Artificial Intelligence & Machine Learning

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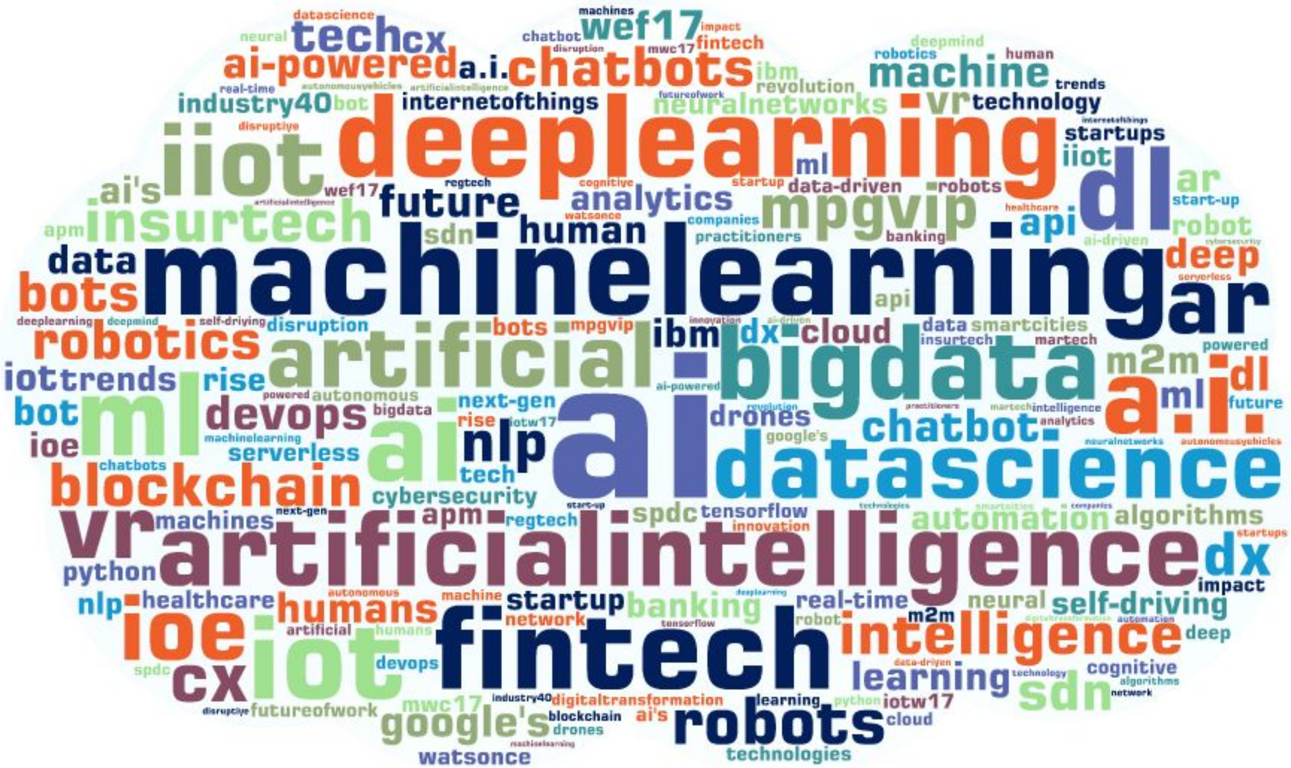
ZorroSign

About Me

- CTO - ZorroSign Inc. (USA)
- Cyber Security and Tech Enthusiast
- BSc (Hons) in Computer Science & BSc in Physical sciences
- MSc in Cyber Security
- Visiting Lecturer @ UCSC & APIIT
- Active Speaker, Blogger and Community Contributor
- Founder of the Colombo Secure Programmers' Community

Why?



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tensorflow
automation
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artificialintelligence
python
healthcare
humans
startup
banking
real-time
neural
self-driving
ioe
iot
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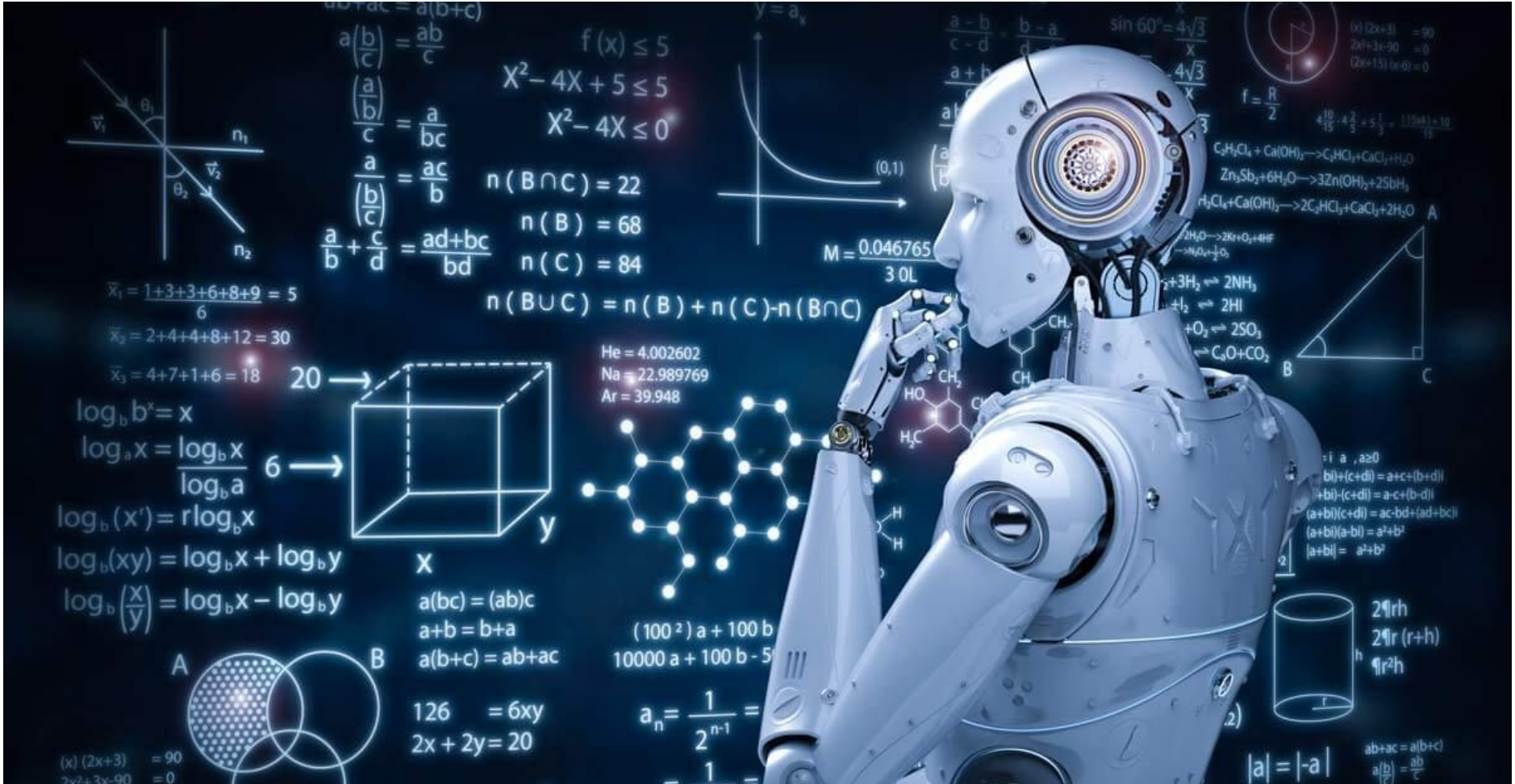
intelligence
cx
learning
sdn
cognitive
google's
robots
futureofwork
digitaltransformation
watsonce
technologies

The main 4 great leaps in Human history

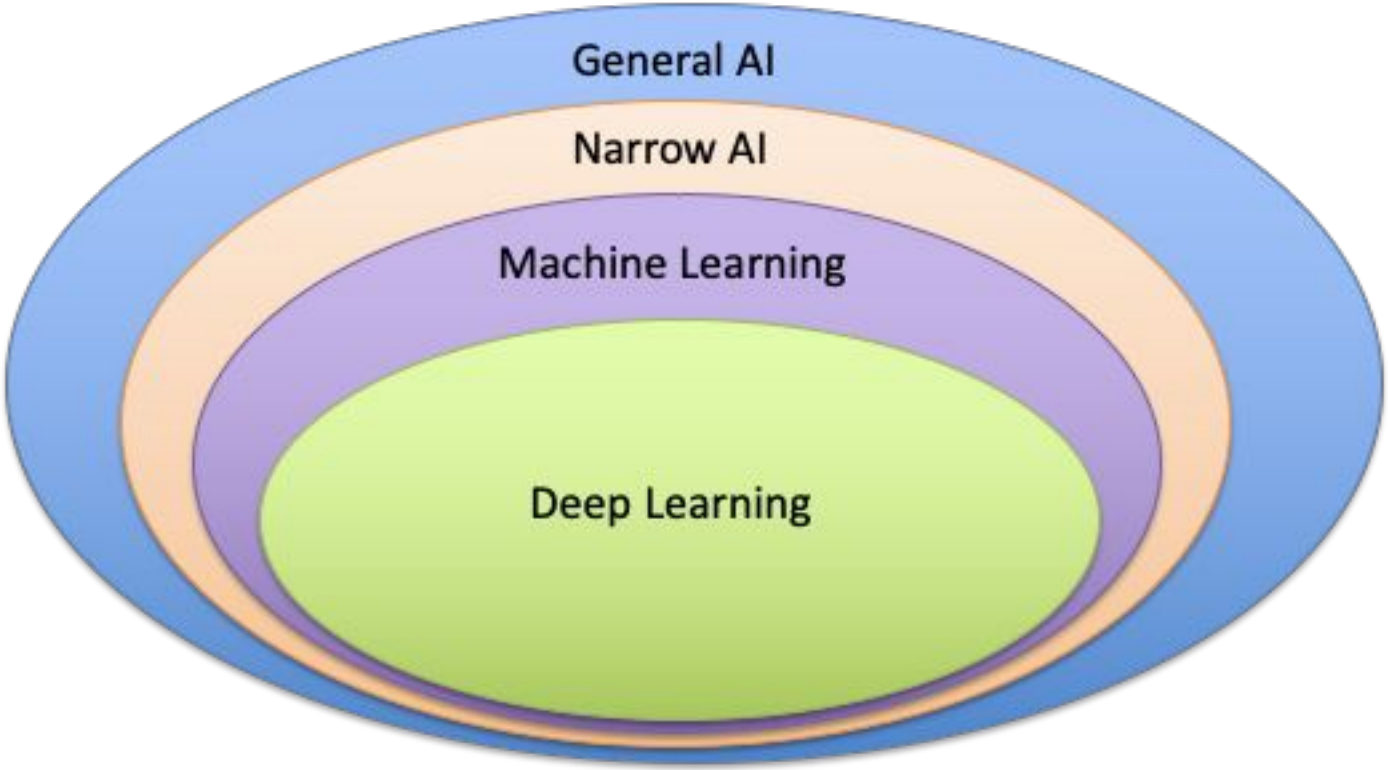
- 1st Age : 100,000 years ago we harnessed fire
- 2nd Age : 10,000 years ago we developed agriculture, which led to cities and warfare.
- 3rd Age : 5,000 years ago we invented the wheel and writing, which led to the nation state.
- 4th Age ???

*The Fourth Age : Byron Reese

What is Artificial General AI ?



What is Deep Learning ?



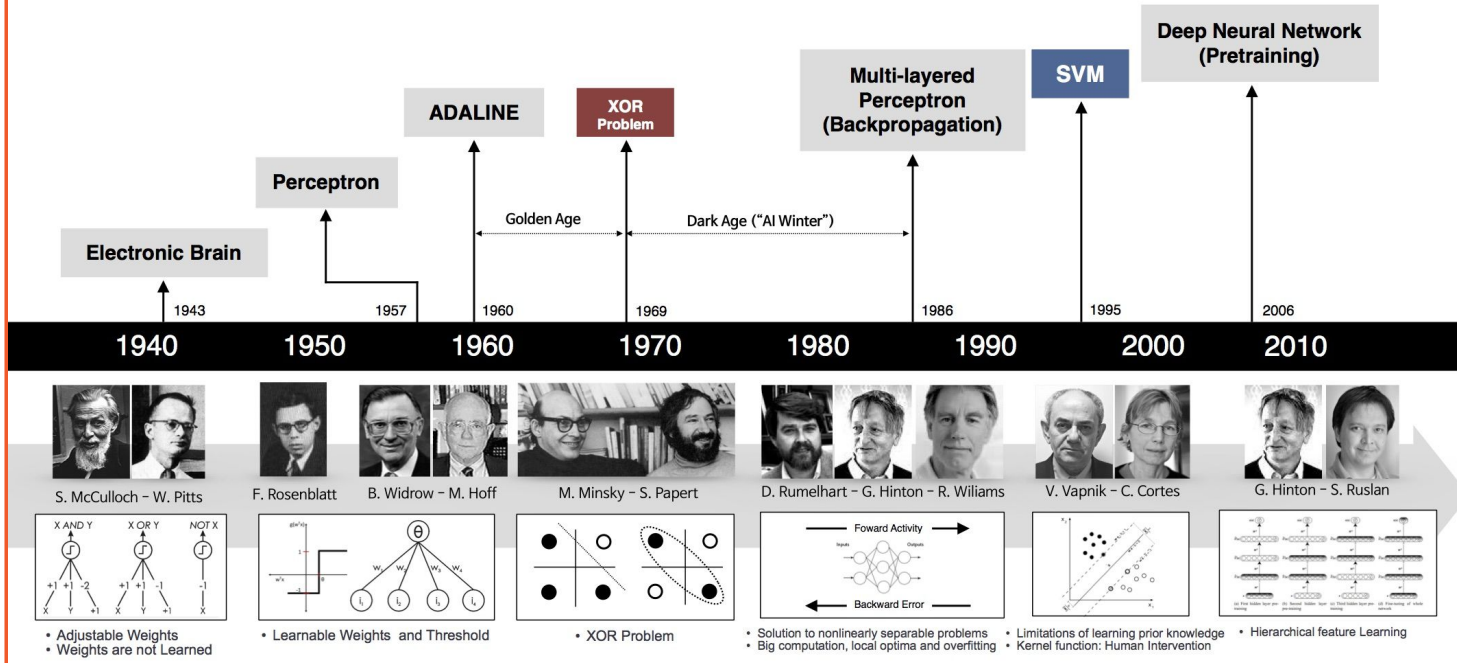
Deep Learning & Machine Learning is part of the Narrow AI

History of AI

Artificial Intelligence is not a new concept

- Early models were developed between 1940 and 1960s
- The first artificial neural network developed by Frank Rosenblatt - 1948 : The Perceptron
- Early models (eg : Minsky & Papert are not that effective)
- Introduction of the backpropagation algorithm (Rummelhart et. al 1986) sparks new interest.
- Early models suffered from lack of data and machine power
- IoT and Bigdata ignites the current hype of the AI

History of AI



What is AI ?

- **Formal Definition**
  “Intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans” *

  “Machines (or computers) that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving" *

What is ML ?

- **Formal Definition**
  “A scientific study of algorithms and statistical models that computer systems use to **perform a specific task without using explicit instructions**, relying on patterns and inference instead.” *

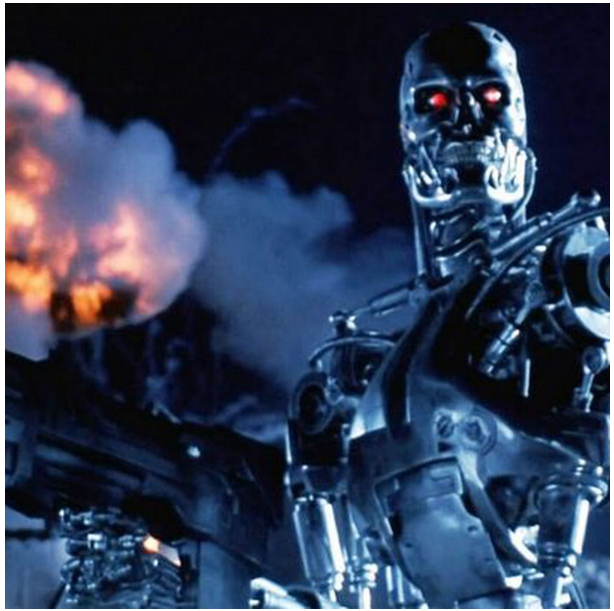
  “Machines learning is a science of getting computers to act without being explicitly programmed " -Arthur Samuel, 1959

What is AI ?

What is AI ?

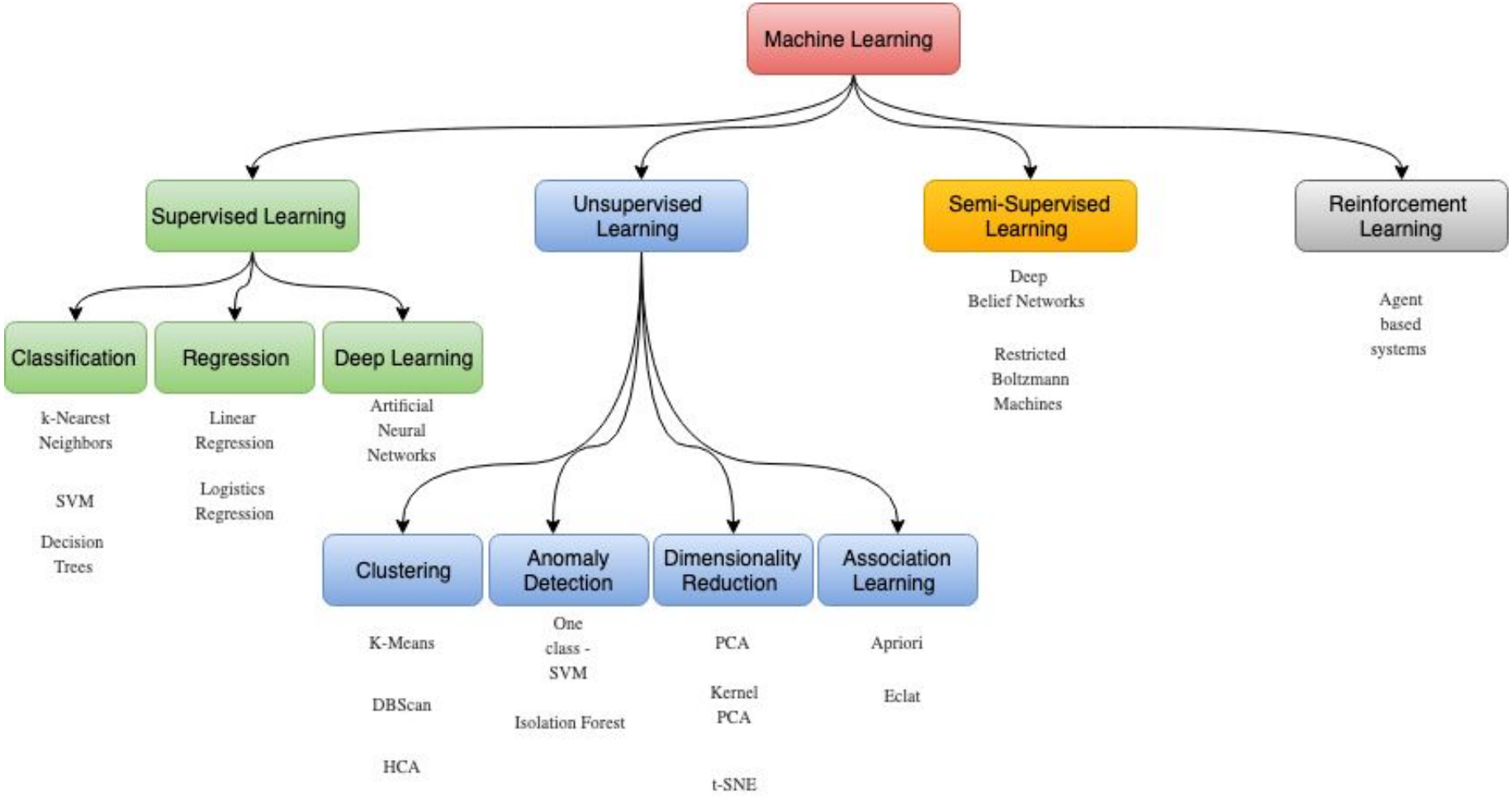
The difference between AI and ML ?

Machine learning is an application of AI that provides systems with the ability to automatically learn and improve from experience without being explicitly programmed. ML focuses on the development of automated computer programs which requires human interaction.



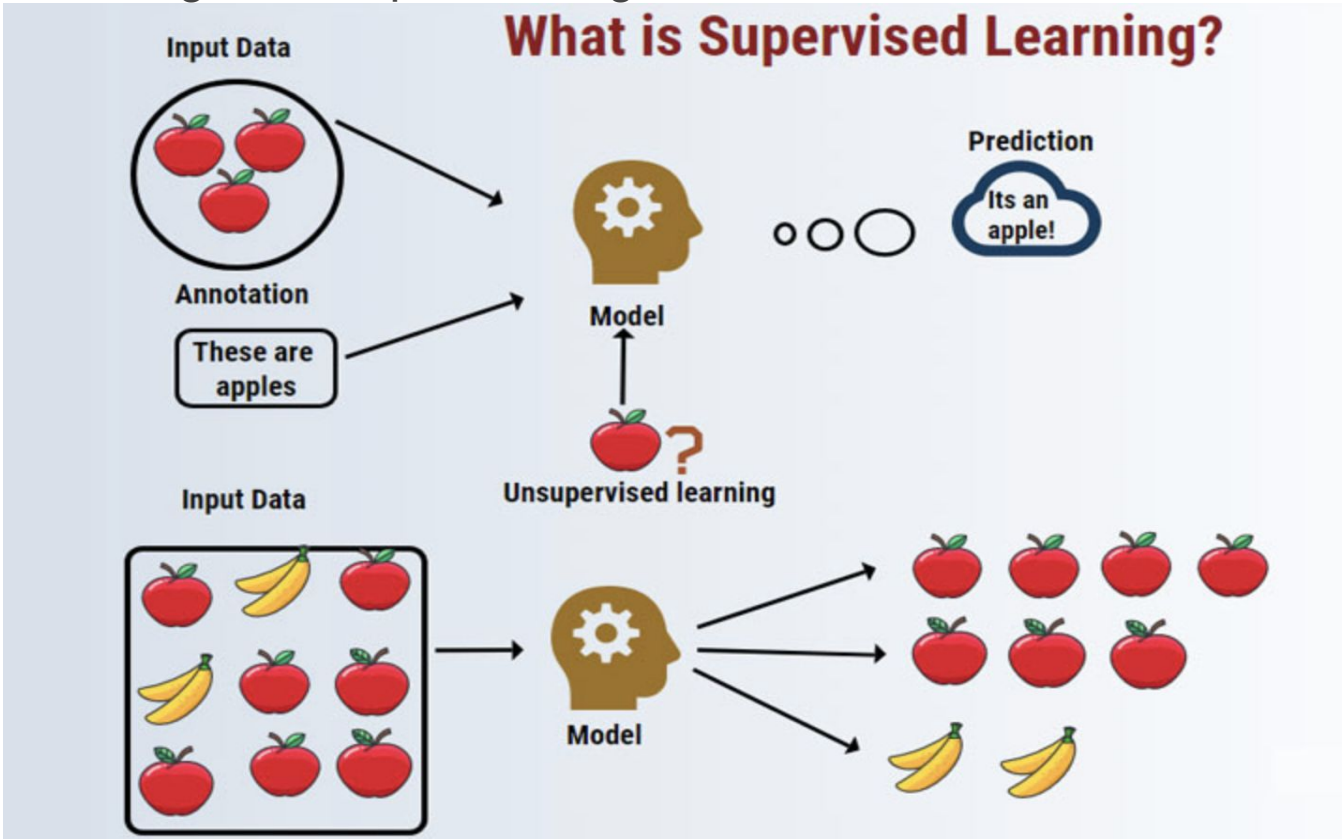
VS

Variances in Machine Learning



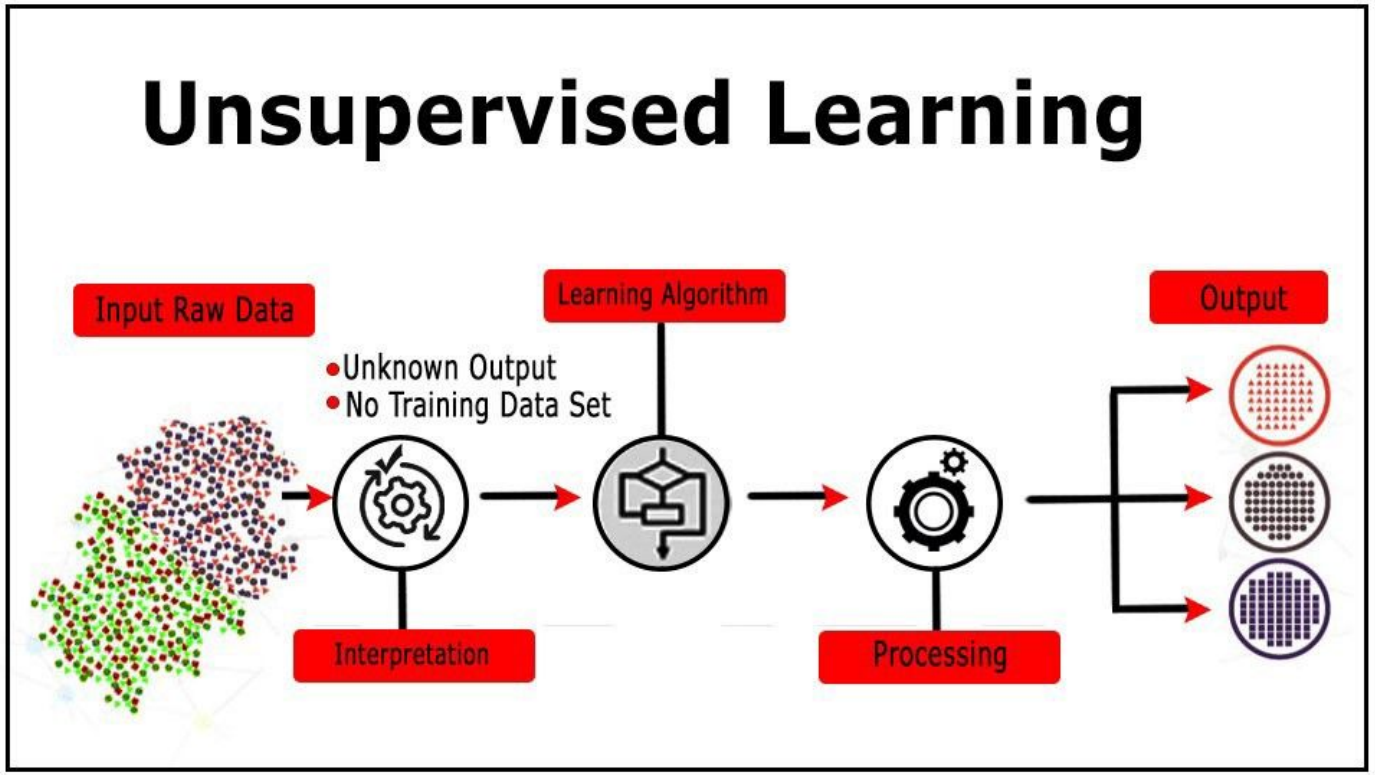
Supervised Learning

- Supervised Learning
  Is a class of machine learning in a which model is **trained** using a set of pre existing data set,

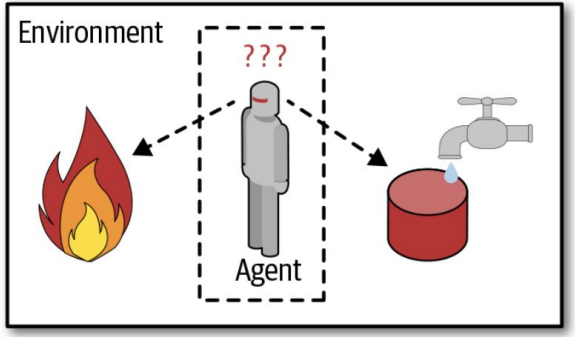


Unsupervised Learning

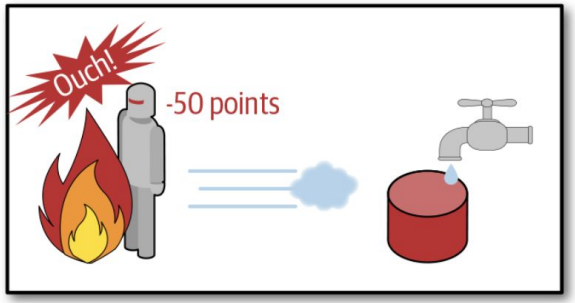
- Unsupervised Learning
  Perform a prediction or classification using unlabeled data



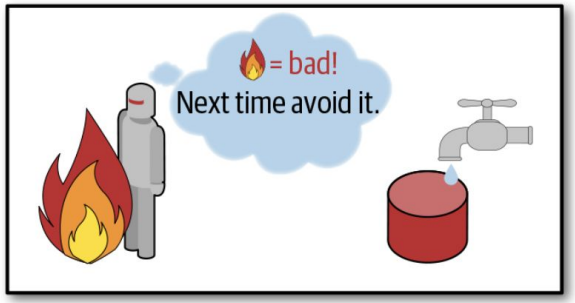
Reinforcement Learning



1. Observe
2. Select action using policy



3. Action!
4. Get reward or penalty



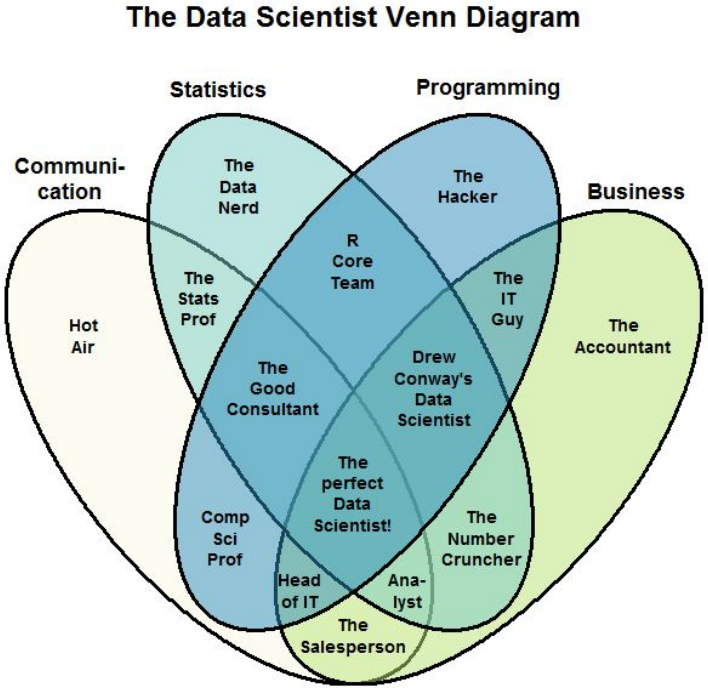
5. Update policy (learning step)
6. Iterate until an optimal policy is found

Alpha GoZero

Recent Applications of Deep learning

Before you jump in ……

How you can become an expert in Artificial Intelligence / Machine Learning and Data science ?



Stephan Kolassa's new enhanced Data Scientist Venn Diagram *

*https://www.kdnuggets.com/2016/09/new-data-science-venn-diagram.html

Recent Applications of Deep learning

Alpha GoZero

Recent Applications of Deep learning

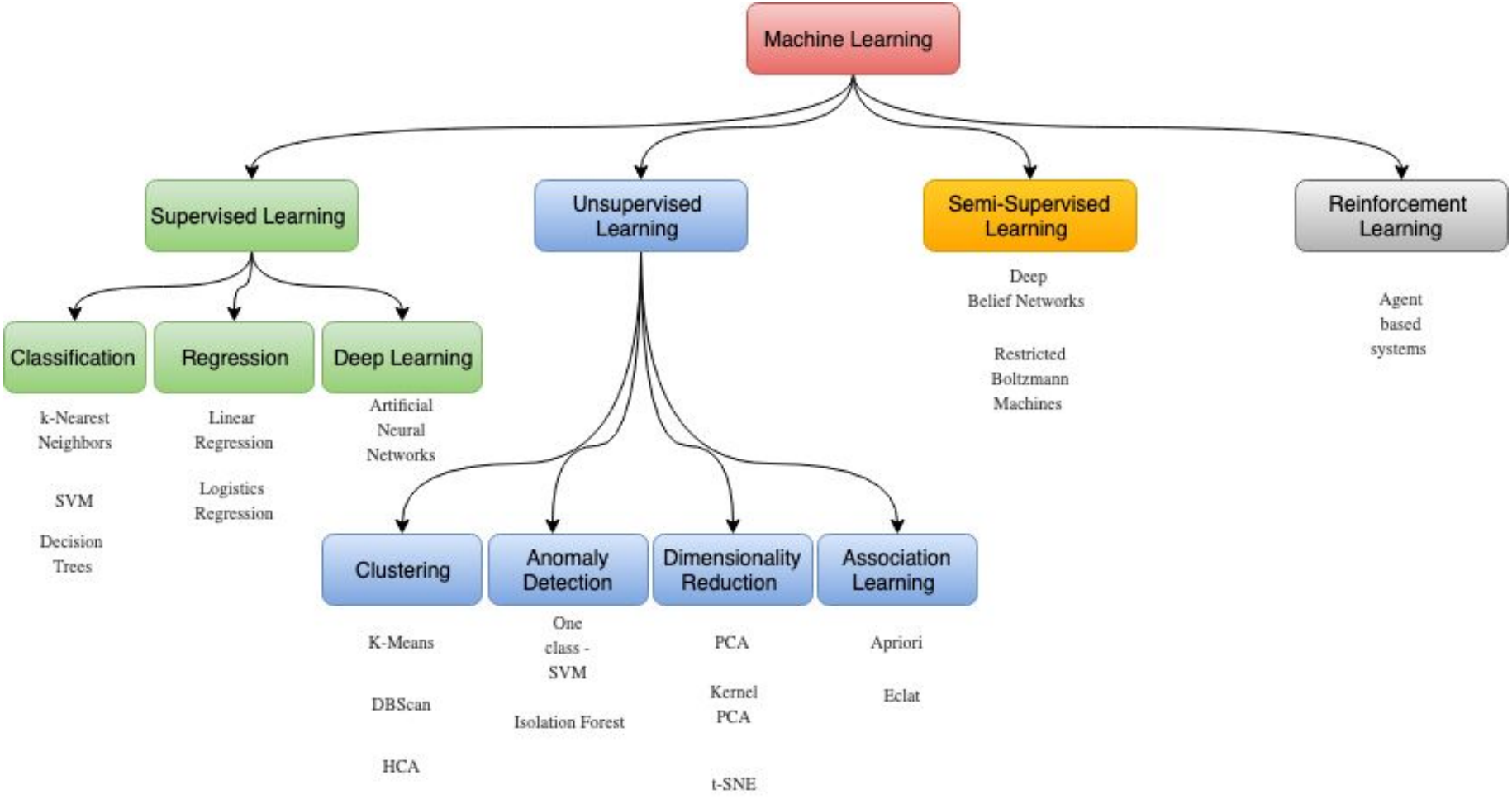
Artificially Generated Images - using Generative Adversarial Networks

https://machinelearningmastery.com/impressive-applications-of-generative-adversarial-networks/

Recent Applications of Deep learning

Open AI beats 5 times Dota world champion

Variances in Machine



Supervised Learning

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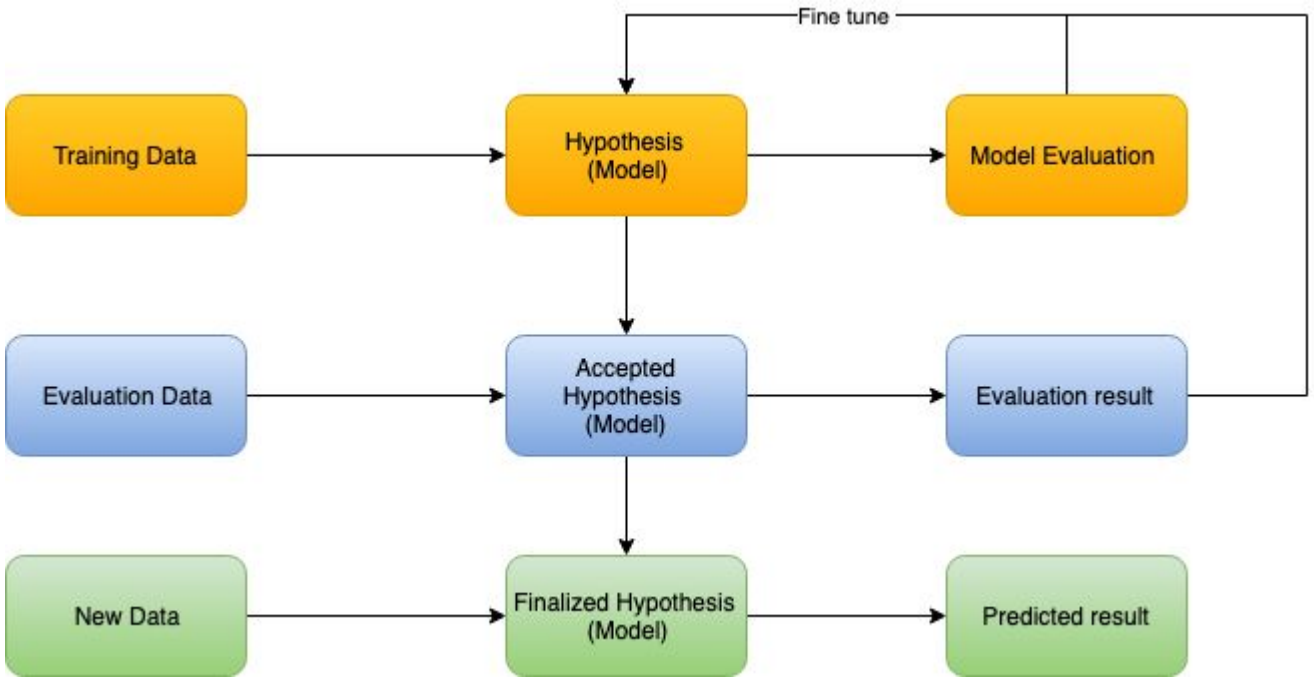
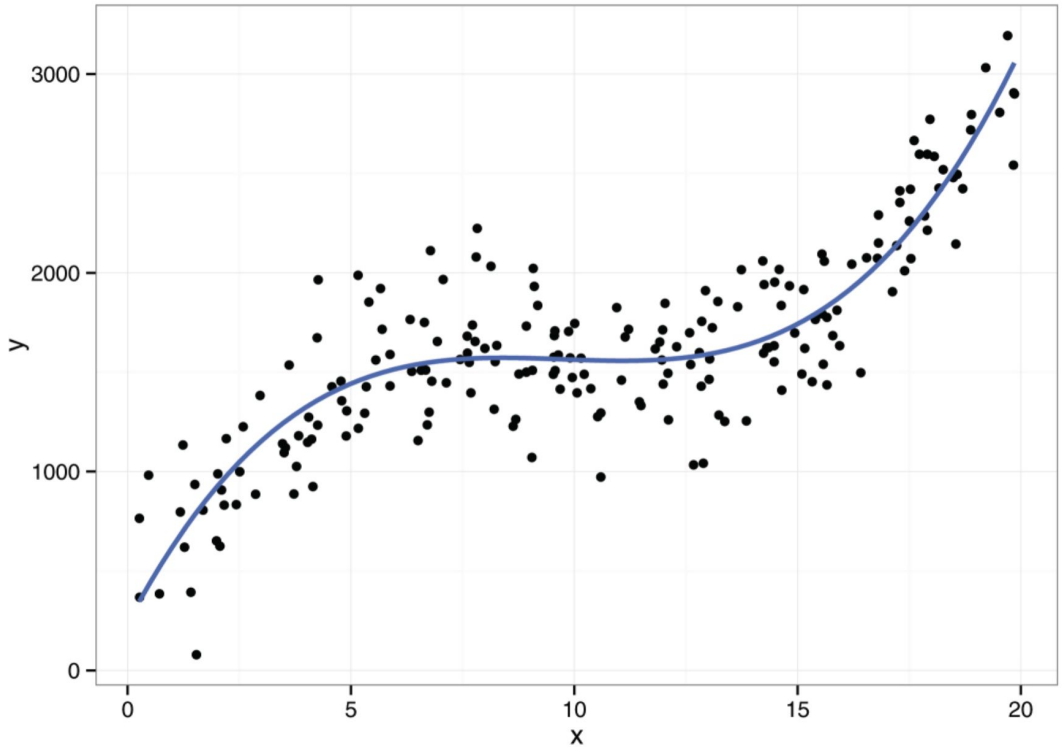


Supervised Learning

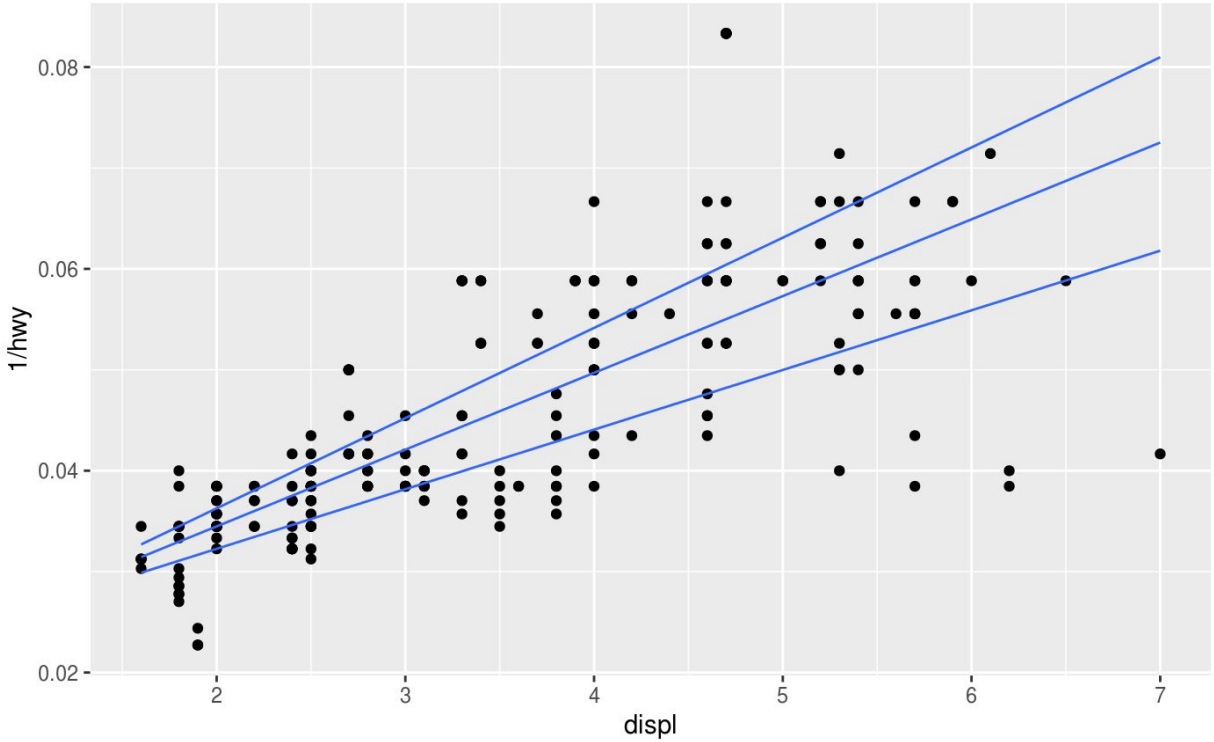
- Linear Regression

  Predicting a continuous value based on observations features



Quantile Regression

- **Quantile Regression**
  Helps to predict the range or entire distribution of the target variable. Techniques such as Bayesian regression and quantile regression have been developed for this purpose.



Linear Regression

- Linear Regression - Cost Function

$$h(x) = \frac{1}{2m} \sum h_0 \left(x^i - y^i\right)^2$$

Objective is to find the cost function where h(x) is minimum

Gradient Descent Algorithm

Repeat until convergence

{

$$\theta_j := \theta_j - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)}) x_j^{(i)}$$

}

Linear Regression

- Calculate the convergence more efficiently

$$J(\Theta_0, \Theta_1) = \frac{1}{2m} \sum_{i=1}^{m} [h_\Theta(x_i) - y_i]^2$$

Predicted Value

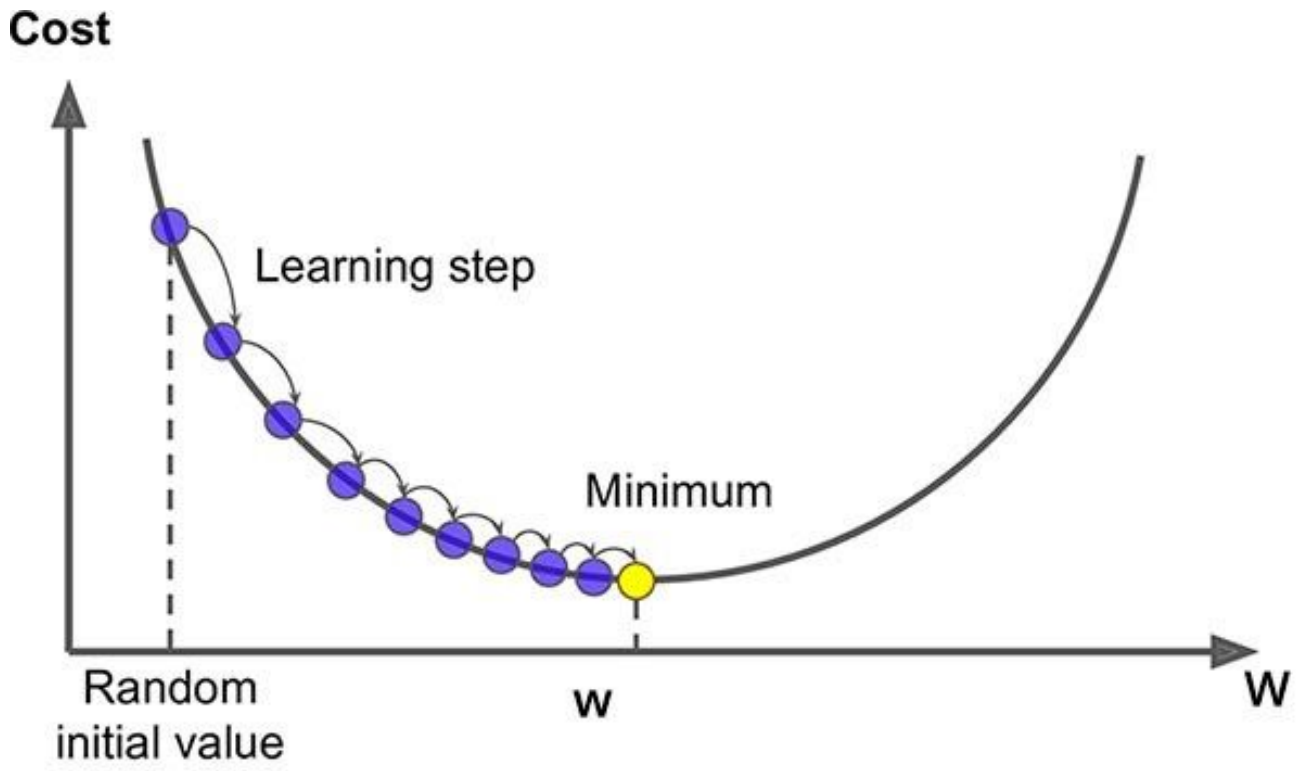
True Value

Gradient Descent Algorithm (Using multivariate calculus)

$$\Theta_j = \Theta_j - \alpha \frac{\partial}{\partial \Theta_j} J(\Theta_0, \Theta_1)$$

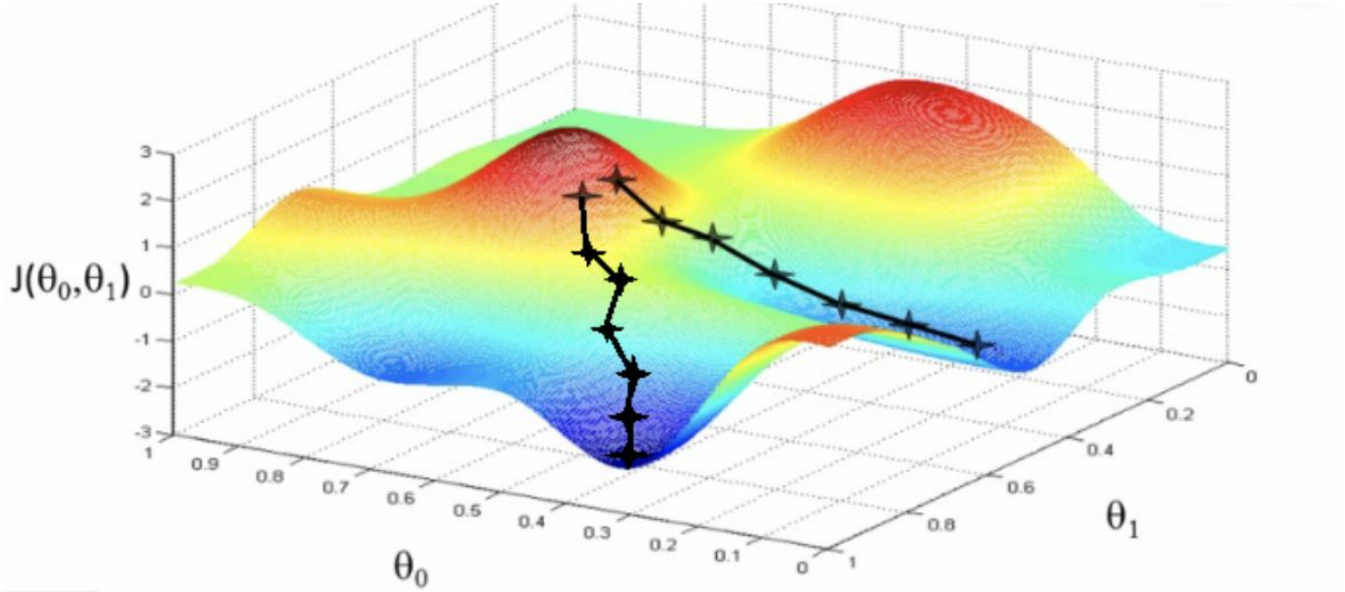
Learning Rate

Gradient Decent



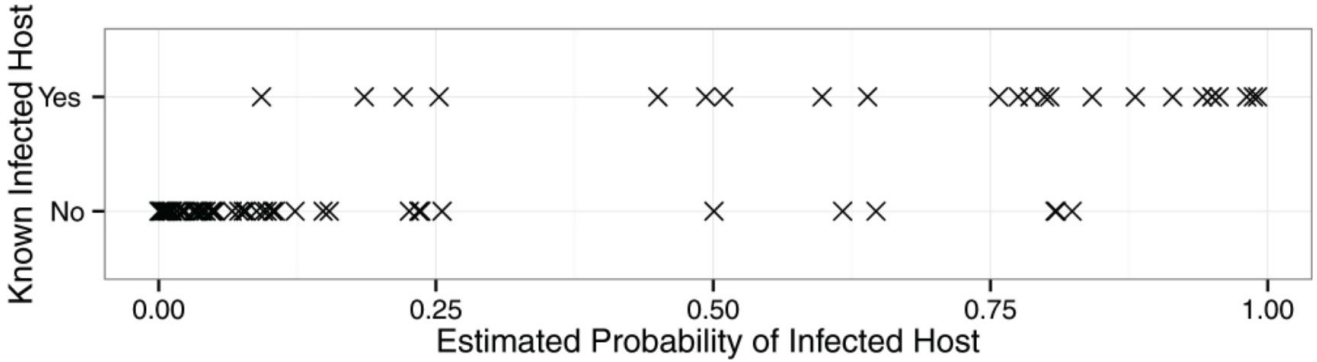
Linear Regression

Gradient Descent



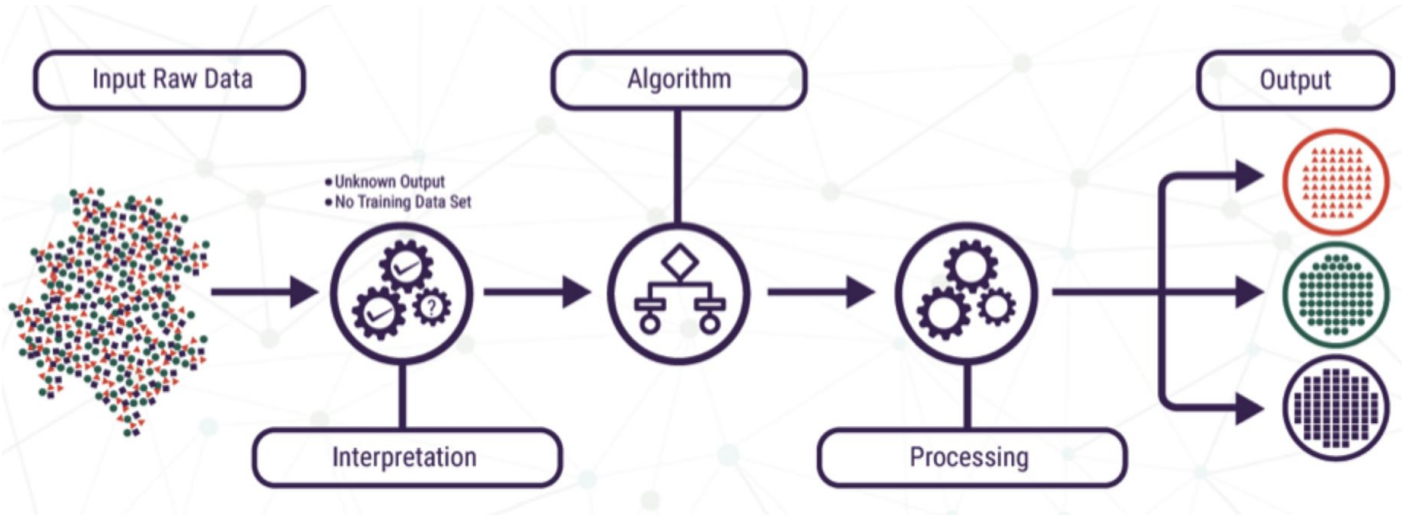
Supervised Learning

- Logistic Regression (Classification)
  Predicting qualitative values based on observations features



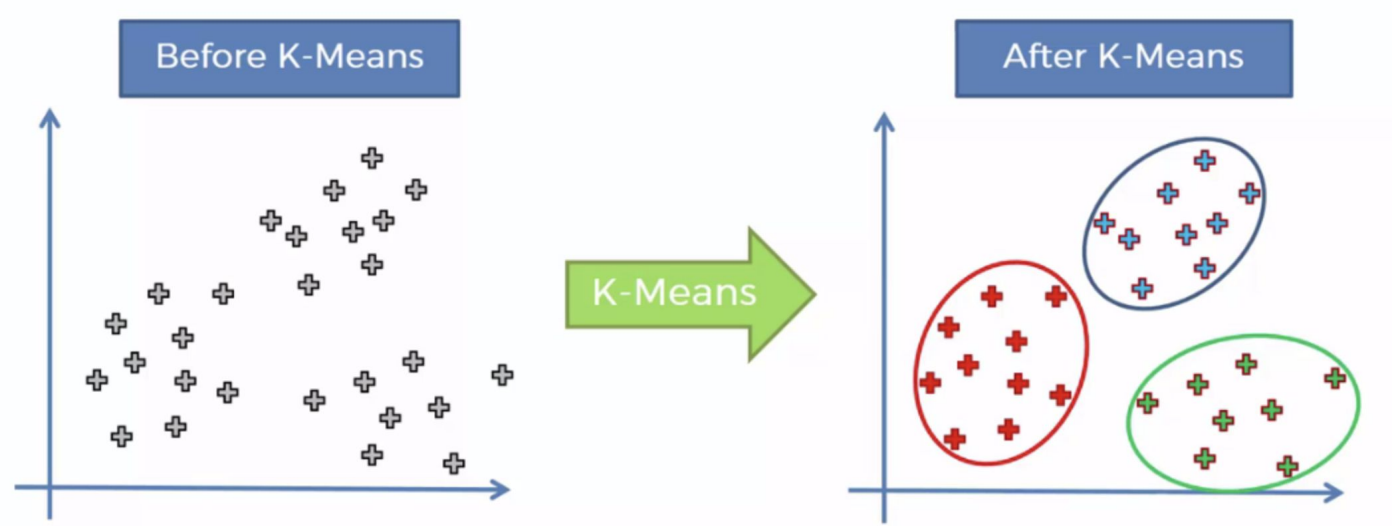
Unsupervised Learning

- **Unsupervised Learning**
  Is a class of machine learning in a which model is build without a labeled data



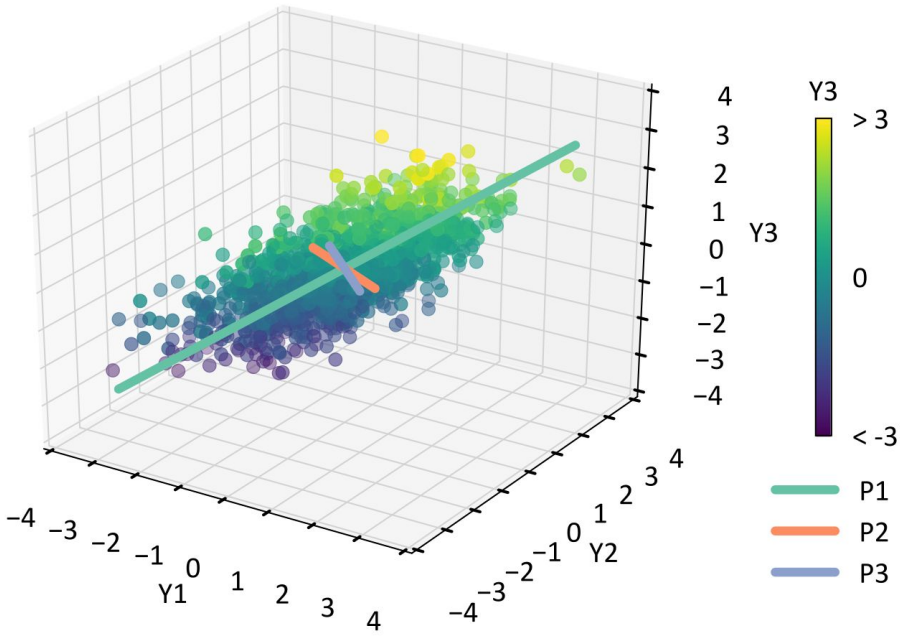
Unsupervised Learning

- K-Means Clustering



Unsupervised Learning - PCA

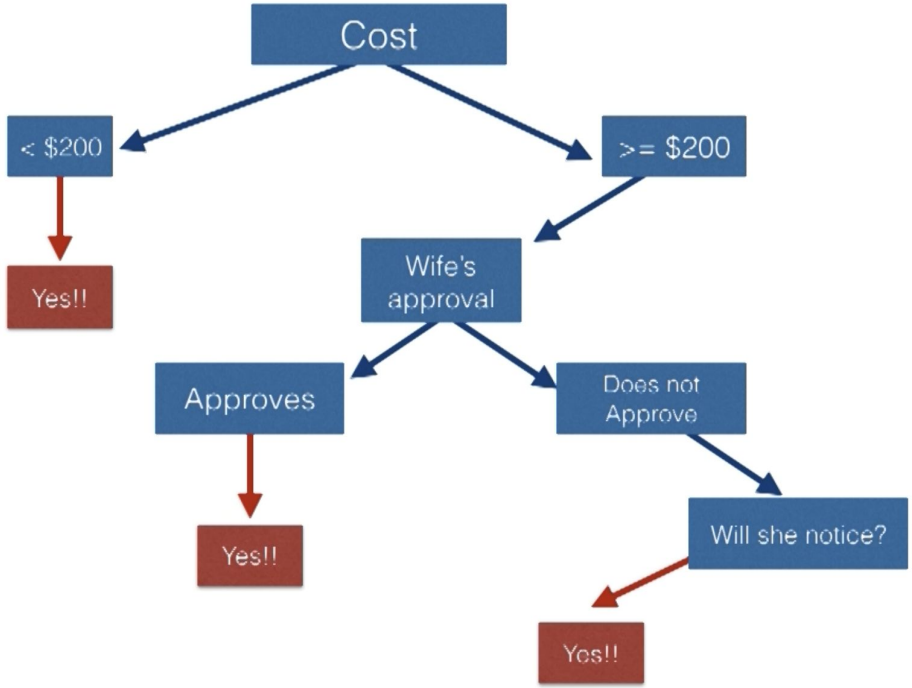
- **Principal Component Analysis**
  The key idea behind the PCA is to use orthogonal projections to find lower dimensional representation of data that retain much information as possible



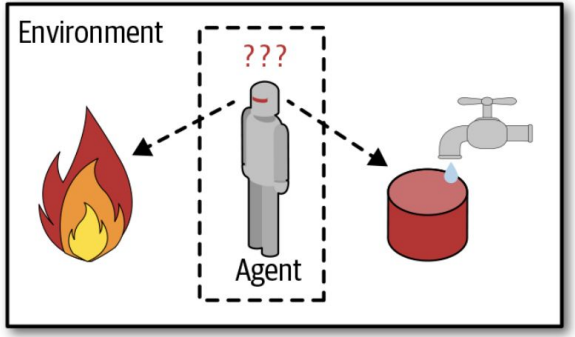
Unsupervised Learning

- Decision Trees

Should I buy a new tech gadget?



Reinforcement Learning



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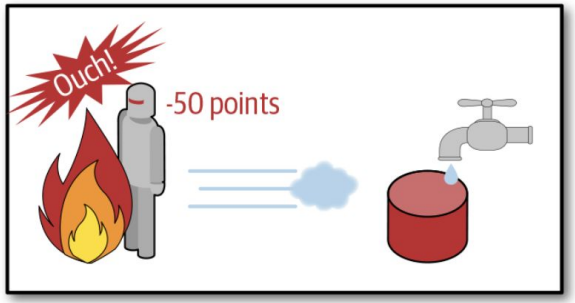

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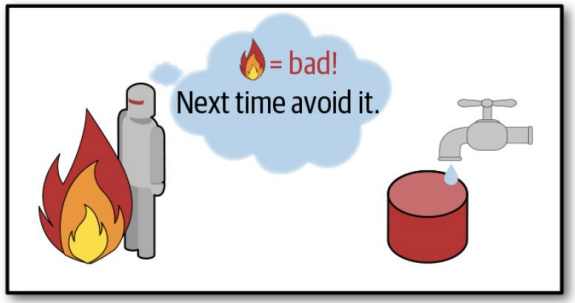

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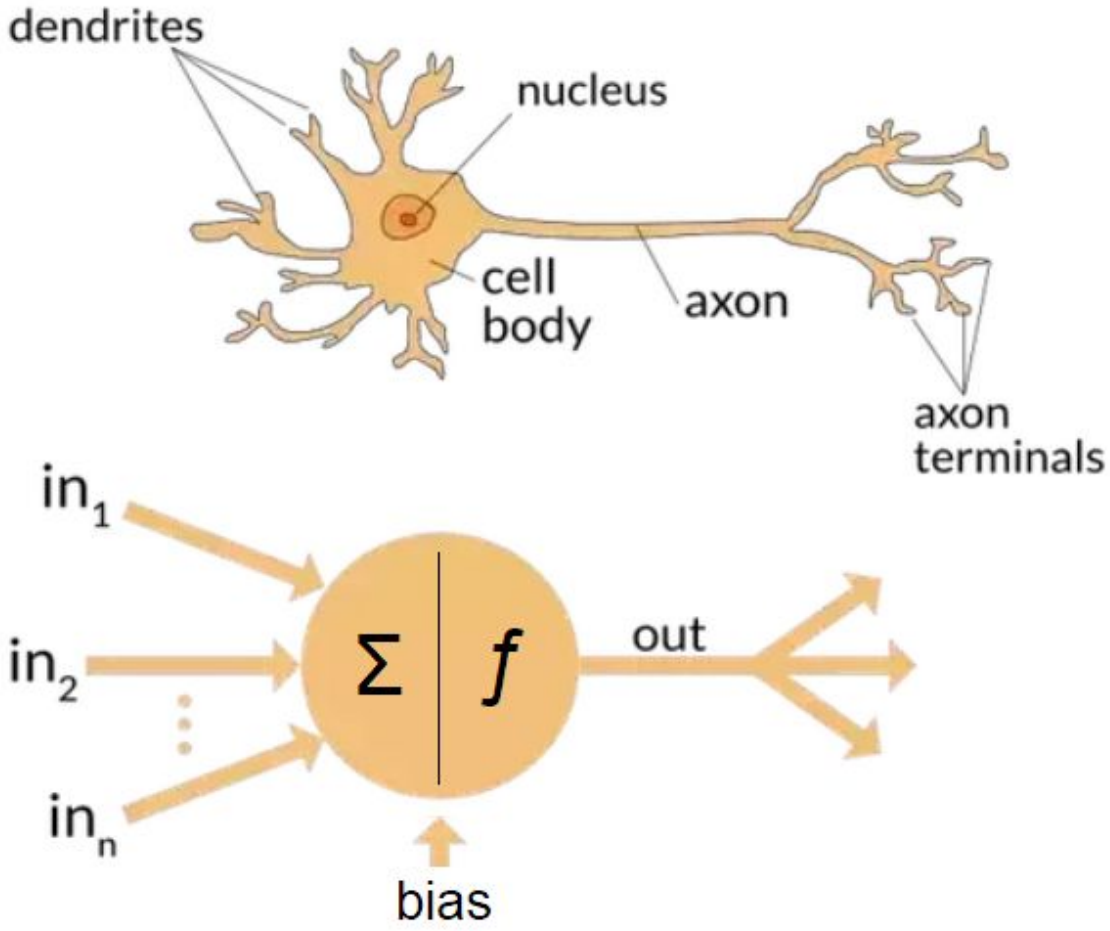
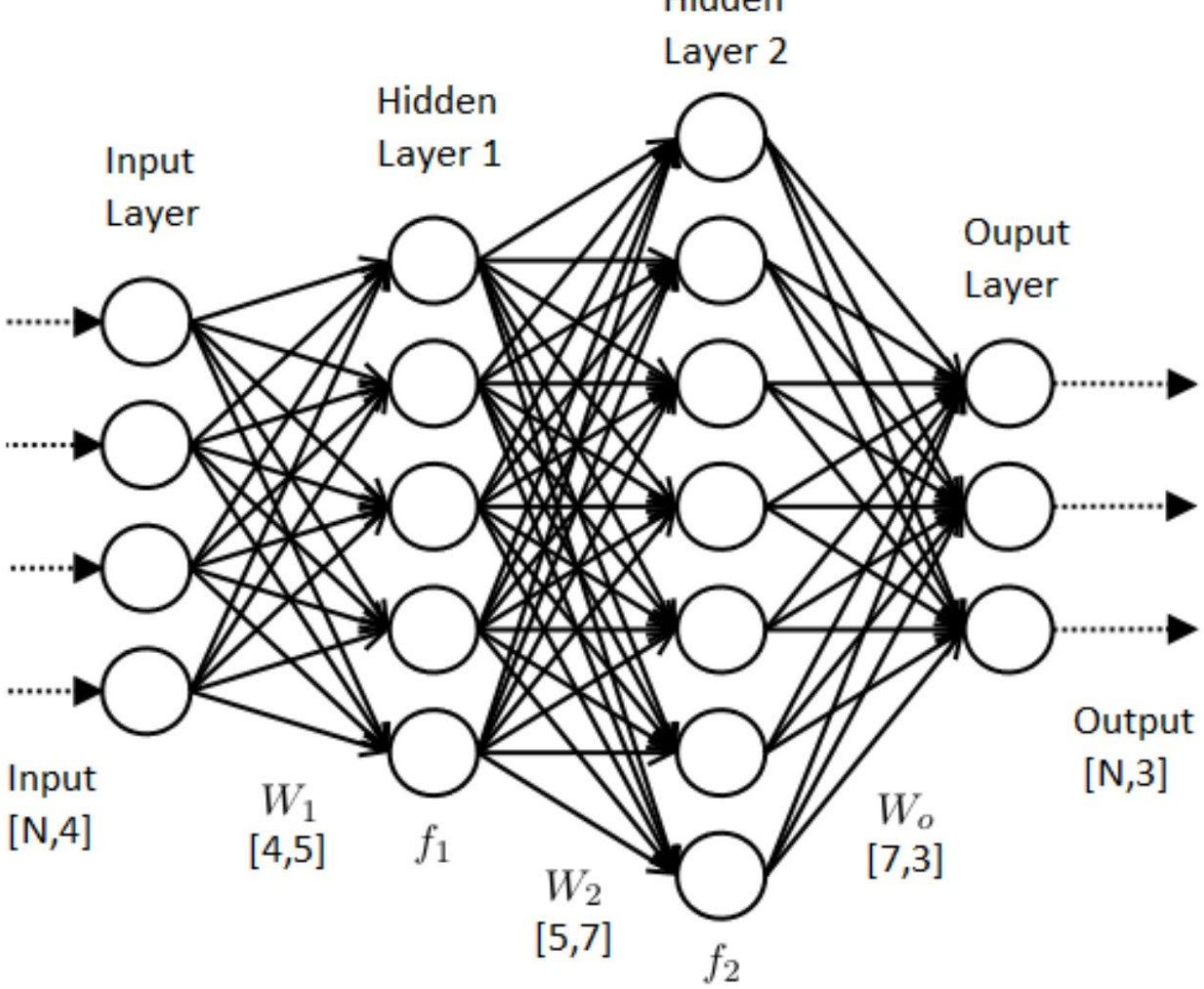
Artificial Neural Networks



Artificial Neural Networks



Artificial Neural Networks - Types and Usage

- Convolutional Neural Network : Computer Vision / Sentiment analysis
- Recurrent Neural Network(RNN) - LSTM : Speech recognition / NLP / Text analysis
- Sequence-To-Sequence Models: Machine translation / chat bots
- Multilayer Perceptrons : Classification problems

AI/ML Use case

IBM Watson : A Generic use case

Lab Sessions

- Sample Lab session to get used with Azure Machine learning studio
- Forecasting
- Credit Risk Analysis


Thank you!

References

- **Big Data and Artificial Intelligence — The Future of Accounting and Finance - CPA Canada**
- https://www.initor-global.com/how-artificial-intelligence-will-change-financial-accounting-services/
- **The Fourth Age :** Byron Reese
- https://ggplot2.tidyverse.org/reference/geom_quantile.html