Artificial intelligence is defined as computers being able to perform human-like tasks and display human intelligence. Machine learning is a technique used to achieve artificial intelligence by feeding the computer the data, and the computer performing tasks without having to explicitly be programmed to do so. Deep Learning is a subfield of Machine learning that is designed to train themselves to perform tasks using a deep neural network with large amounts of data (Nguyen, 2019). For this question, I will be giving an overview of Deep Learning.

Deep Learning is the preferred subset of machine learning algorithms when dealing with large amounts of information. They are more accurate and are better at handling unstructured data compared to their other machine learning counter parts.

A graph on a black background

Description automatically generated

A deep neural network is an artificial neural network that has more than one hidden layer. Artificial neural networks were derived from the human biological neural network. In the human biological network, the dendrites receive multiple electrochemical inputs, then each input is assigned weights, and they are multiplied together. After that, these products are transferred to the axon, where these products are added together. To reach the next stage of the human biological neural network and for action potential to occur, the sum of these products must reach a specific threshold. If the sum does not reach the threshold, nothing will happen, if the sum does reach the threshold, action potential occurs, and the output will send a chemical message using the axon terminal to the next neuron. A diagram of a nerve cell

Description automatically generated

These events are like what happens in an artificial neural network. There are types of layers, an input layer, a hidden layer (there are multiple hidden layers in a deep neural network), and an output layer. The elements in each layer are called neurons. Each input neuron is assigned weights, and then they are multiplied together. After that, the results are transferred to the hidden layer where the results of each input neuron and weight combination are added together for each hidden layer neuron. The sum has to reach a specific threshold value for the activation to occur, and for the artificial neural network processes to enter the next stage. The there most popular activation functions are sigmoid, tanh, and relu. Relu is the most used activation function as of right now. Once the activation function is completed, two options can happen, the first is where the next stage is the next hidden layer, and it’s the same process all or again where the neurons of the first hidden layer will play the same role as the neurons in the input. The other option is the output layer stage where the outputs are displayed, and the artificial neural network is complete.

A graph of a function

Description automatically generated

A diagram of a network

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There are multiple types of deep learning neural networks. The two most popular ones are convolutional neural networks (CNN) and recurrent neural networks (RNN). CNNs are mainly used for image recognition, object detection, and image segmentation. It is a popular algorithm in computer vision. RNNs are used for natural language processing techniques and time series analysis like speech recognition (Craig, 2023).

Nguyen, T. (2019). AI Deep Learning: An Introduction. Slide 10. <https://unt.instructure.com/courses/95988/files/23212521?module_item_id=5844840>

Nguyen, T. (2019). AI Deep Learning: An Introduction. Slide 11. <https://unt.instructure.com/courses/95988/files/23212521?module_item_id=5844840>

Craig,Lee. (2023). CNN vs. RNN: How are they different?. Tech Target. https://www.techtarget.com/searchenterpriseai/feature/CNN-vs-RNN-How-they-differ-and-where-they-overlap#:~:text=The%20main%20differences%20between%20CNNs,and%20RNNs%20have%20different%20architectures.