Artificial neural networks (ANN) attempt to mimic the complexity and problem recognition skills of biological neural networks (BNN). However, ANN differs in function and structure from the level of a single neuron to the level of the entire network. A single neuron in an ANN utilizes a mathematical computation to determine what value should be sent to the next layer. An associated weight and bias can be utilized to modify the value to assist with fine-tuning each neuron. Alternatively, a neuron in a BNN receives an electrical signal, which will be passed along to the next neuron via a synapse after a certain electrical threshold has been surpassed. Each neuron will react differently to the signal described as "each neuron has its own unique setting, meaning that the degree of excitement varies between the cells. While some cells get excited about everything, there are cells with no excitement, causing an inhibitory effect" (Buettgenbach, 2021). Nagyfi (2018) describes the difference between neurons as the fact that each neuron in an ANN will pass a series of bits to the next layer regardless of the outcome, while a neuron in a BNN will either fire or not depending on the excitement of the neuron itself.

The overall ANN or BNN also has differences in structure and function. The most important distinction between these networks is the sequential nature of an ANN versus the parallel and distributive nature of a BNN (JavaTpoint, n.d.). This means that each neuron in an ANN will receive, process, and output information individually, while thousands of neurons in a BNN can operate simultaneously. Additionally, an ANN has a much smaller size and does not possess the fault-tolerant nature of a BNN. Within this topology, every neuron in an ANN layer connects to the nodes of the next and previous layers, while a BNN resembles a more mesh-style configuration where a neuron may connect to a few or thousands of other neurons. Connections between neurons in a BNN are also dynamic, described as "brain fibers grow and reach out to connect to other neurons; neuroplasticity allows new connections to be created or areas to move and change function; and synapses may strengthen or weaken based on their importance" (Nagyfi, 2018).

Finally, the ANN and BNN structures incorporate new information in different ways. As previously mentioned, BNN are fault-tolerant, which is achieved by information being stored redundantly in different neurons (Nagyfi, 2018). Subsequently, new information or patterns can be identified, learned, and stored relatively quickly. Alternatively, ANN requires a high volume of data to be passed through the network to identify similarities and patterns with previously learned material. This is accomplished by adjusting the weights and biases of each neuron to make increasingly precise decisions. Checkpoints throughout the learning process can be created to vaguely imitate the redundancy of neurons in BNN. Furthermore, identification can be disrupted in ANN much easier than in BNN, which is described as, "By adding a slight amount of noise or another image besides the banana, your DNN might now think the picture of a banana is a toaster" (Fernandez, 2019). This occurrence could be attributable to the sequential nature of ANN, while a BNN would be better at identifying separate objects and patterns due to simultaneous neuron firing sequences.

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