# A Review on Machine Learning

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***ABSTRACT:***

*Machine Learning is one of the most important methods in today's research. It has become ubiquitous and one often encounters results of Machine Learning processes in daily life without even noticing. Machine learning is an integral part of artificial intelligence which is used to design algorithms based on the data trends and historical relationship between data. This paper try to cover all the important aspects of machine learning algorithms.*

**Key Words:** Machine Learning Algorithms

## Introduction

There are many technical and functional definitions for Machine learning and some of them are as follows:
A branch of artificial intelligence in which a computer generates rules underlying or based on raw data that has been fed into it [1]. Machine learning is a scientific discipline that is concerned with the design and development of algorithms that allow computers to evolve behaviors based on empirical data, such as from sensor data or databases. [2].Machine learning usually refers to the changes in systems that perform tasks associated with artificial intelligence (AI). Such tasks involve recognition, diagnosis, planning, robot control, prediction, etc.

Machine learning is used in **different domains** such as

- security heuristics that distill attack patterns to protect, for instance, ports or networks;
- image analysis to identify distinct forms and shapes, such as for medical analyses or face and fingerprint recognition;
- deep learning to generate rules for data analytics and big data handing, such as are used in marketing and sales promotions;

Machine learning is a powerful tool for gleaning knowledge from massive amounts of data. Machine learning typically contain **main three phases**:
a. Training Phase
b. Validation and Test Phase
c. Application Phase
In the testing phase, the normal pattern is defined for detecting anomalies. In the training phase, the learned model is applied into new data and each pattern is classified into normal or anomalous.

## Models

Models are central to any Machine learning implementation. A model describes data that is observed in a system. Models are the output of algorithms applied to a dataset, models are categorized as the following:

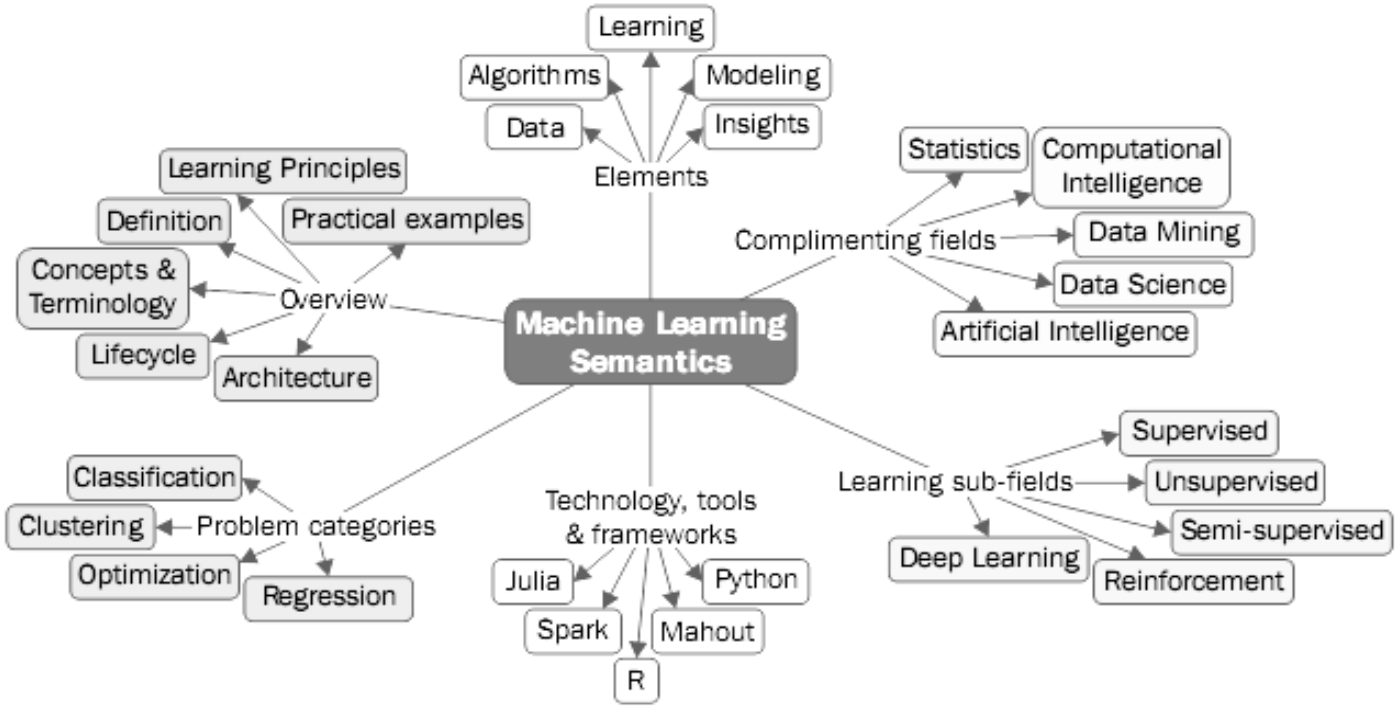
- Logical models
- Geometric models
- Probabilistic models

## Types of Machine Learning

Machine Learning (ML) is divided into three subdomains [4]:

- supervised learning,
- unsupervised learning,
- reinforcement learning.

In 'supervised learning', the algorithm is fed a set of 'training' data that contains labels on some portion of the observations




Machine Learning Semantics

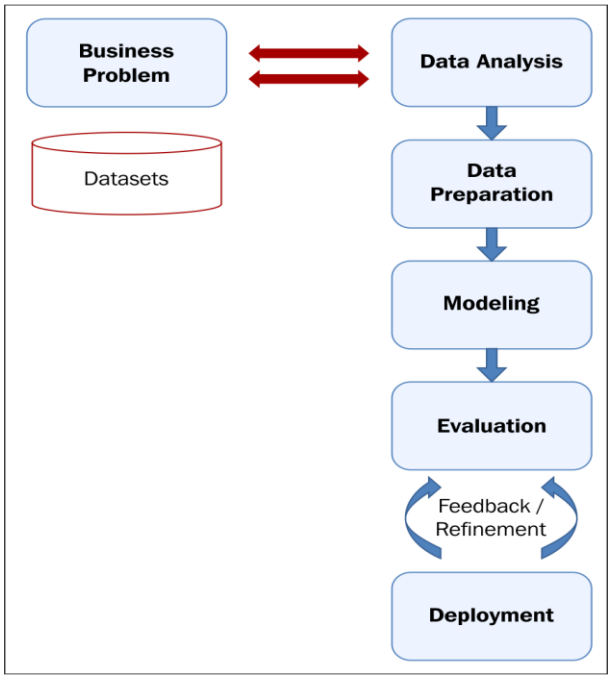
- 'Unsupervised learning' refers to situations where the data provided to the algorithm does not contain labels.
- 'Reinforcement learning' falls in between supervised and unsupervised learning

## List of Common Machine Learning Algorithms:

1. Linear Regression
2. Logistic Regression
3. Decision Tree
4. SVM
5. Naive Bayes
6. kNN
7. K-Means
8. Random Forest
9. Dimensionality Reduction Algorithms
10. Gradient Boosting algorithms

1. GBM
2. XGBoost
3. LightGBM
4. CatBoost

Machine learning lifecycle process is to analyze the avail-able data of a given business problem, then the input data is prepared as training data that does not contain any errors with identified features and values in it.




Machine learning process lifecycle and solution architecture

| Algorithms | Algorithms type | Algorithms characteristic | Learning policy | Learning algorithms | Classification strategy |
|---|---|---|---|---|---|
| Decision tree | Discriminant | Classification tree | Regularized maximum likelihood estimation | Feature selection, generation, prune | IF-THEN rule According to tree spitting |
| Non-linear SVM (based on libsvm) | Discriminant | Super-plane separation, kernel trick | Minimizing regular hinge loss, soft margin maximization | Sequential minimal optimization algorithm (SMO) | Maximum class of test samples |
| Linear SVM (based on liblinear) | Discriminant | Super-plane separation | Minimizing the loss of regular hinge, soft margin maximization | Sequential dual method | Maximum Weighted test sample |
| Stochastic gradient boosting | Discriminant | Linear combination of weak classifier (based on decision tree) | Addition minimization loss | Stochastic gradient descent algorithm | Linear combination of weighted maximum weak classifiers |
| Naive Bayesian classifier | Generative | Joint distribution of class and feature, conditional independent assumption | Estimation ofm aximum likelihood, Maximum post erior | Probabilistic computation | Maximum posterior probability |

**comparison** of some machine learning algorithms

## Essential Tools

The new generations tools are very smart,it breaks the traditional tools of operating in batch mode, New tools are used in real-time analytics, big data and deeper analytics.

| Tools | | | | | |
|---|---|---|---|---|---|
| | Python | R | Spark | Matlab | TensorFlow |
| License | Open Source | Open Source | Open Source | Proprietary | Open Source |
| Distributed | No | No | Yes | No | No |
| Visualization | Yes | Yes | No | Yes | No |
| Neural nets | Yes | Yes | Multilayer classifier | Yes | Yes |
| Supported languages | Python | R | Scala,java | Matlab | Python & C++ |
| Variety of machine learning models | High | High | Medium | High | Low |
| Suitability as a general purpose Tool | High | Medium | Medium | High | Low |

Some popular machine-learning tools

## Benefits of Machine Learning in the Cloud

- The cloud's use per pay model is good for AI or machine learning workloads.
- The cloud with machine learning projects increases the production ondemand .
- Additional intelligence skills are not required while using Cloud with AI.
- AWS, Microsoft Azure, and Google Cloud Platform software are provide many machine learning algorithm.

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