

# Machine Learning

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## Abstract

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves.

The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

## Introduction

The term Machine Learning was coined by Arthur Samuel in 1959, an American pioneer in the field of computer gaming and artificial intelligence and stated that it gives computers the ability to learn without being explicitly programmed.

Machine Learning is a latest buzzword floating around. It deserves to, as it is one of the most interesting subfield of Computer Science.

## Applications

As we move forward into the digital age, One of the modern innovations we've seen is the creation of Machine Learning.

We apply machine learning methods to obtain an index arbitrage strategy. In particular, we employ linear regression and support vector regression (SVR) onto the prices of an exchange-traded fund and a stream of stocks.

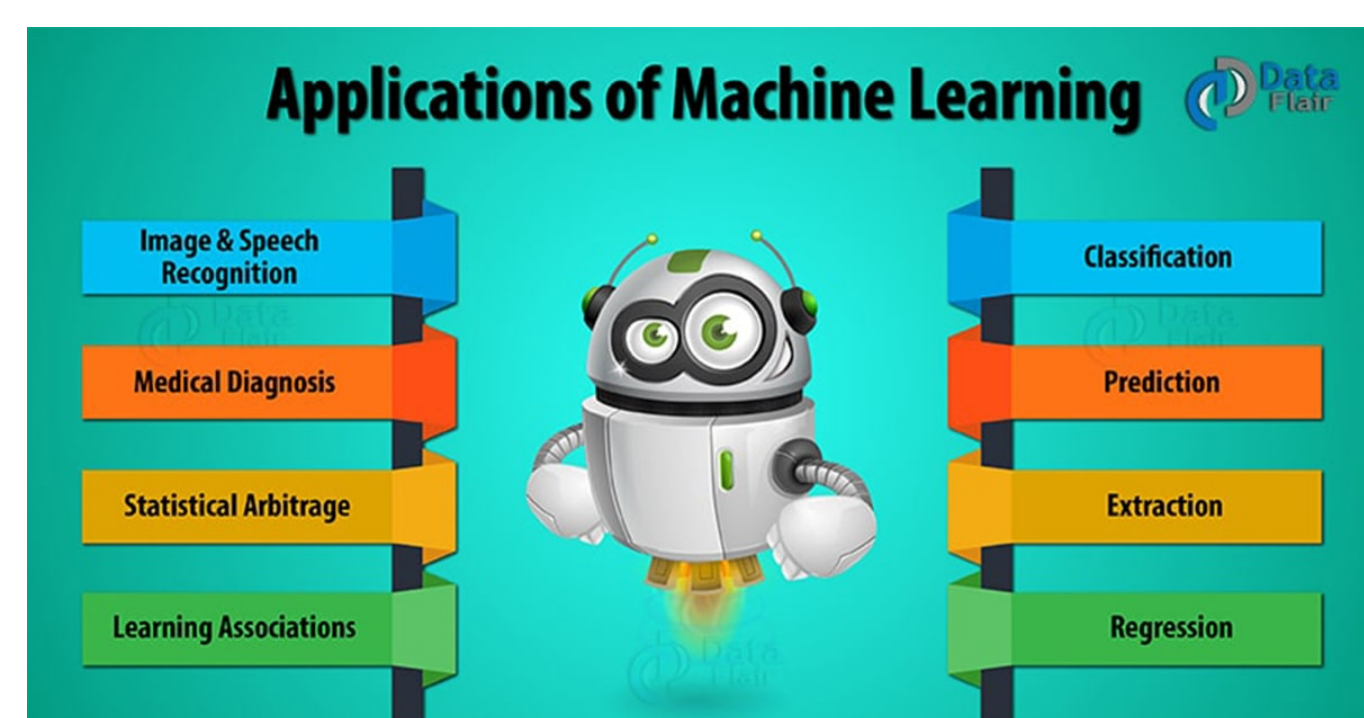


Figure 1: Some applications of Machine Learning.

## Scope of Machine Learning

### Quantum Computing

It is likely that both the development of both supervised and unsupervised quantum machine learning algorithms will hugely increase the number of vectors and their dimensions exponentially more quickly than classical algorithms.

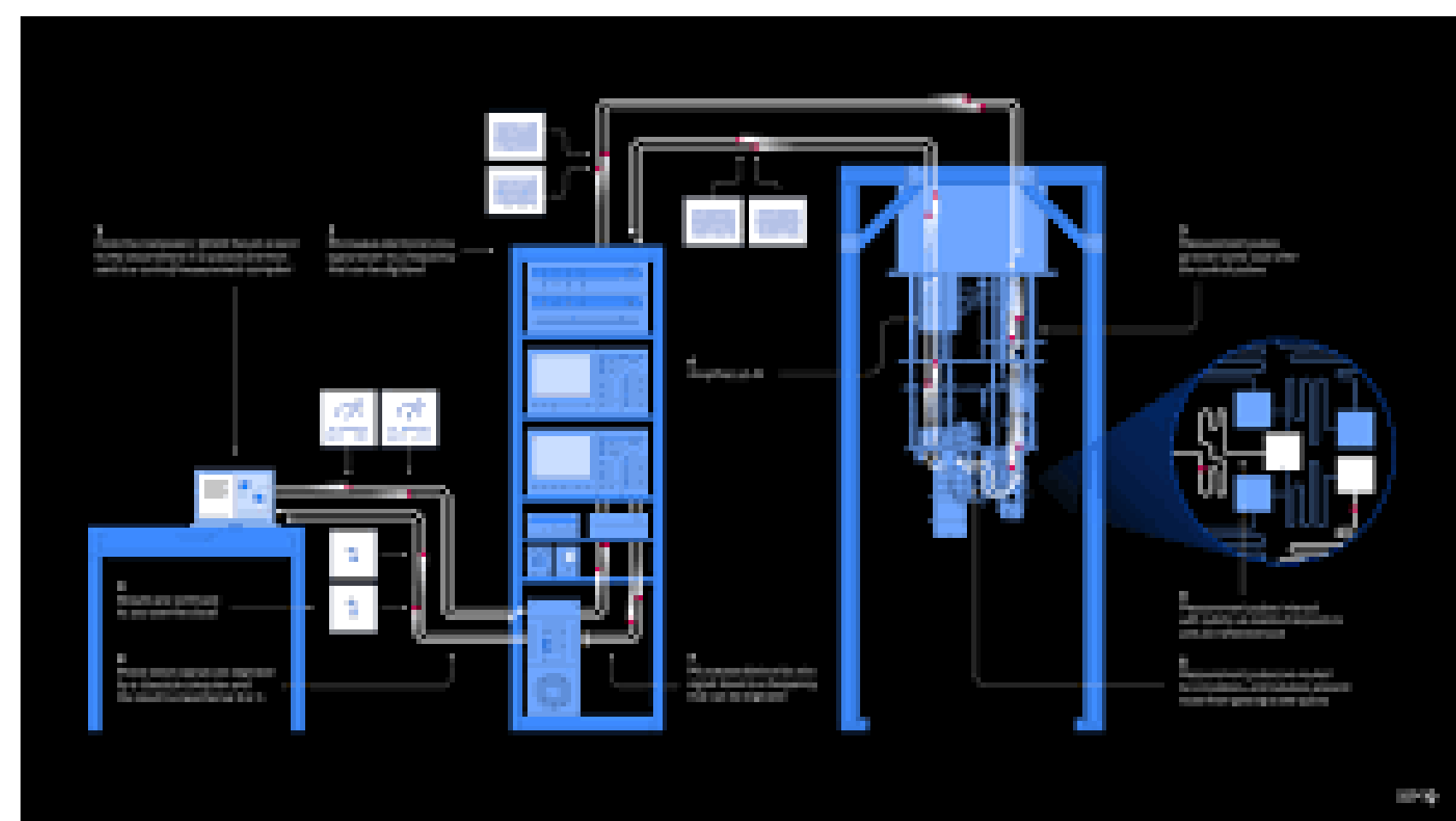


Figure 2: Quantum Computing

## Collaborative Learning

Collaborative learning is about utilizing different computational entities so that they collaborate in order to produce better learning results than they would have achieved on their own. An example of this would be utilizing the nodes of an IoT sensor network.

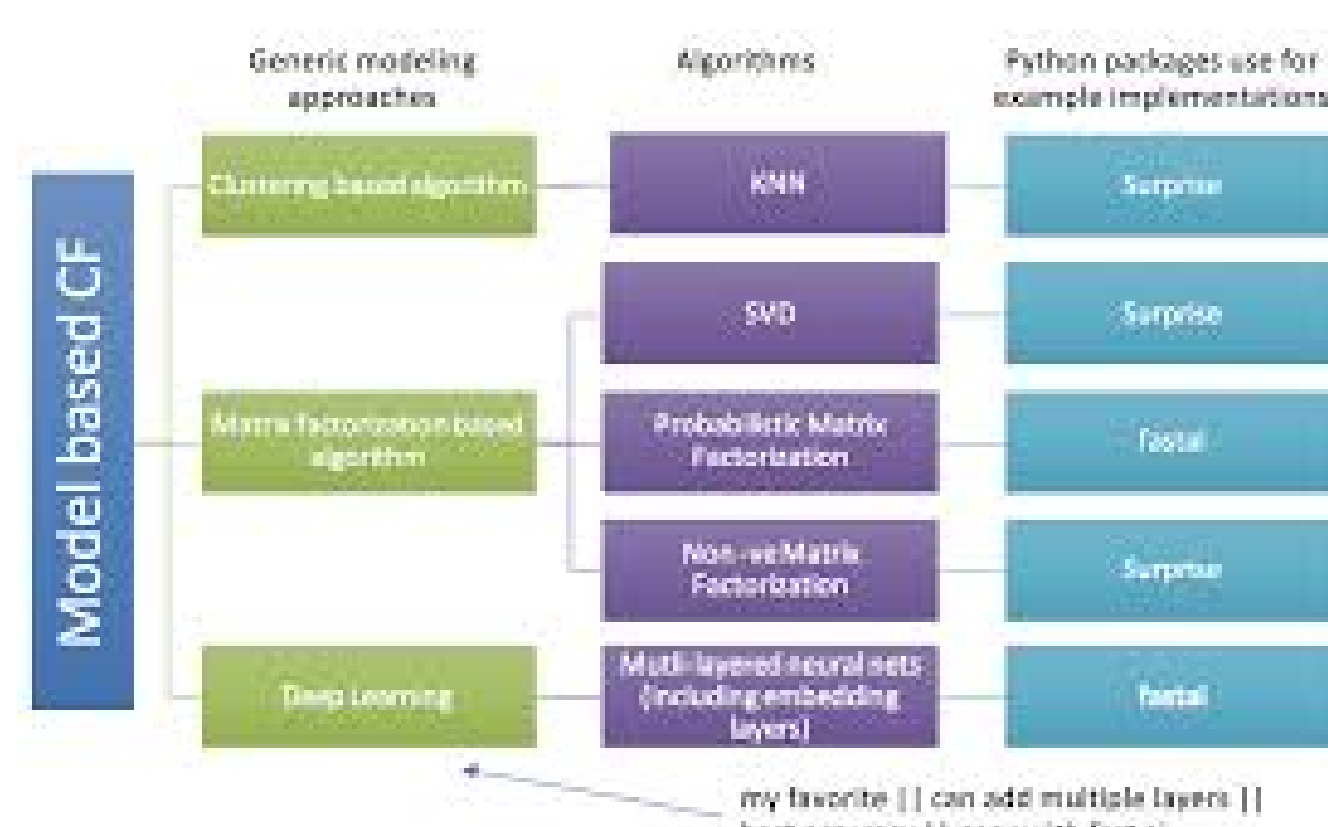


Figure 3: Collaborative Filtering

## Cognitive Services

This technology includes kit like APIs and services through which developers can create more discoverable and intelligent applications. Machine learning APIs will allow developers to introduce intelligent features such as emotion detection; speech, facial, and vision recognition; and language and speech understanding into their applications.

## Effects on Daily Life

- **Intelligent Gaming:** In 1997, IBM's Deep Blue defeated Gary Kasparov in chess. Google DeepMind's AlphaGo, defeated Lee Sedol, the Go world champion, in 2016.
- **Self-Driving Cars and Automated Transportation:** AI-powered cars have even surpassed human-driven cars in safety, according to a study with 55 Google vehicles that have driven over 1.3 million miles altogether.
- **Taking Over Dangerous Jobs:** Today, robots (or more more technically, drones) are taking over these risky jobs, among others. Right now, most of these drones require a human to control them. But as machine learning technology improves in the future, these tasks would be done completely by robots with AI.
- **Environmental Protection:** Machines can store and access more data than any one person could including mind-boggling statistics. Using big data, AI could one day identify trends and use that information to arrive at solutions to previously untenable problems.



Figure 4: Effects of ML

## Important Algorithms

Following is the list of some important ML Algorithms

1. Linear Regression
2. Logistic Regression
3. Decision Tree
4. SVM (Support Vector Machines)
5. Naive Bayes
6. Dimensionality Reduction Algorithms
7. Random Forest
8. Gradient Boosting algorithms

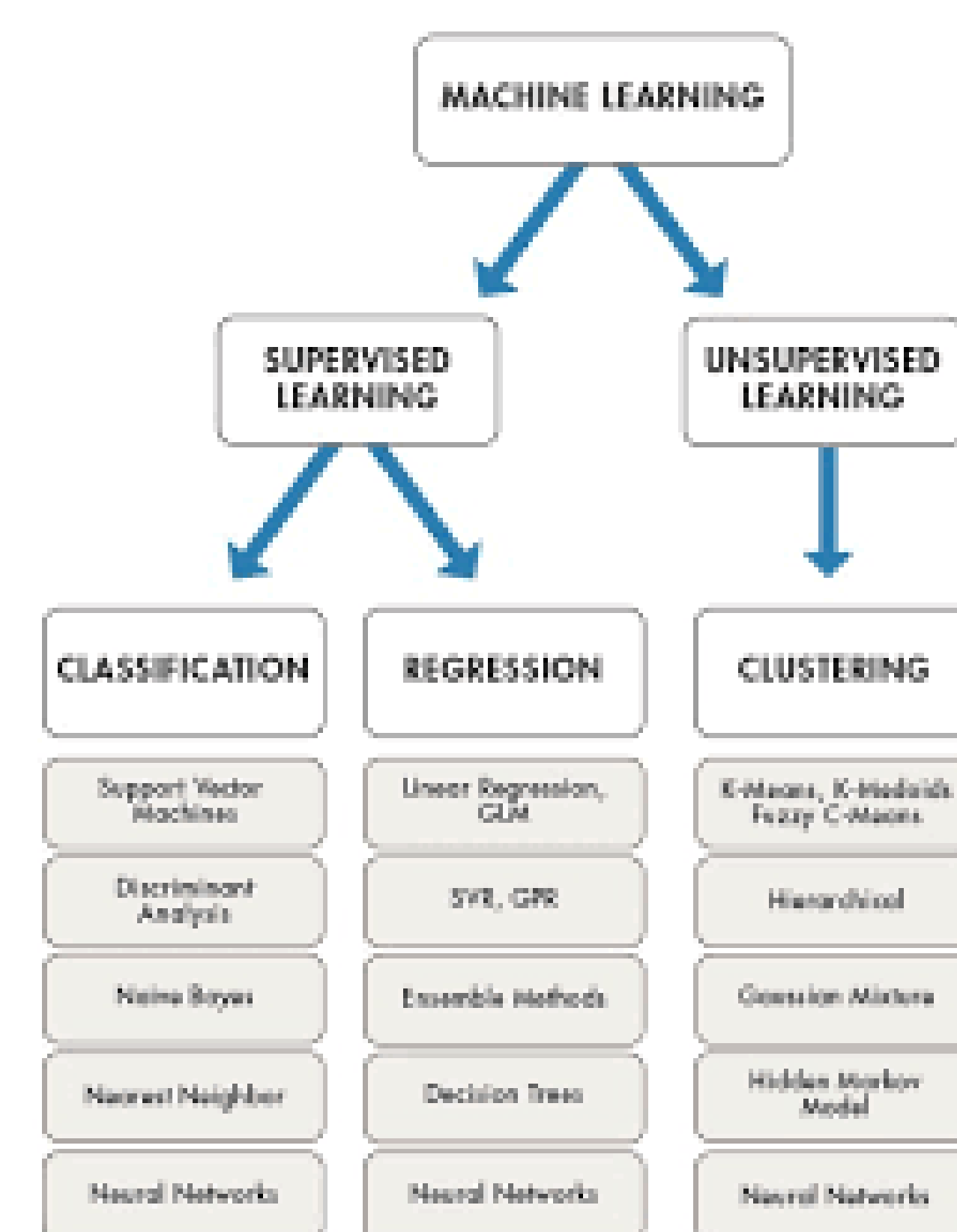


Figure 5: Some Important Algorithms

## Conclusions

Machine Learning is one of the most exciting fields of research today. Companies like Google, Amazon, Microsoft are widely using ML to provide better services to customers. Data Mining and Data Science are quickly becoming important and widely researched areas of study. The applications of Machine Learning in the fields of Automation, Military, Image Recognition etc. are endless.

## Forthcoming Research

Real-time analytics, which has applied in real world scenarios like IOT sensor data, 'live' recommenders, real-time bidding (RTB) for advertisements, stock market analysis, fraud, anomaly detection, etc. The community has done a lot of foundation work in the form of architecture, tools and online learning models

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