

# Machine Learning

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# 1 Introduction

## 2 ML history

## 3 Types of ML

# What is ML?

Arthur Samuel, Machine Learning algorithms enable the computers to learn from data, and even improve themselves, without being explicitly programmed.

Aurélien Géron, Machine Learning is about building systems that can learn from data. Learning means getting better at some task, given some performance measure.

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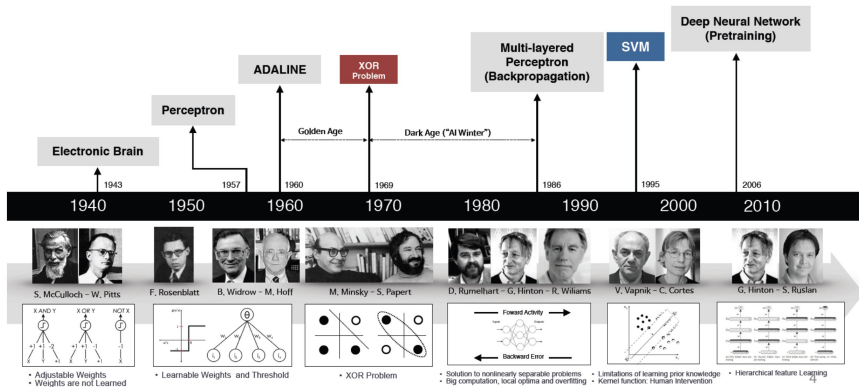


Figure 1: ML history



Figure 2: ENIAC

## ENIAC

It was in the 1940s when the first manually operated computer system, ENIAC (Electronic Numerical Integrator and Computer), was invented. At that time the word computer was being used as a name for a human with intensive numerical computation capabilities, so, ENIAC was called a numerical computing machine! Well, you may say it has nothing to do with learning?! WRONG, from the beginning the idea was to build a machine able to emulate human thinking and learning.



# Milestones of ML

- 1986 - backpropagation algorithm
  - The algorithm works by taking the derivative of the network's loss function and back-propagating the errors to update the parameters in the lower layers
- 2006 - Hinton, deep belief nets - multilayer network
  - Around 2006, Hinton once again declared that he knew how the brain works, and introduced the idea of unsupervised pretraining and deep belief nets.  
Deep Learning ... moving beyond shallow machine learning since 2006
- 2012 - the breakthrough - multi-GPU, AlexNet

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# Types of Learning

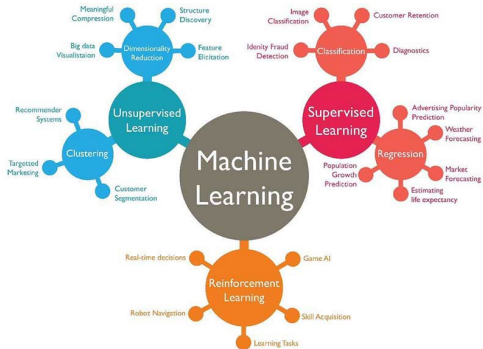


Figure 3: Types of Learning

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

# Supervised Learning

In Supervised learning, an AI system is presented with data which is labeled, which means that each data is tagged with the correct label.

The goal is to approximate the mapping function so well that when you have new input data ( $x$ ) that you can predict the output variables ( $Y$ ) for that data.

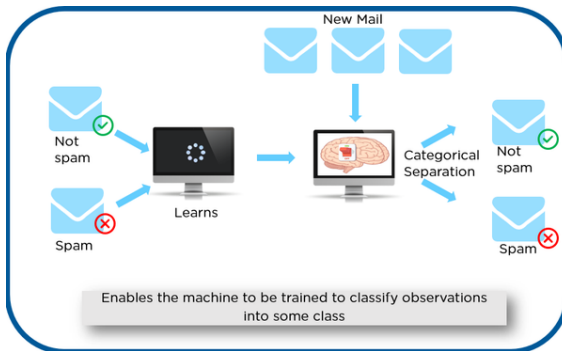


Figure 4: Supervised Learning

# Unsupervised Learning

In unsupervised learning, an AI system is presented with unlabeled, uncategorized data and the systems algorithms act on the data without prior training. The output is dependent upon the coded algorithms. Subjecting a system to unsupervised learning is one way of testing AI.

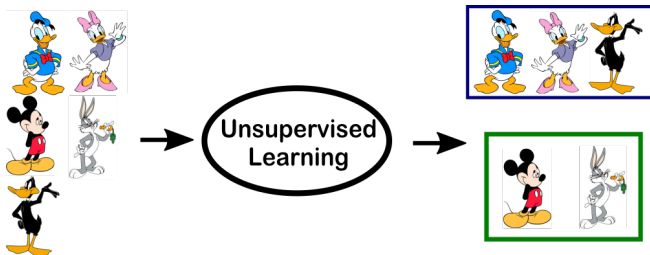


Figure 5: Unsupervised Learning

# Reinforcement Learning

A reinforcement learning algorithm, or agent, learns by interacting with its environment. The agent receives rewards by performing correctly and penalties for performing incorrectly. The agent learns without intervention from a human by maximizing its reward and minimizing its penalty. It is a type of dynamic programming that trains algorithms using a system of reward and punishment.



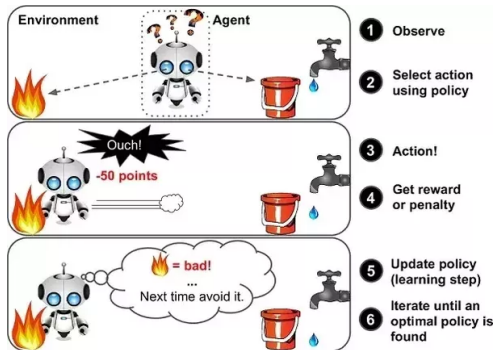


Figure 6: Reinforcement Learning



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