Deep Learning Foundation & Application

with a Focus on Medical Informatics

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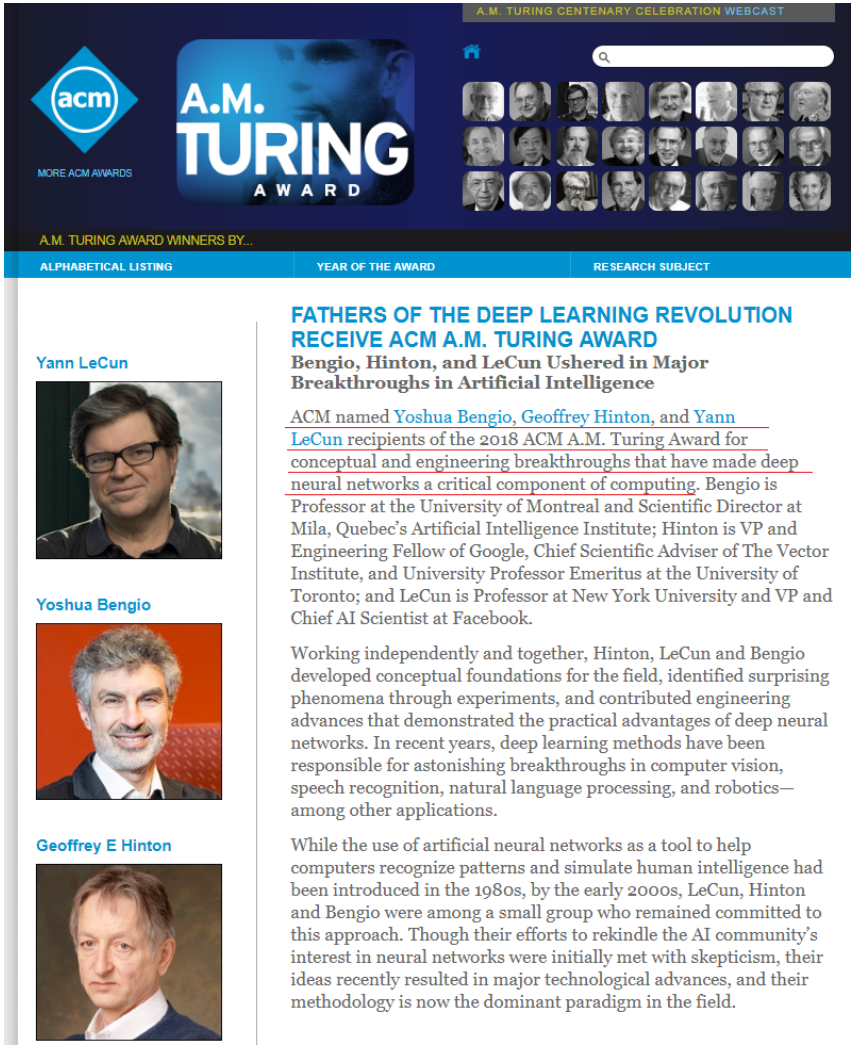
Artificial Intelligence and Deep Learning; What and Why?



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https://amturing.acm.org/

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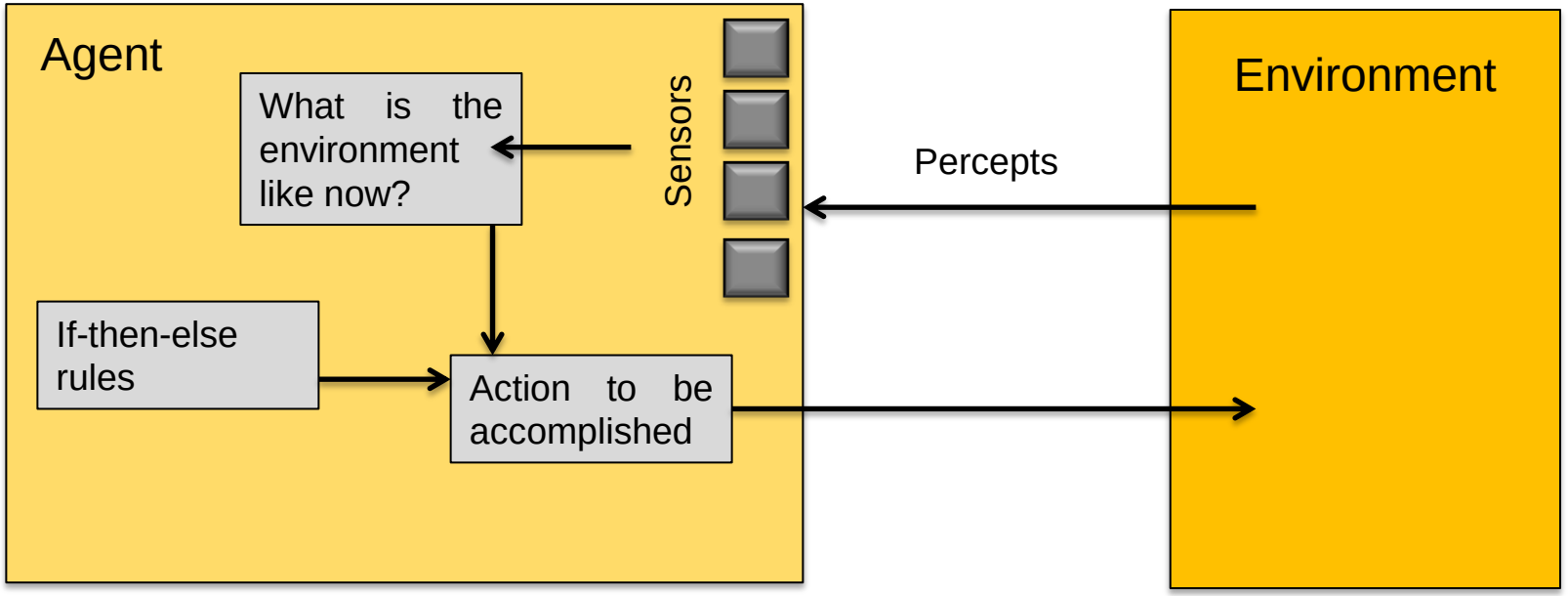
Artificial Intelligence and Deep Learning; What and Why?

- **AI** is all about computerized models targeting at **Perception**, and **Action**.
- It **solves** a **problem, optimally**.
- It **figures out (alone)** what is the **best action to take**.



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AI SUB-SYSTEMS

- Speech Recognition
- Natural Language Processing
- Computer Vision
- Robotics

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RULE-BASED VERSUS LEARNING-BASED AI

Step

Door

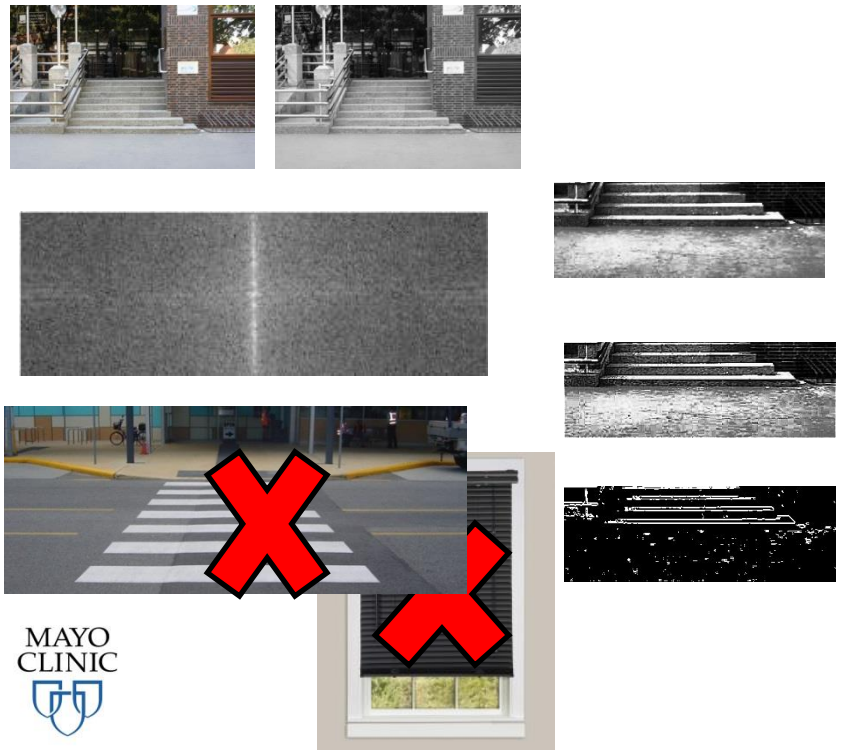
How to implement **singularities**???

Rule-based algorithms

Learning-based algorithms

Deep and machine learning strategies vs. **Traditional** (rule-based) methods

Traditional (there is no any learning technique)

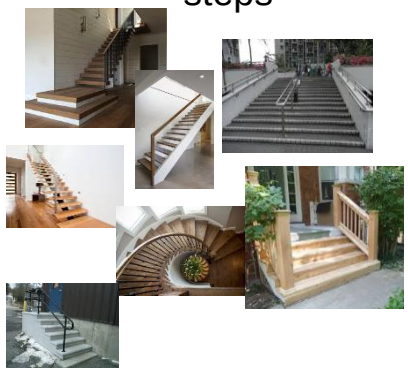


Deep and machine learning techniques

We train computers at recognizing doors from steps by showing them a **large amount** of:

(object_type, picture) pairs.

steps



doors

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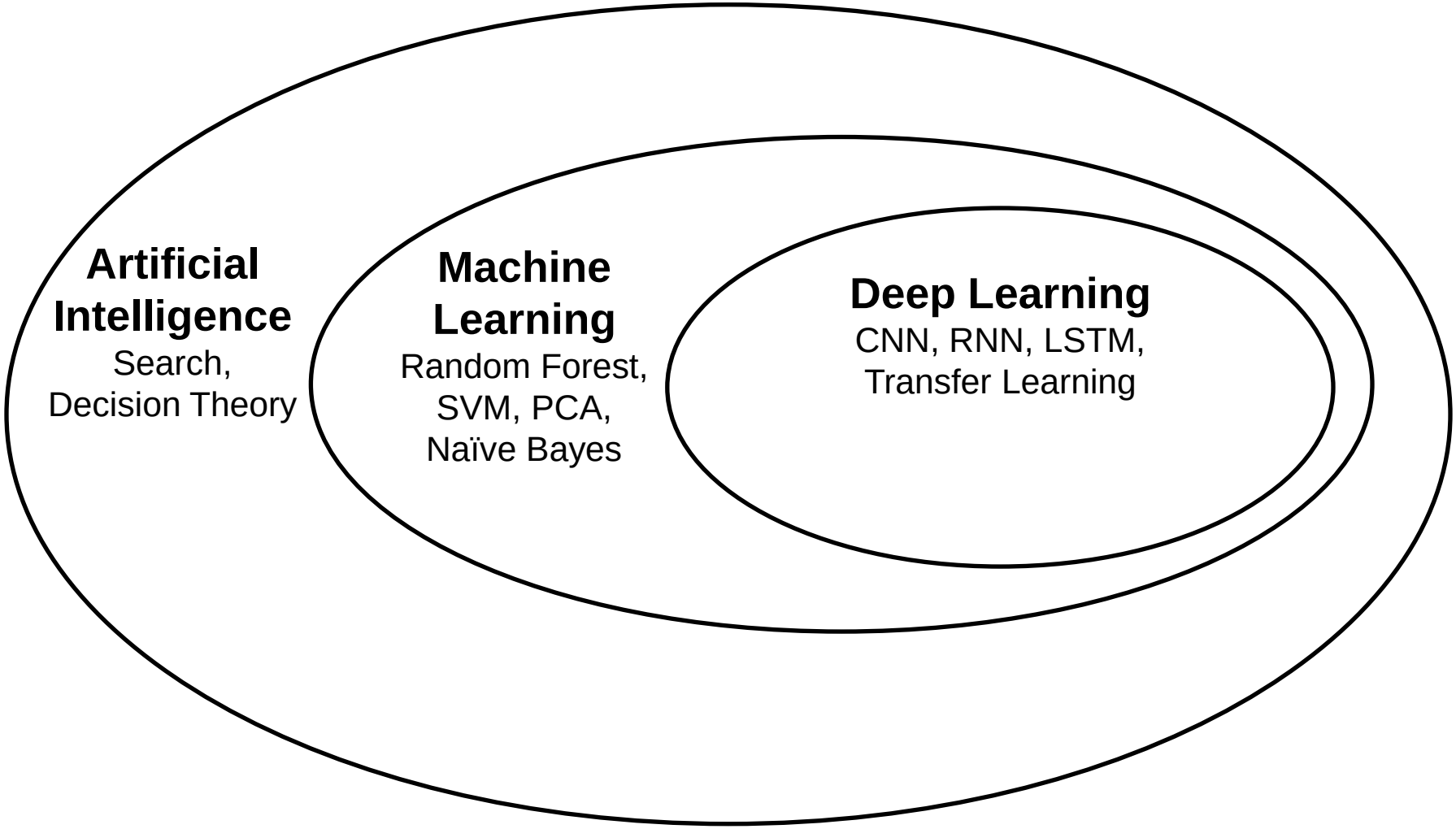
DEEP LEARNING; WHAT AND WHY?



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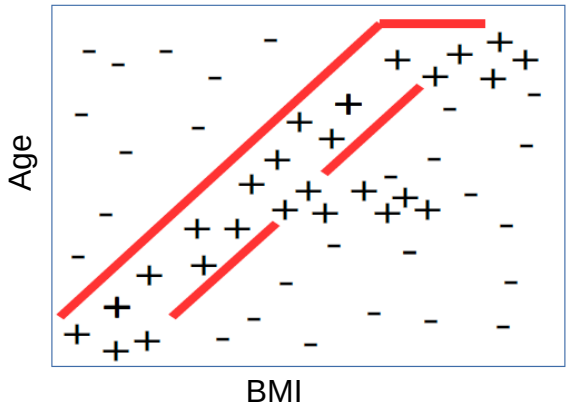
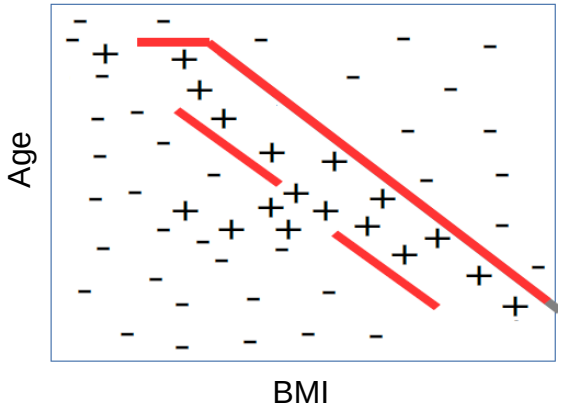
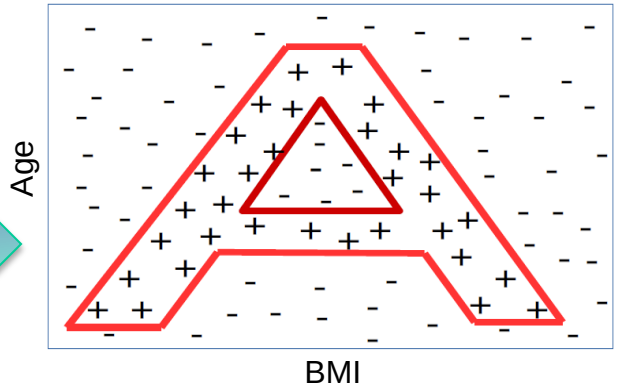
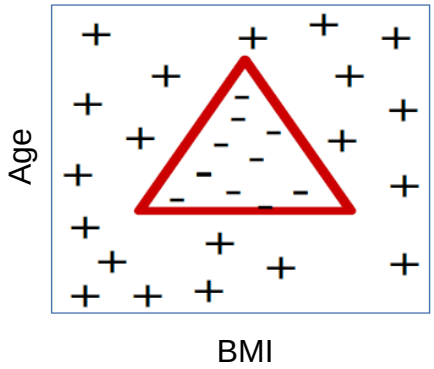
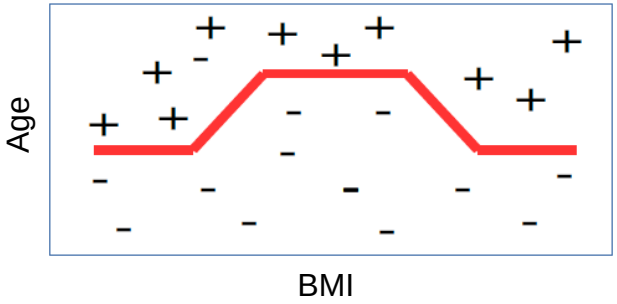




Data amount is being increased, and the model tends to be a complex one







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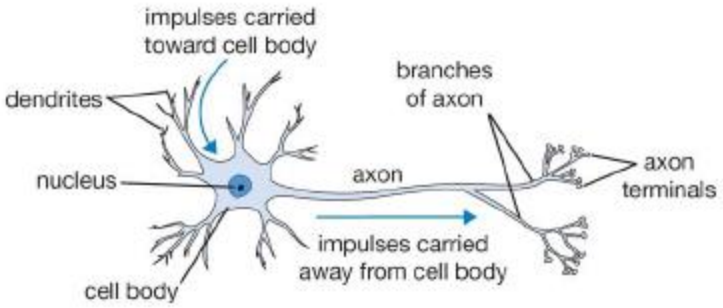
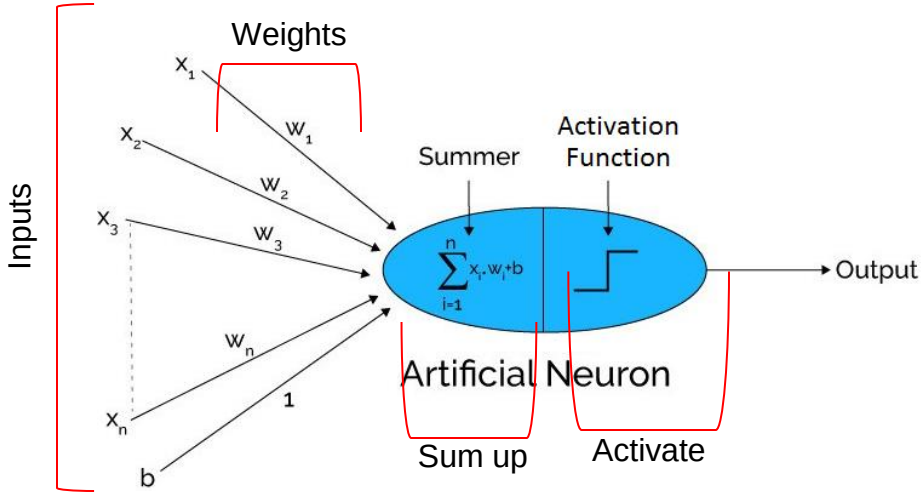
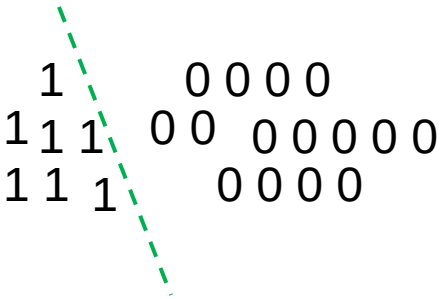




Neuron: Computational building block for the "Brain"
Human Brain: ~100 to 1000 trillion synapses

Artificial Neuron: Computational building block for the "Neural Networks"
Neural Network: ~1 to 10 billion synapses



Universality: for any arbitrary function f(x), there exists a neural network that closely approximates it for any input x.

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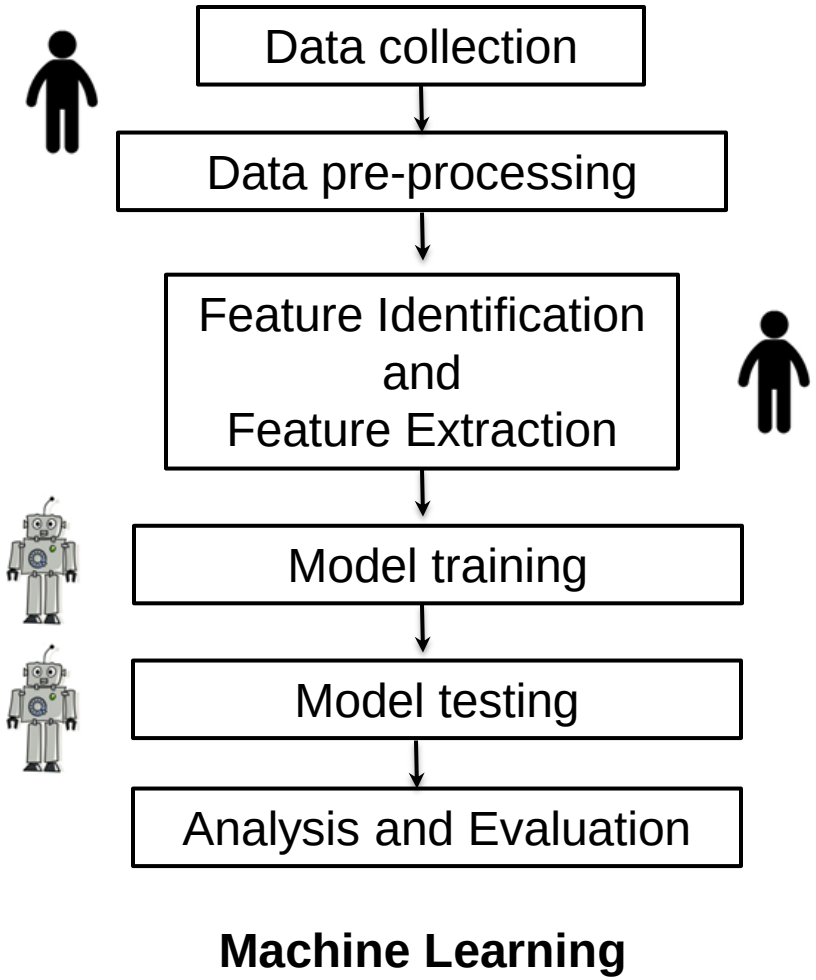
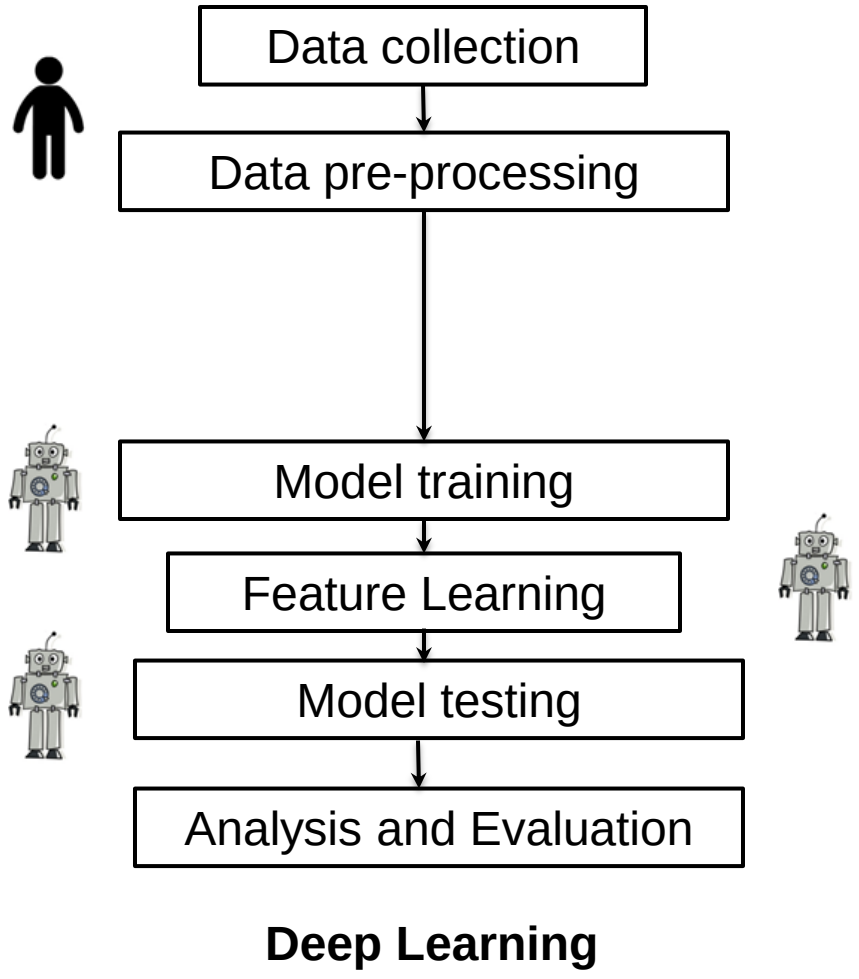


Machine Learning



Deep Learning

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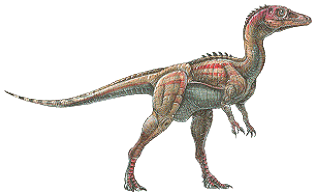
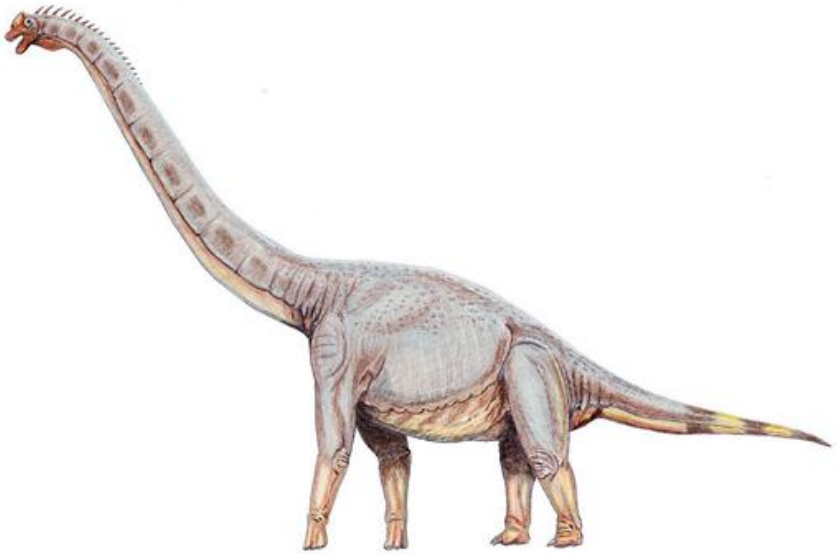


Machine Learning



Deep Learning

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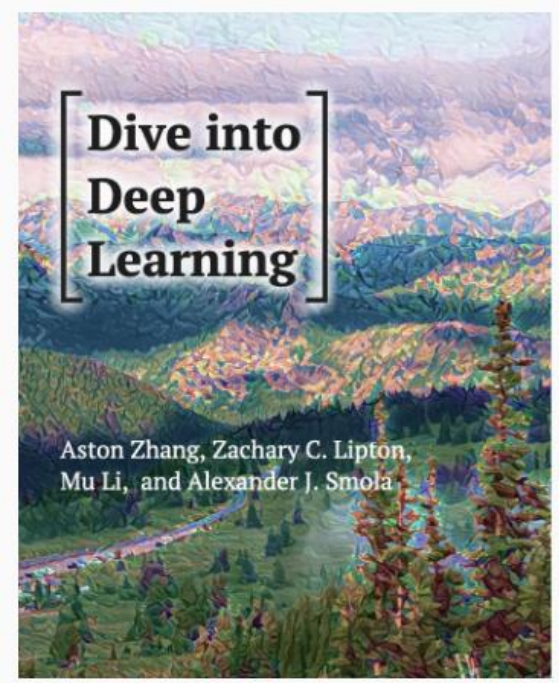
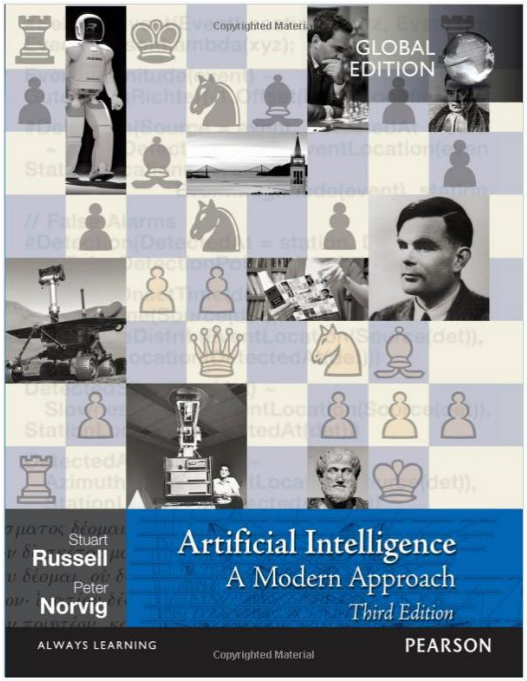
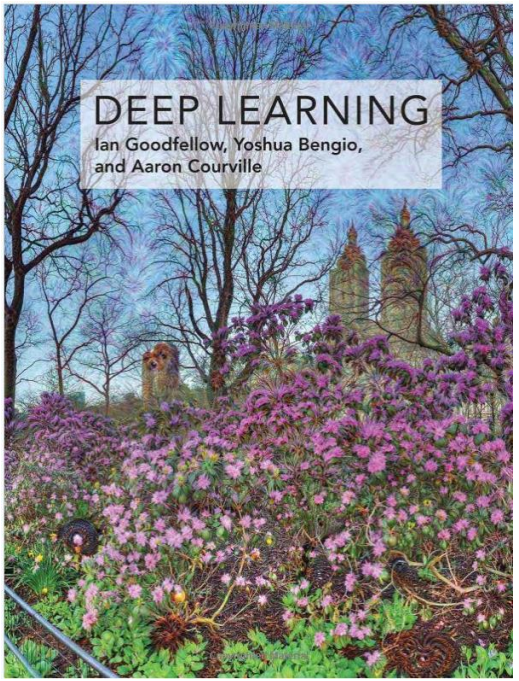
REFERENCES







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