

Introduction to Deep Learning

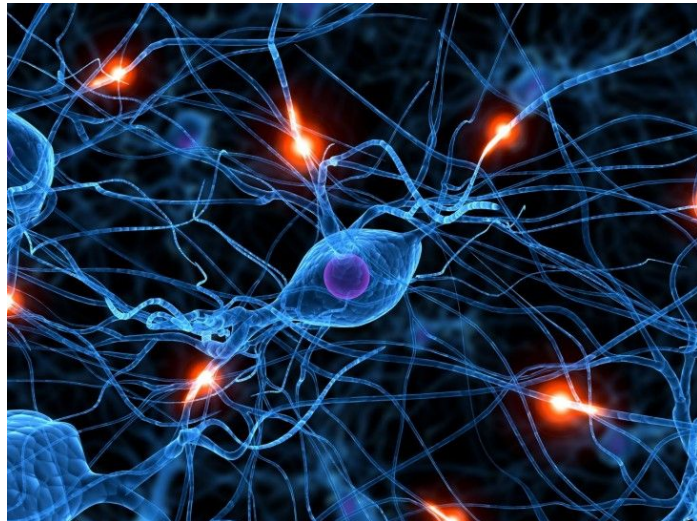
ITI106 Foundations of Deep Learning

Topics

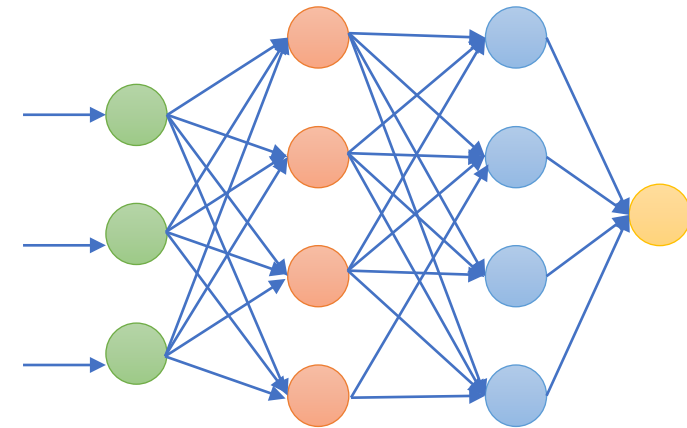
- Introduction to deep learning
- Architecture
- Tensors
- Operations
- Dataflow Graphs
- Functions
- TensorBoard
- Gradient
- TensorFlow v1

What is Deep Learning?

- A **supervised learning algorithm** inspired by the human brain (but not necessarily works like the brain).
- Deep learning is usually associated with artificial neural network (ANN). It can be considered a **Deep** or **Large Neural Network** made possible with advancements in **processing power** and large amount of data.

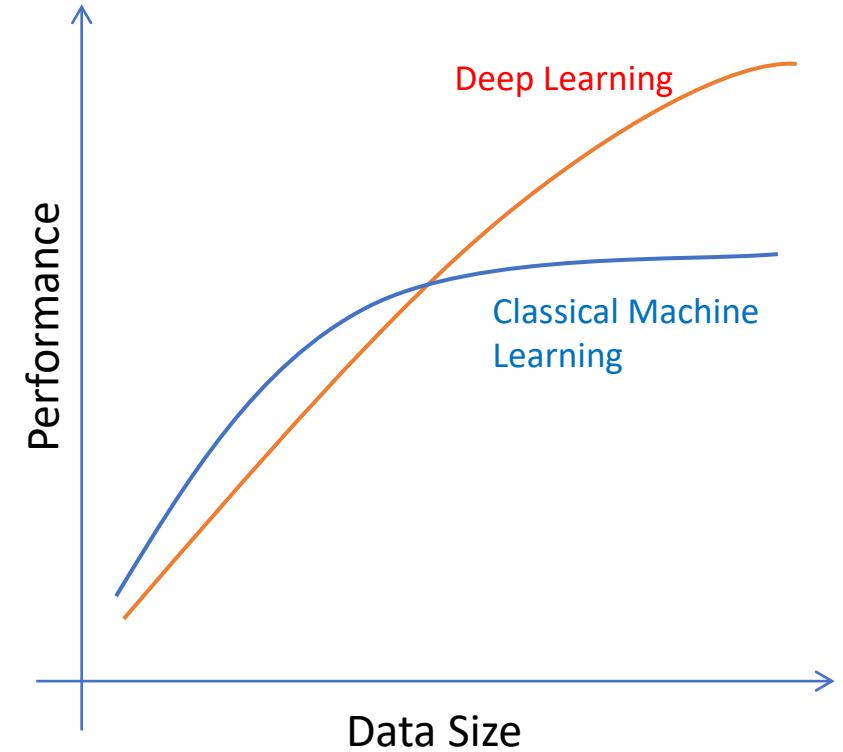


Neural Network. A network of interconnected nodes. Inspired from structure of human brain where neurons are connected by synapses



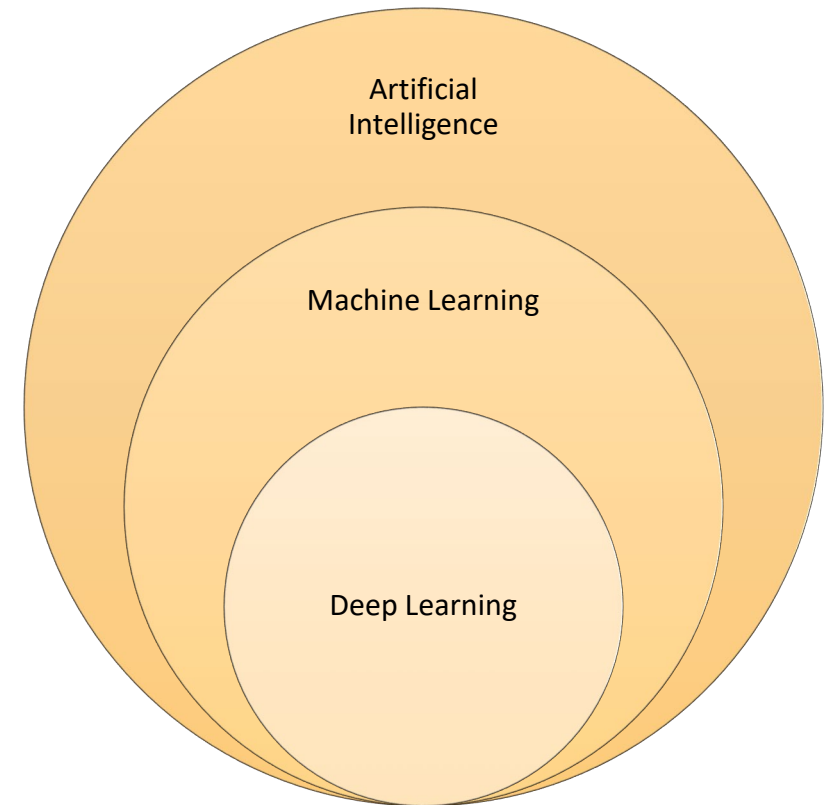
What is Deep Learning?

- In 2010s, Stanford University Professor Andrew Ng collaborated with Google on the Google Brain project. It was very successful and eventually used in Google's many services.
- Andrew Ng commented that large neural network, unlike other machine learning algorithms, improves its performance as more data is available.



Machine Learning and Deep Learning

- Deep learning is considered a subset of machine learning.
- Deep learning has attained a wide field of applications but especially useful in computer vision (video and images), natural language process (text) and speech recognition (audio).
- One important aspect of deep learning is that **less intervention** from human is required compared to other machine learning algorithms. Deep learning can learn and make intelligent decisions on its own.



Deep Learning vs Other Algorithms

- Deep learning has some important advantages over other machine learning algorithms like decision tree or linear regression
 - Feature learning/extraction
 - Deep learning is able to automatically discover and **learn features** from raw data.
 - Reduce reliance on domain experts.
 - Complex problems
 - Useful for **complex problems** especial in video, image classification, natural language processing and speech recognition.
 - Data Size
 - With large data size, deep learning has the **capacity** to continue to improve its performance

Deep Learning vs Other Algorithms

- Deep learning might not always be better:
 - **Data Size**
 - For small datasets, deep learning might not work so well compared with other algorithms like decision tree or k-NN.
 - **Interpretation**
 - In some modelling algorithms, we can explain the model and their parameters.
 - For example: in linear regression, $y = \beta_1 x_1 + \beta_2 x_2 + \dots \beta_n x_n$, each of the parameters (β_i) corresponds to how y varies with x_i .
 - In contrast, it is very difficult to interpret the model generated by deep learning.
 - **Computation**
 - Deep learning can be very computationally intensive. The number of parameters increases dramatically and huge amount of computation is required to find a solution.
 - Fortunately, hardware technology advancements in GPUs help alleviate this issue.

Tools



Topics

