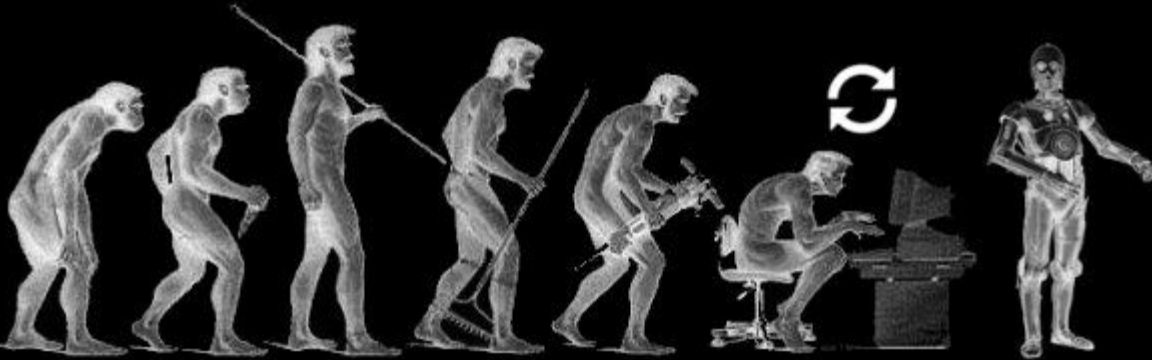


# AI4ALL

Giri Iyengar, Davood Shamsi  
Jan 22, 2018





# Agenda

- Introduction
- Define AI, ML, Data Science
- What are you looking to get out of this class?
- Tour of topics
  - Supervised Learning
  - Unsupervised Learning
  - Deep Learning
  - Reinforcement Learning
- Course Logistics
  - Assignments
  - Reading group/meetups

# Definitions

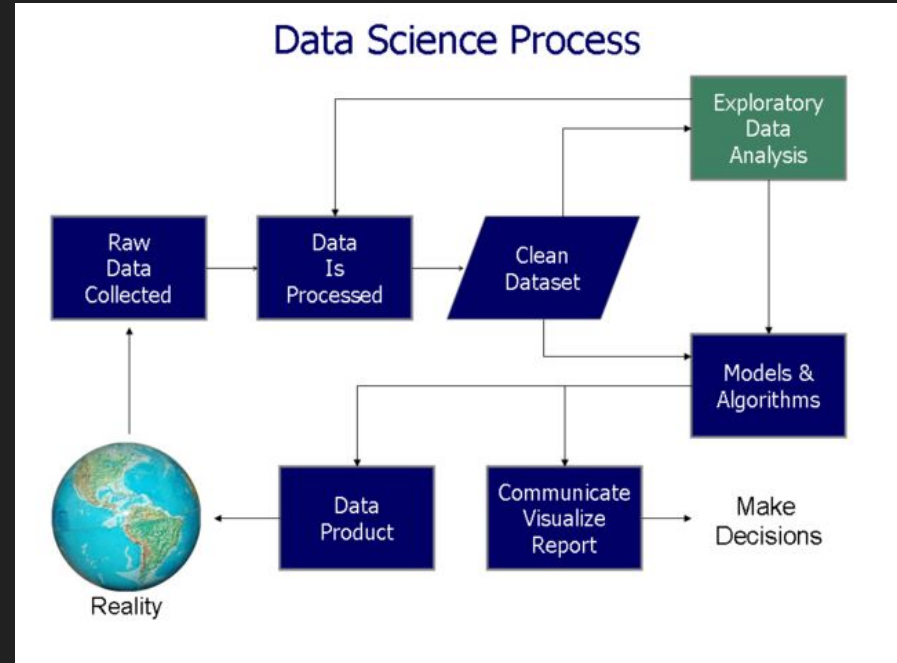
[https://en.wikipedia.org/wiki/Machine\\_learning](https://en.wikipedia.org/wiki/Machine_learning)

[https://en.wikipedia.org/wiki/Artificial\\_intelligence](https://en.wikipedia.org/wiki/Artificial_intelligence)

[https://en.wikipedia.org/wiki/Data\\_science](https://en.wikipedia.org/wiki/Data_science)

# Data Science

- Encompasses Data Collection, Modeling, and Analysis
- Frequently viewed as an extension of Statistics
- Modeling uses **Machine Learning / Statistical Learning** techniques



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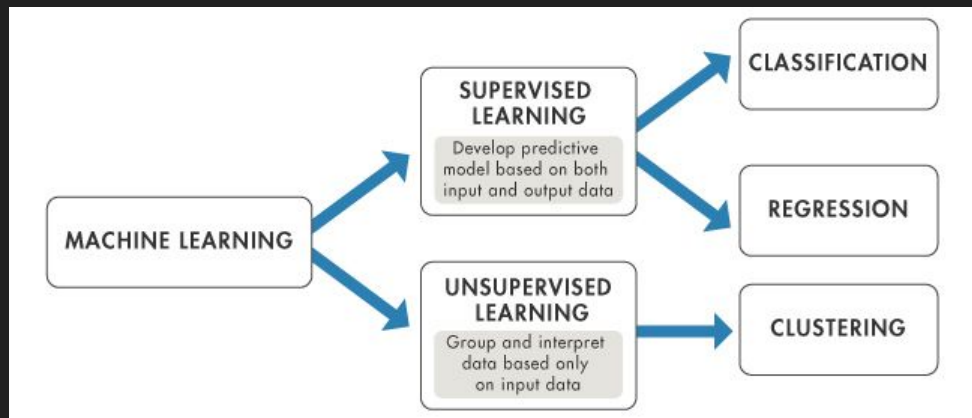
# Machine Learning

**Machine Learning** is a field of Computer Science that gives Computers the ability to learn without being explicitly programmed

Born out of a quest for Artificial Intelligence

How does a computer learn?

- By processing / analyzing examples



Courtesy - the Mathworks

# Artificial Intelligence

In Computer Science, AI is defined as the study of Intelligent Agents -- any device that *perceives* its environment and *takes actions*

We call a Computer Program or a Machine AI when it seemingly displays or mimics “cognitive” functions that we associate with humans -- e.g. learning, problem solving, autonomous driving

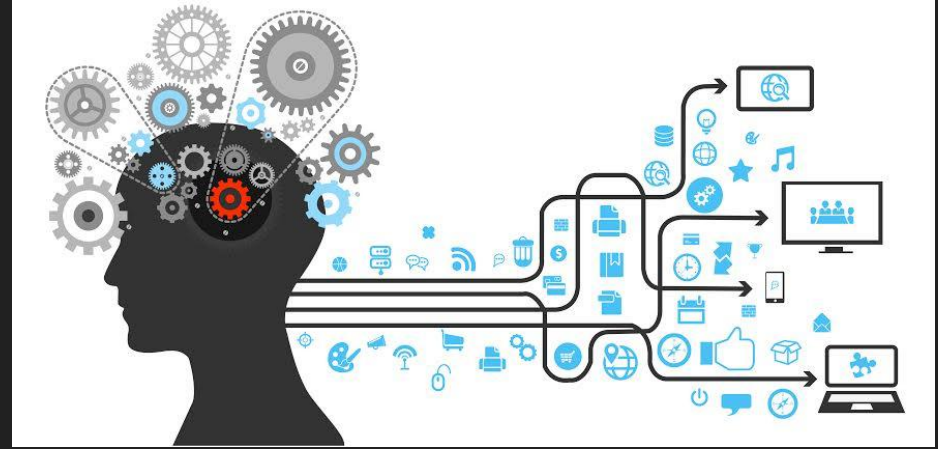
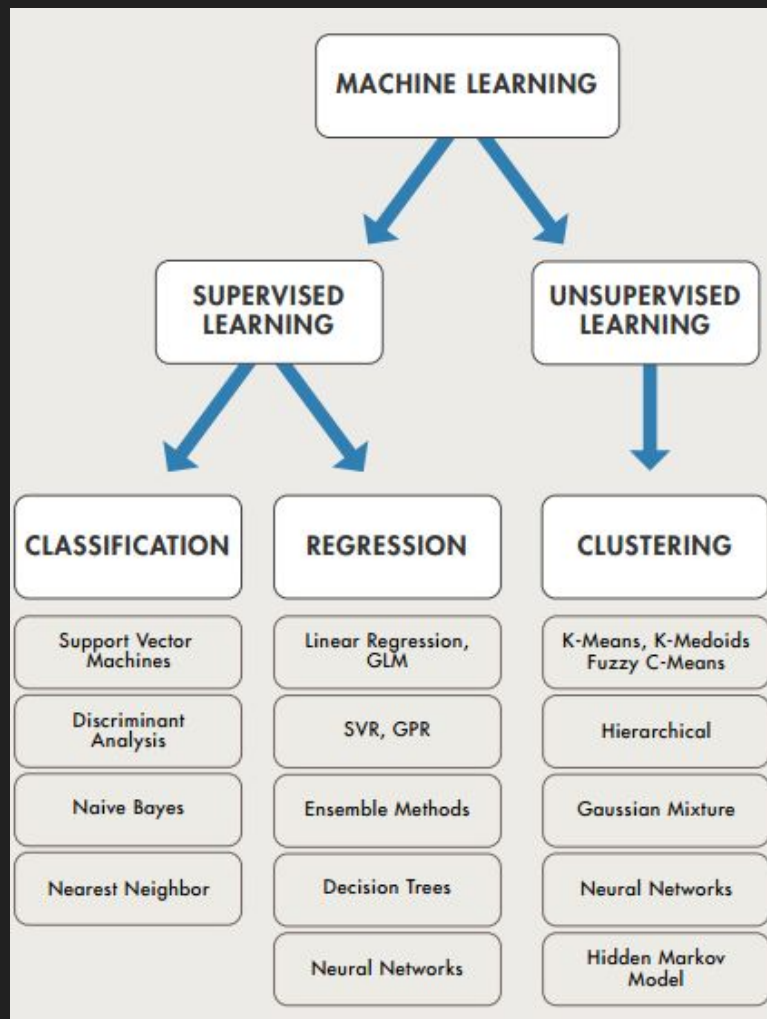



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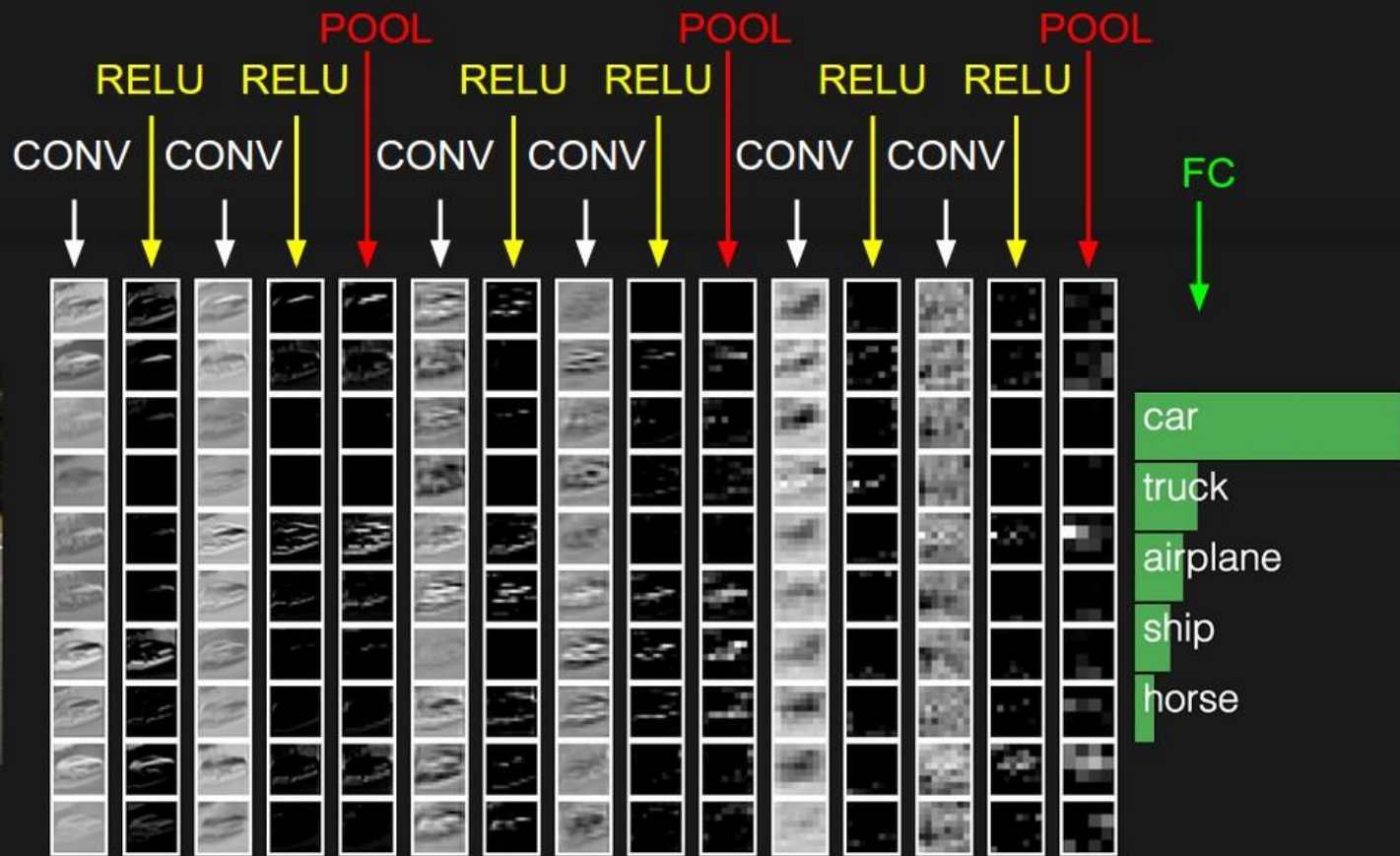
<https://youtu.be/kWmX3pd1f10>

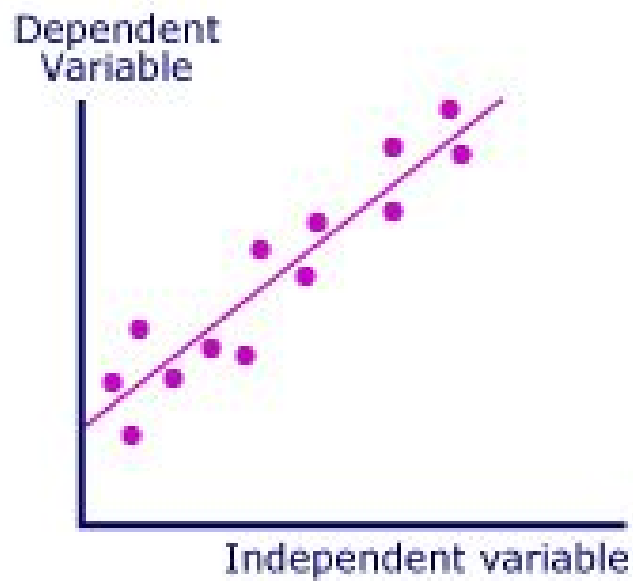




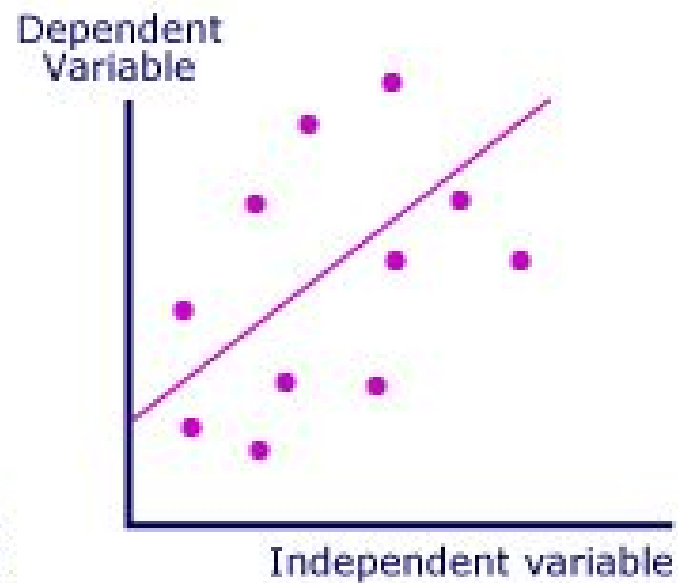
# Supervised Learning

- The algorithm is given data in the form of {input, target} and it attempts to learn a function that **maps** the **input** to the **target**
  - Given  $\{X, y\}$ , learn  $f$  so that  $f(X) = y$
  - E.g.  $\{[\text{no. of rooms, zipcode, median income, acreage}], \text{house\_price}\}$
  - E.g.  $\{[\text{income, own or rent, years of education, debt to income ratio, ...}], \text{risk\_of\_default}\}$
  - E.g.  $f(\text{) = \text{CAT}$
- Two type of supervised learning
  - Regression
    - E.g. Credit Scores, House Prices
  - Classification
    - E.g. Image Recognition, Sentiment Analysis, Face ID





Graph A



Graph B

Courtesy: Columbia University

# Supervised Learning

- Start with some sample data  $\{X,y\}$
- Train a model
  - How do we train the model?
- Evaluate the model
  - What do we need to evaluate the model?
- Repeat as necessary till satisfied
  - How do we know we are done?
- Deploy the model into Production
- Monitor metrics and rebuild model if needed

# Unsupervised Learning











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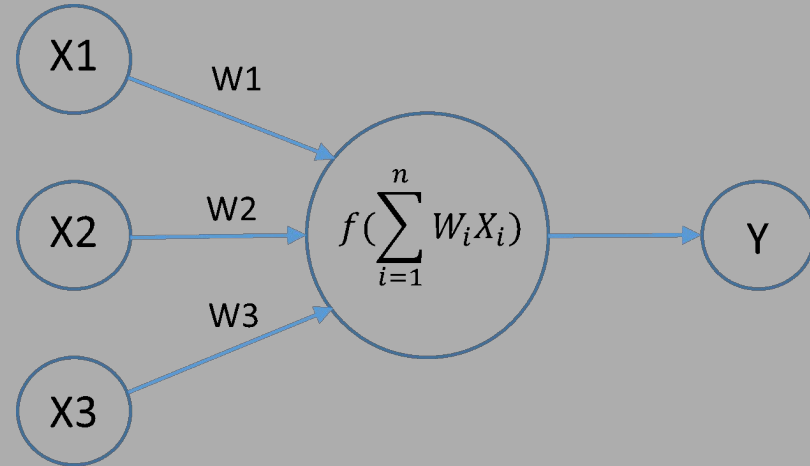
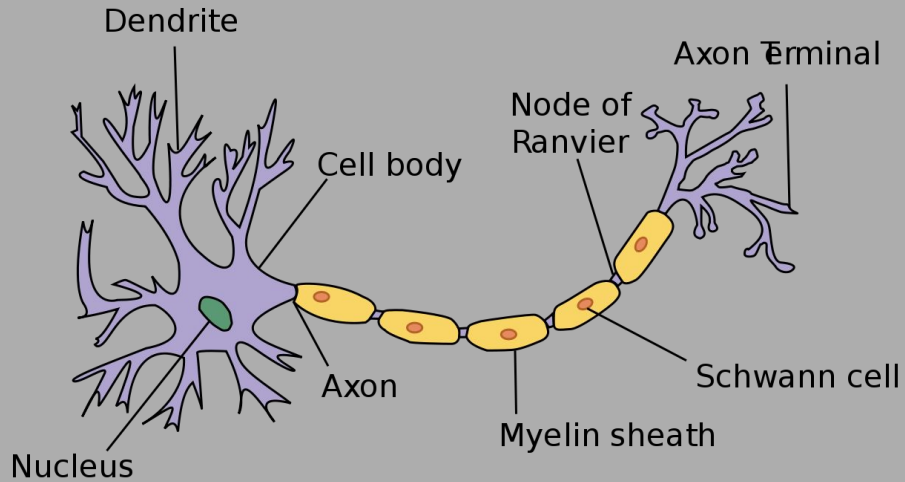
# Unsupervised Learning

- No labels
- Clustering
- Dimensionality reduction



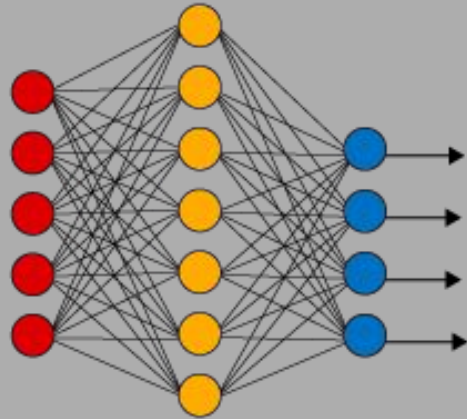
# HOW BIG DATA IS USED IN AMAZON RECOMMENDATION SYSTEMS TO CHANGE OUR LIVES

# Deep Learning



# Deep Learning

Simple Neural Network

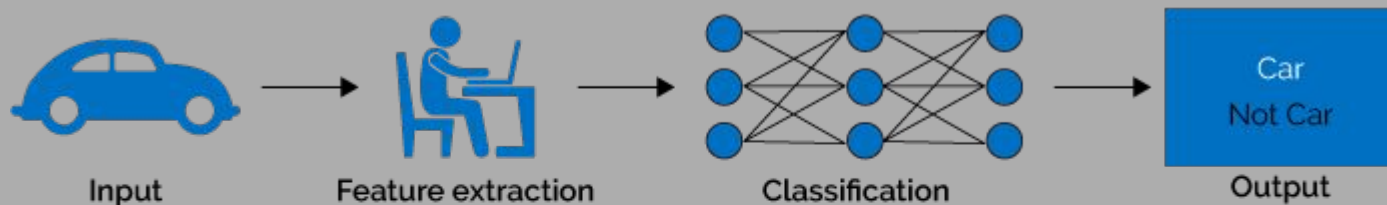


● Input Layer

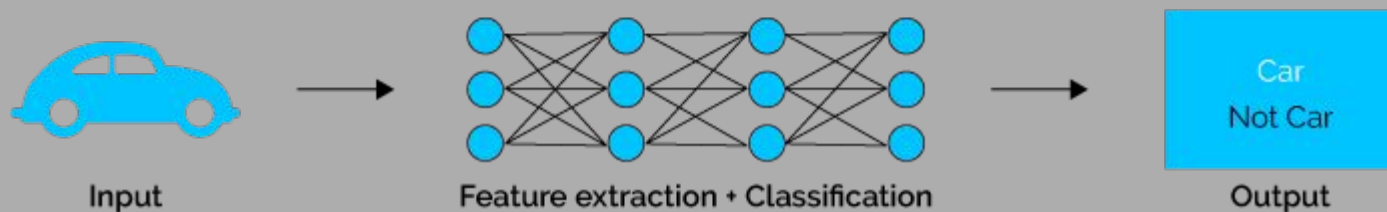
● Hidden Layer

● Output Layer

## Machine Learning



## Deep Learning



# Reinforcement Learning

