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# MACHINE LEARNING

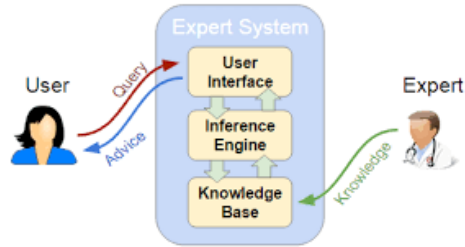


# WHAT IS A.I.?

# Artificial Intelligence(AI)

Artificial intelligence refers to the development of computer-based solutions that are able to perform tasks which mimic human intelligence.

Popularity



Explosive Growth

New Hopes

Inflated Hype

AI winter II



Birth

AI winter I



Lim, 2018

1950 1956

1974

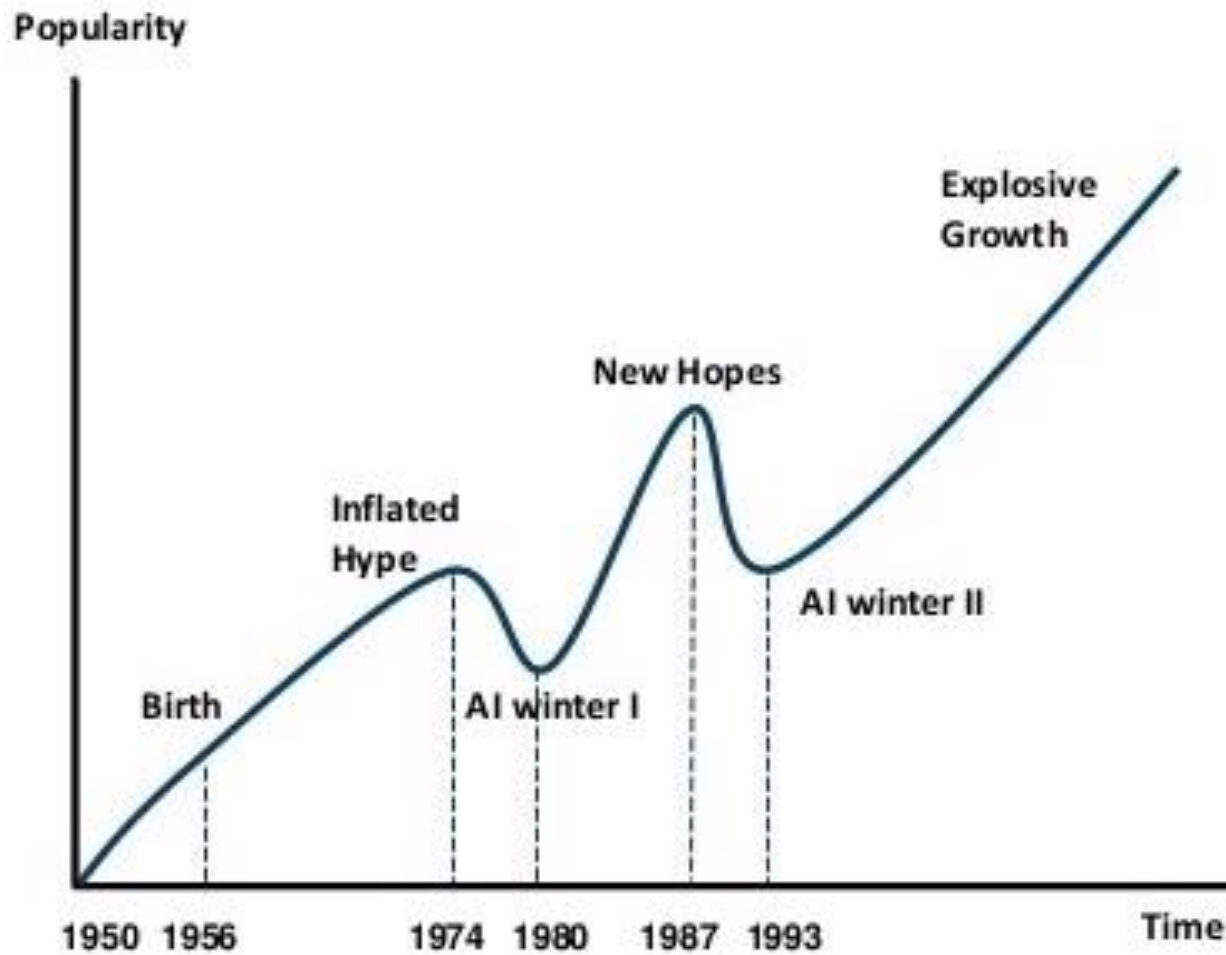
1980

1987

1993

Time



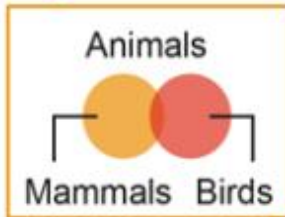


Lim, 2018

# Machine Learning

- It is as a subset of artificial intelligence that enable systems to learn patterns from data and subsequently improve from experience.

## Symbolists



Use symbols, rules, and logic to represent knowledge and draw logical inference

**Favored algorithm**

Rules and decision trees

## Bayesians

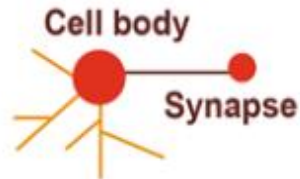


Assess the likelihood of occurrence for probabilistic inference

**Favored algorithm**

Naive Bayes or Markov

## Connectionists



Recognize and generalize patterns dynamically with matrices of probabilistic, weighted neurons

**Favored algorithm**

Neural networks

## Evolutionaries



Generate variations and then assess the fitness of each for a given purpose

**Favored algorithm**

Genetic programs

## Analogizers



Optimize a function in light of constraints ("going as high as you can while staying on the road")

**Favored algorithm**

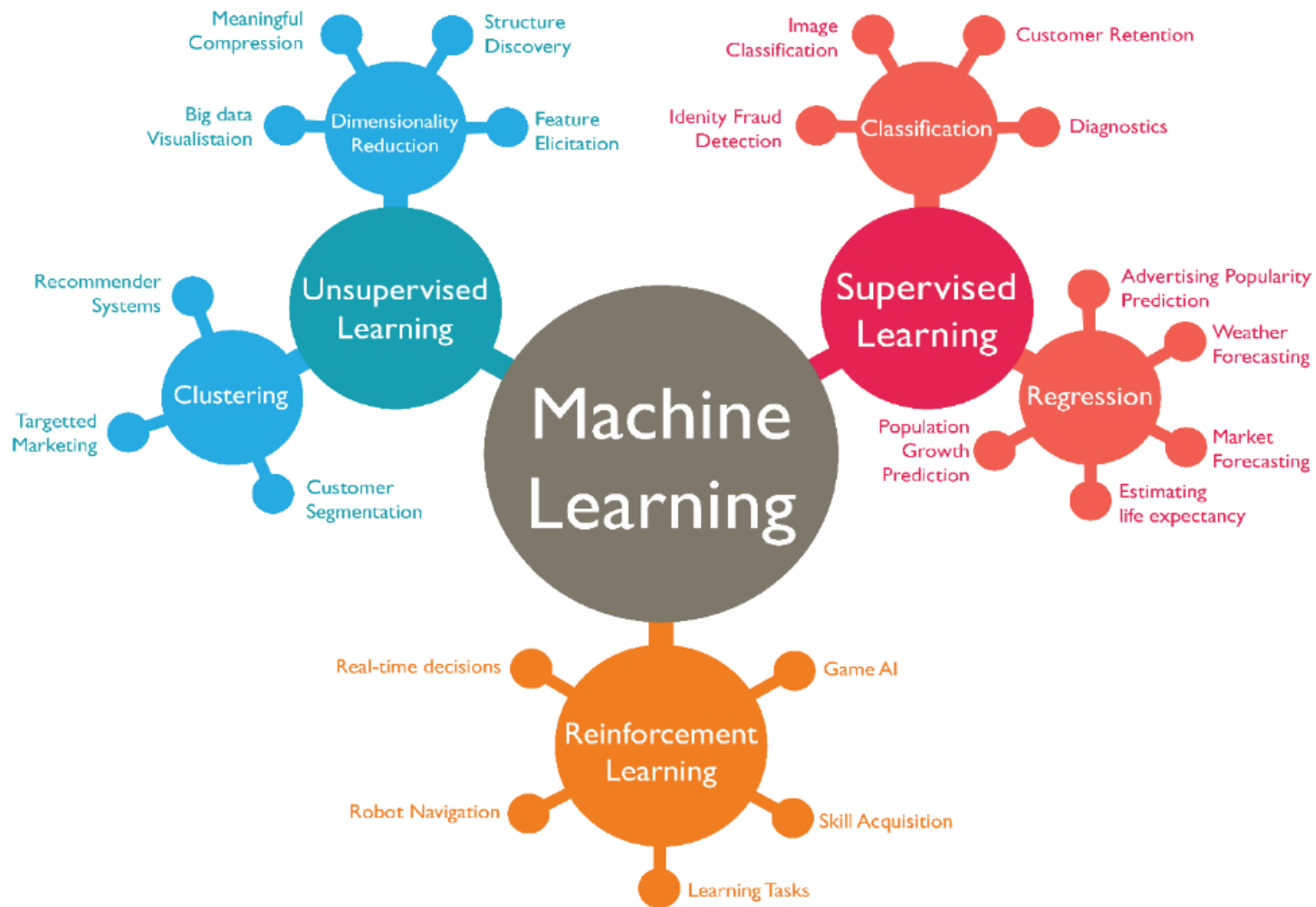
Support vectors

Source: Pedro Domingos, *The Master Algorithm*, 2015

# Machine Learning

Tribe	Origins	Master Algorithm
Symbolists	Logic, philosophy	Inverse deduction
Connectionists	Neuroscience	Backpropagation
Evolutionaries	Evolutionary biology	Genetic programming
Bayesians	Statistics	Probabilistic inference
Analogizers	Psychology	Kernel machines





# Machine Learning

## Train-Validate-Test

- Step 1: Making the model examine data.
- Step 2: Making the model learn from its mistakes.
- Step 3: Making a conclusion on how well the model performs

# Inference and Prediction

Inference:

- Given a dataset, the purpose is to infer how the output is generated as a function of the data.
- Use the model to learn about the data generation process.
- Understand the way the independent variables  $X$  affect the target variable  $Y$ .

Ex: find out what the effect of passenger gender, class and age, has on surviving the Titanic Disaster

Model interpretability is a necessity for inference

# Inference and Prediction

## Prediction:

- Use the model to predict the outcomes for new data points.
- When performing predictions over data, the purpose is estimating  $f$  in  $y=f(x)$
- The purpose is not understanding the exact form of the estimated function, as far as it can perform predictions quite accurately.
- To be able to predict what the responses are going to be to future input variables.

Ex: predict prices of oil

# Machine Learning

## **1. Supervised Learning:**

1. Classification
2. Regression

## **2. Unsupervised Learning**

1. Clustering
2. Dimensional Reduction

# Machine Learning

- Data Processing and Machine Learning
  - Libraries: Numpy, Pandas, statsmodels, sklearn, networkx
  - Tools: IDE – Jupiter



IDE: Integrated  
Development  
Environment