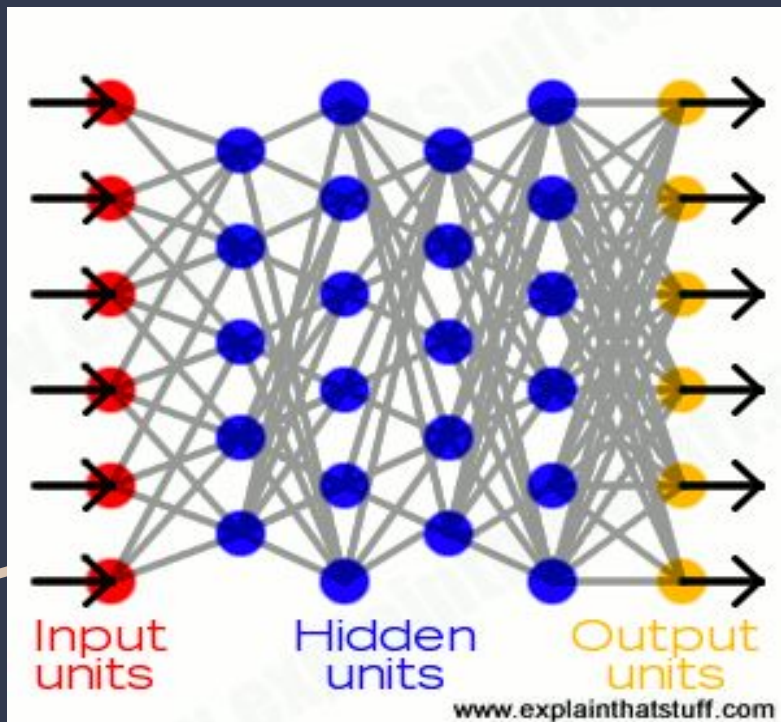


It's a tricky prospect to ensure that a deep learning model doesn't draw incorrect conclusions—like other examples of AI, it requires lots of training to get the learning processes correct.

An Example of Google's AlphaGo

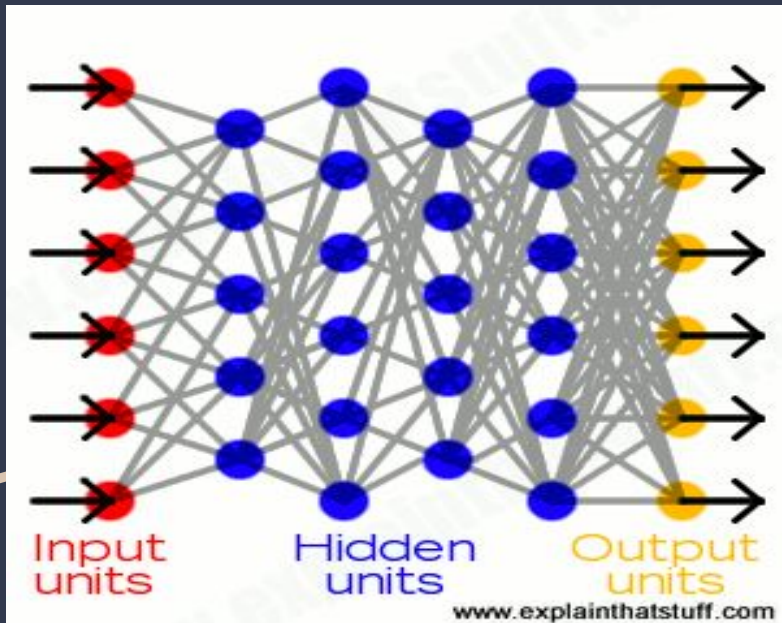
A great example of deep learning is [Google's AlphaGo](#). Google created a computer program with its own neural network that learned to play the abstract board game called Go, which is known for requiring sharp intellect and intuition. By playing against professional Go players, AlphaGo's deep learning model learned how to play at a level never seen before in artificial intelligence, and did without being told when it should make a specific move

So.. What is a Neural Network?



A typical neural network has anything from a few dozen to hundreds, thousands, or even millions of artificial neurons called **units** arranged in a series of layers, each of which connects to the layers on either side. Some of them, known as **input units**, are designed to receive various forms of information from the outside world that the network will attempt to learn about, recognize, or otherwise process. Other units sit on the opposite side of the network and signal how it responds to the information it's learned; those are known as **output units**. In between the input units and output units are one or more layers of **hidden units**, which, together, form the majority of the artificial brain. Most neural networks are **fully connected**, which means each hidden unit and each output unit is connected to every unit in the layers either side. The connections between one unit and another are represented by a number called a **weight**, which can be either positive (if one unit excites another) or negative (if one unit suppresses or inhibits another). The higher the weight, the more influence one unit has on another.

How does a neural network learn things?



Information flows through a neural network in two ways. When it's learning (being trained) or operating normally (after being trained), patterns of information are fed into the network via the input units, which trigger the layers of hidden units, and these in turn arrive at the output units.

Each unit receives inputs from the units to its left, and the inputs are multiplied by the weights of the connections they travel along. Every unit adds up all the inputs it receives in this way and (in the simplest type of network) if the sum is more than a certain **threshold** value, the unit "fires" and triggers the units it's connected to (those on its right).

For a neural network to learn, there has to be an element of feedback involved—just as children learn by being told what they're doing right or wrong.



THANK YOU

SO MUCH