Knowledge Organiser: Deep Learning

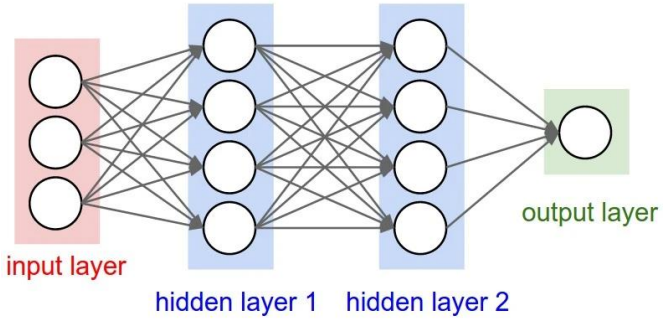
Deep learning is a subset of machine learning, which is essentially a neural network with three or more layers. These neural networks attempt to simulate the behaviour of the human brain allowing it to "learn" from large amounts of data.

What is the difference between Deep Learning and Machine Learning?

- Deep learning eliminates some of data pre-processing that is typically involved with machine learning.
- These algorithms can ingest and process unstructured data, like text and images, and it automates feature extraction, removing some of the dependency on human experts.
- For example, let's say that we had a set of photos of different pets, and we wanted to categorize by "cat", "dog", "hamster", et cetera.
- Deep learning algorithms can determine which features (e.g. ears) are most important to distinguish each animal from another.
- In machine learning, this hierarchy of features is established manually by a human expert.

Artificial Neural Network

- Artificial neural networks consist of multiple layers of interconnected nodes, each building upon the previous layer to refine and optimize the prediction or categorization.
- This progression of computations through the network is called forward propagation. The input and output layers of a deep neural network are called *visible* layers.
- The input layer is where the deep learning model ingests the data for processing, and the output layer is where the final prediction or classification is made.



- Another process called backpropagation uses algorithms, like gradient descent, to calculate errors in predictions and then adjusts the weights and biases of the function by moving backwards through the layers in an effort to train the model.
- Together, forward propagation and backpropagation allow a neural network to make predictions and correct for any errors accordingly. Over time, the algorithm becomes gradually more accurate.
- This is repeated multiple times depending on the epochs value that has been set. 1 epoch consists of 1 forward and 1 backward propagation.