Introduction to Deep Learning

Lecture 1

Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL)

AI is intelligence demonstrated by machines, as opposed to natural intelligence displayed by animals including humans.

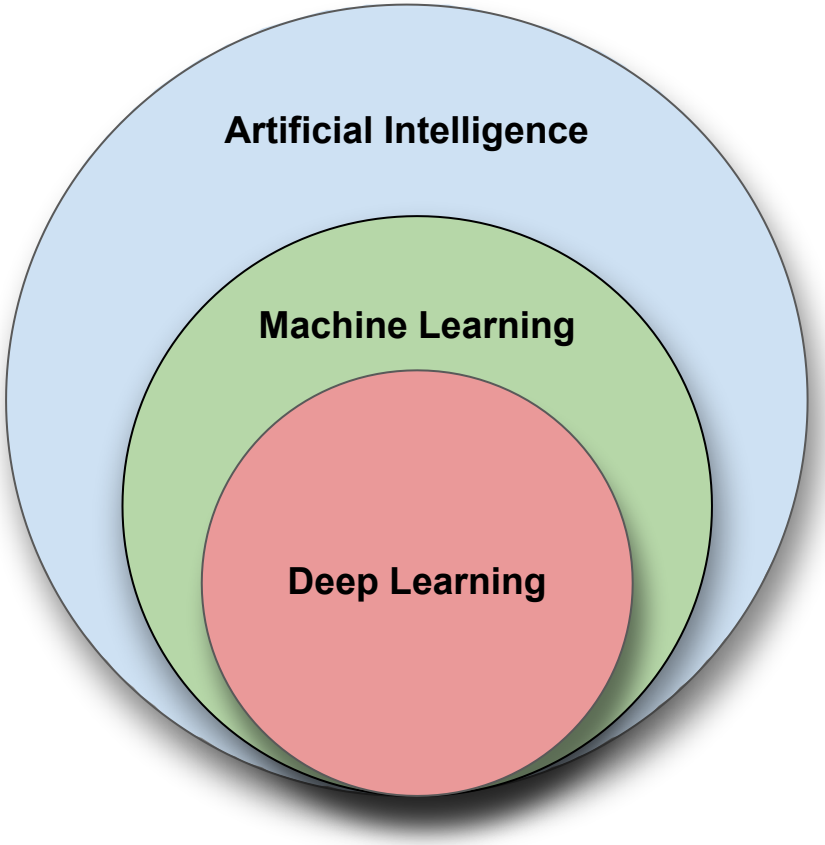
ML is the study of computer algorithms that can improve automatically through experience and using data. It is seen as a part of artificial intelligence.

DL is part of a broader family of machine learning methods based on artificial neural networks.

(Source: Wikipedia)

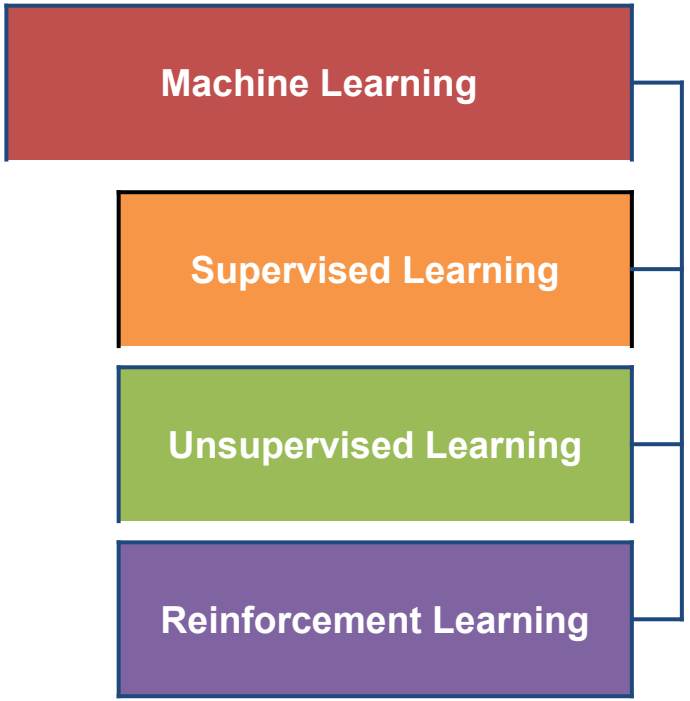
Relationship of AI, ML and DL

- **Artificial Intelligence (AI)** is anything about man-made intelligence exhibited by machines.
- **Machine Learning (ML)** is an approach to achieve **AI**.
- **Deep Learning (DL)** is one technique to implement **ML**.



Types of ML Algorithms

- **Supervised Learning**
  - trained with labeled data; including regression and classification problems
- **Unsupervised Learning**
  - trained with unlabeled data; clustering and association rule learning problems.
- **Reinforcement Learning**
  - no training data; stochastic Markov decision process; robotics and self-driving cars.



What is Deep Learning?

- Deep learning is a subset of machine learning that utilizes artificial neural networks to analyze data and make predictions. These networks, inspired by the human brain, consist of multiple layers that learn from large datasets and can automatically extract features, analyze data in real time, and reveal hidden insights.

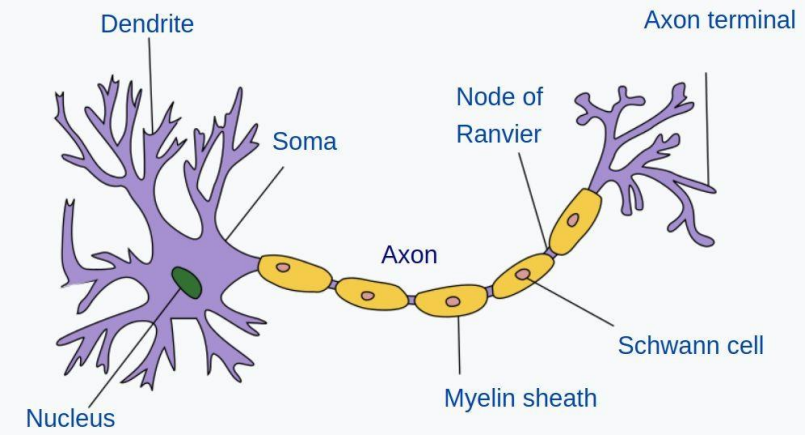
(Source: Wikipedia)

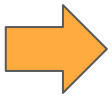
Why Deep Learning?

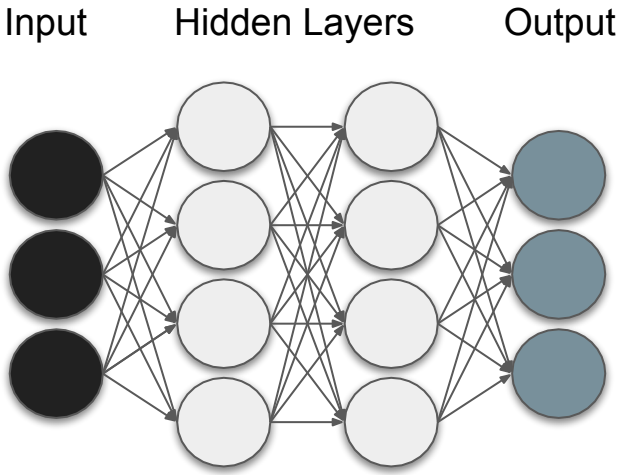
- Limitations of traditional machine learning algorithms
  - not good at handling high dimensional data.
  - difficult to do feature extraction and object recognition.

- Advantages of deep learning
  - DL is computationally expensive, but it is capable of handling high dimensional data.
  - feature extraction is done automatically.

Artificial Neural Network







(Image Credit: Wikipedia)