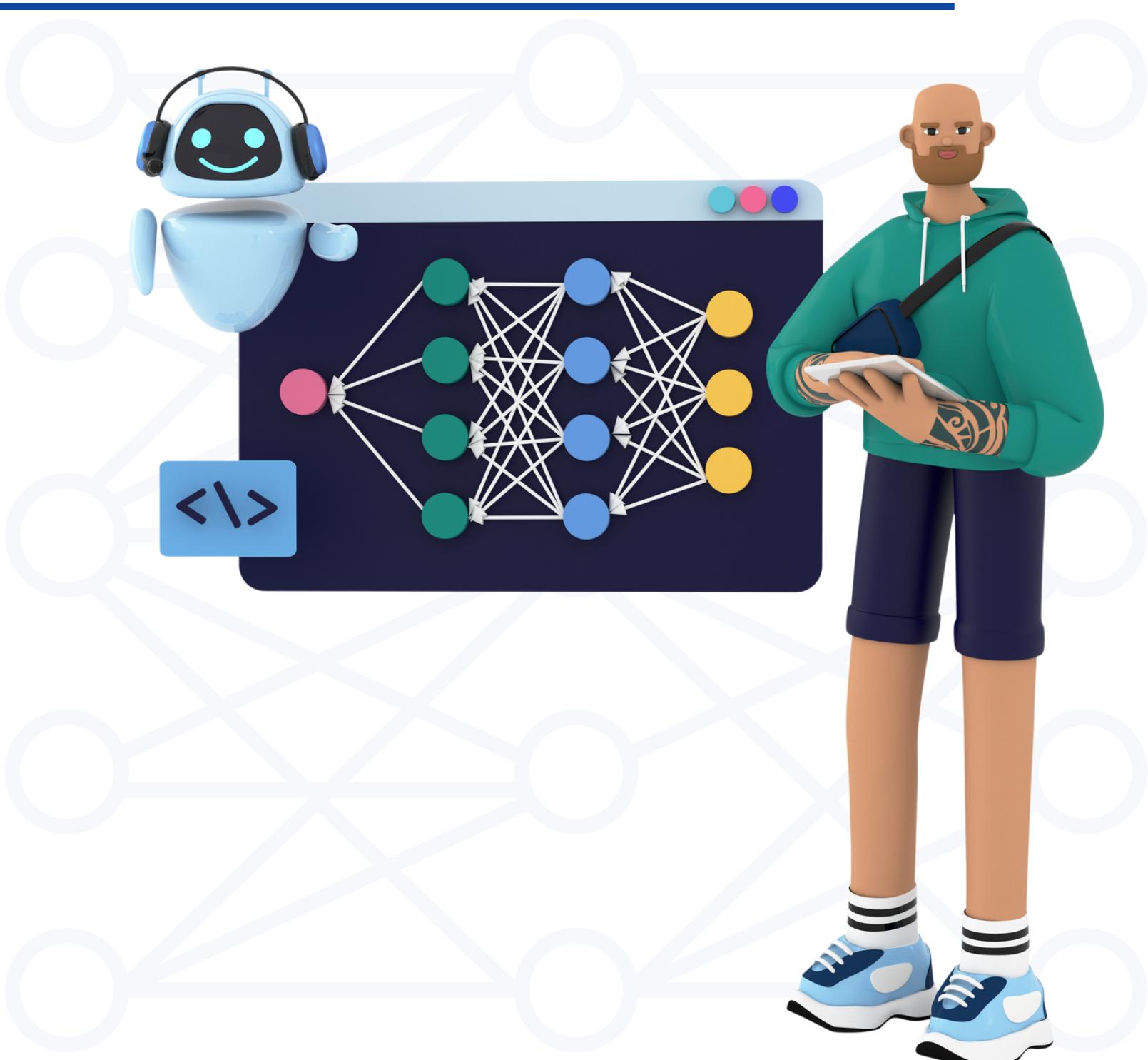
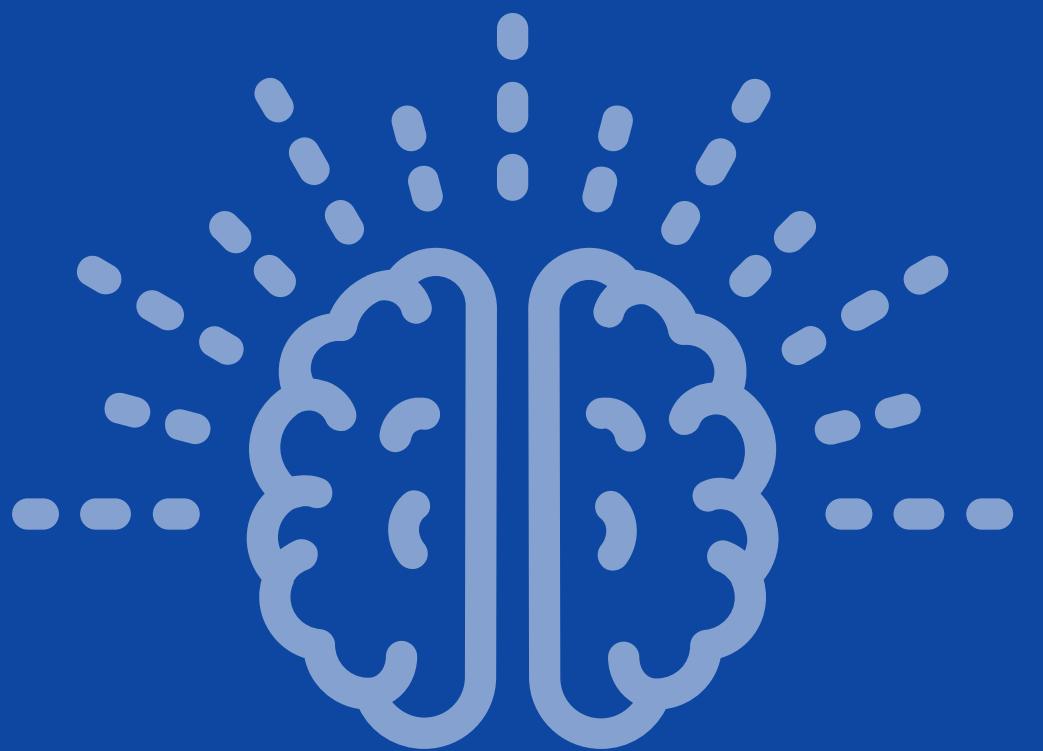


Introduction to Neural Networks



The term “**neural**” derives from the term “**neuron**,” which refers to a single nerve cell. A neural network is simply a collection of neurons that carry out routine tasks in our daily lives.

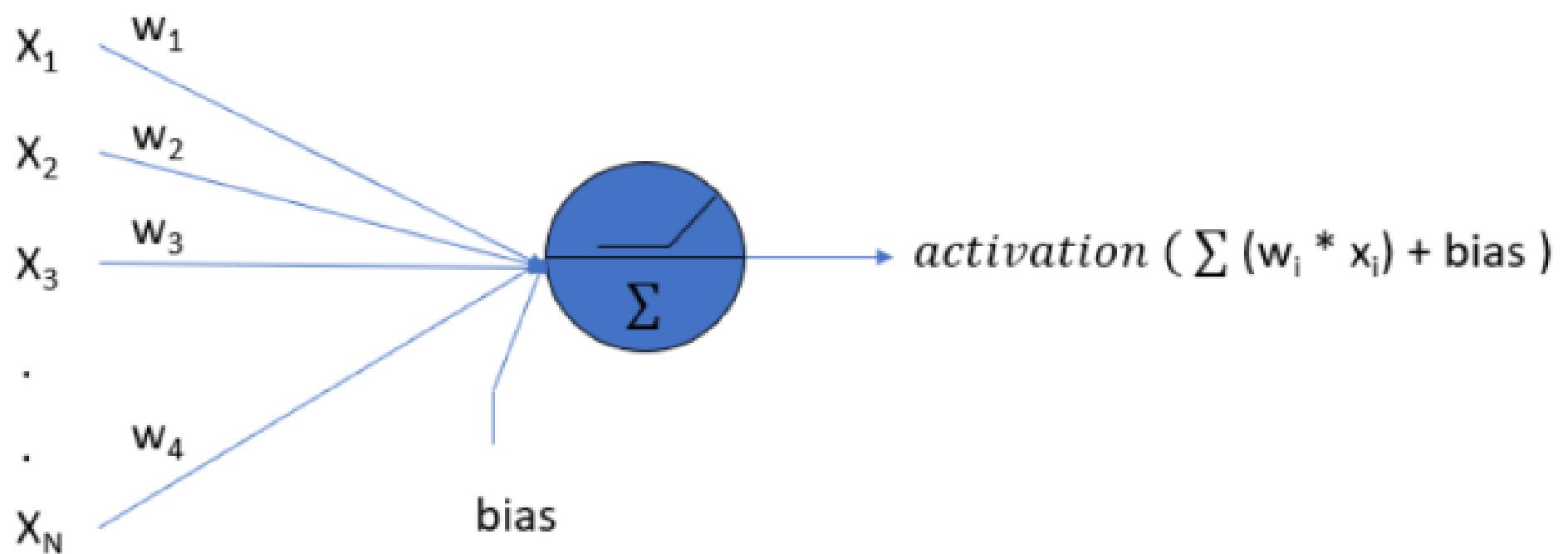


Just like our brain, a neural network is made up of artificial neurons that are connected in a special way. These artificial neurons can do calculations and learn from examples, just like we do when we practice and learn new things.



What are Neural Networks?

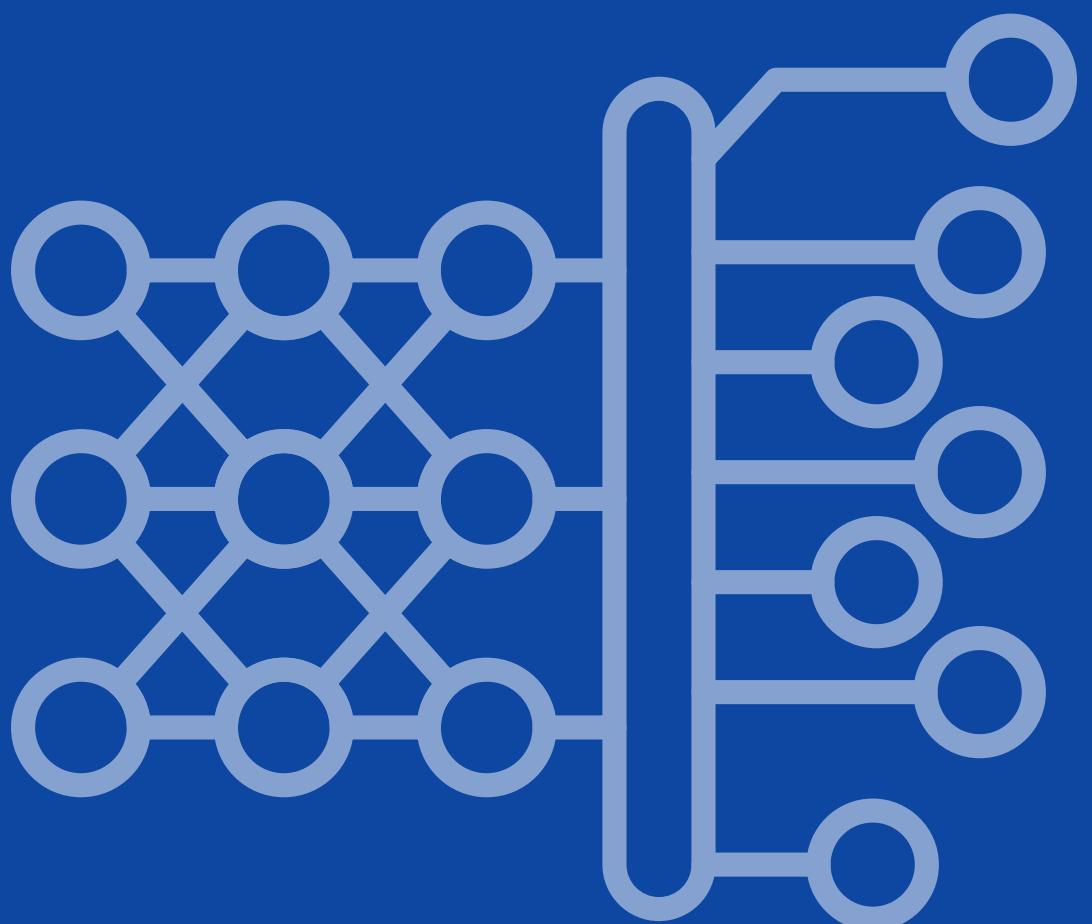
A neural network is an algorithmic model inspired by the structure and functioning of the human brain. It consists of artificial neurons arranged in layers that are connected in a specific pattern to form a network. The neurons communicate and pass information to each other through these connections.



A single neuron shown with x_i inputs with their respective weights W_i and a bias term and applied activation function

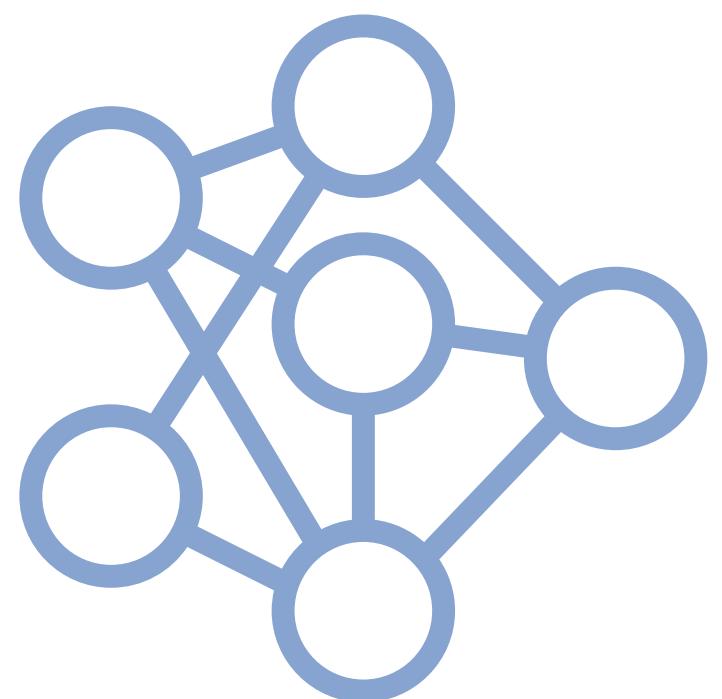


Types of Neural Networks



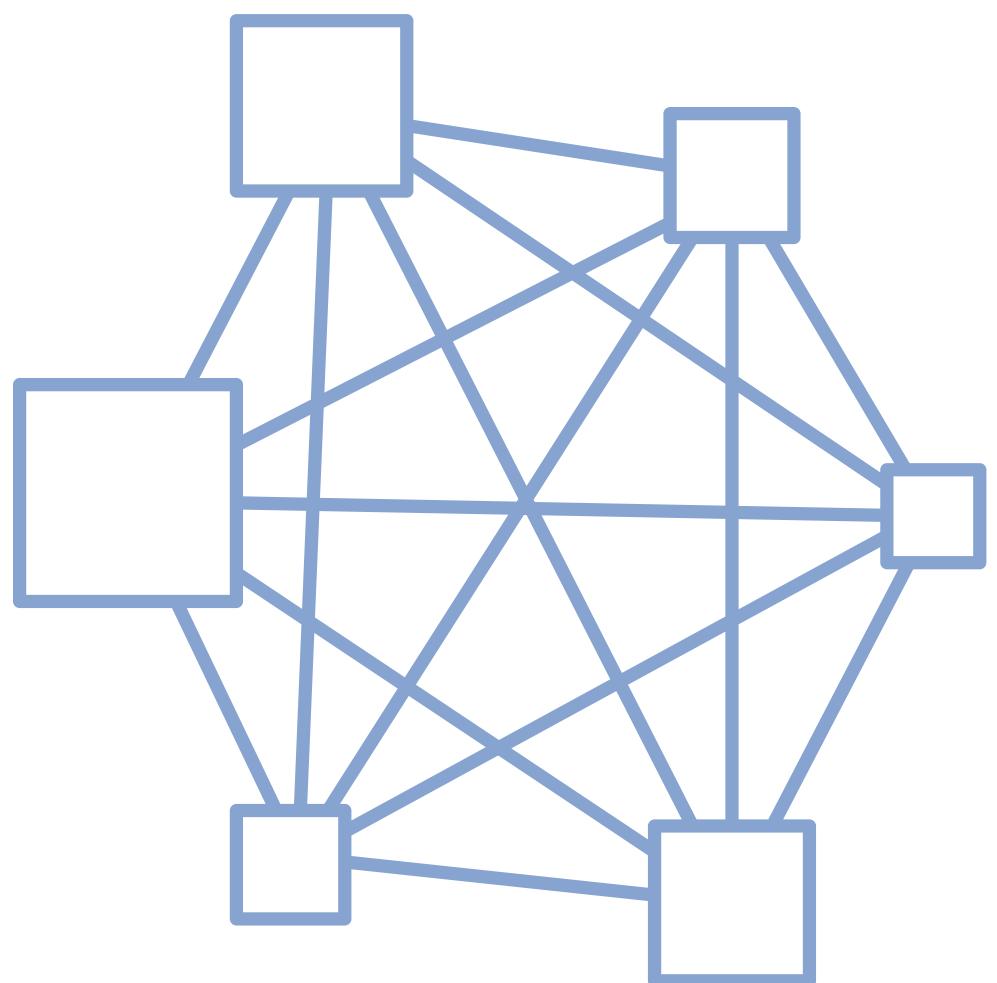
1 ANN

It is also known as an **Artificial Neural Network**. It is a feed-forward neural network that sends inputs forward and can have hidden layers. It's used for Textual and Tabular Data, and Facial Recognition is a common application. It's less powerful than CNN and RNN. The ANN is made up primarily of three layers. These include the **input layer**, **hidden layers** in between, and the **output layer**.



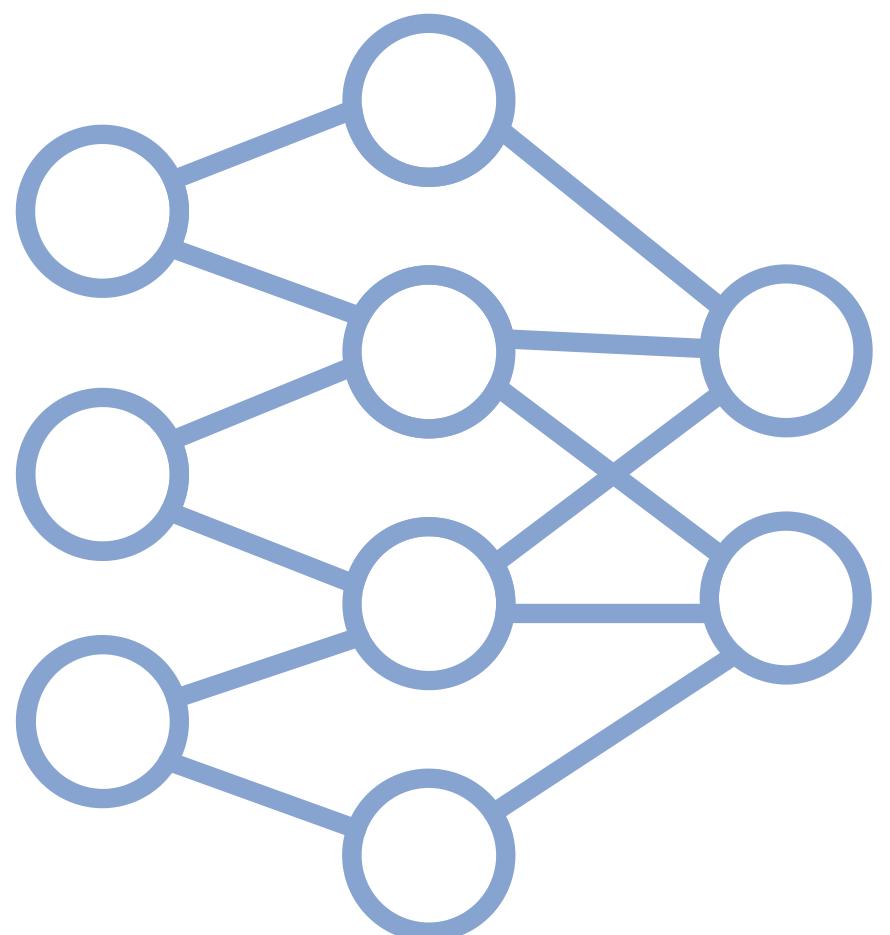
2 CNN

It is also known as **Convolutional Neural Networks**. CNN is used for Image Data and Computer Vision. It's powerful, with real-life applications such as object detection in autonomous vehicles. It contains convolutional layers and neurons, making it more powerful than ANN and RNN.



3 RNN

It is also known as **Recurrent Neural Networks**. It is used to process and interpret time series data. In this type of model, the output from a processing node is fed back into nodes in the same or previous layers. The most known types of RNN are LSTM (Long Short Term Memory) Networks

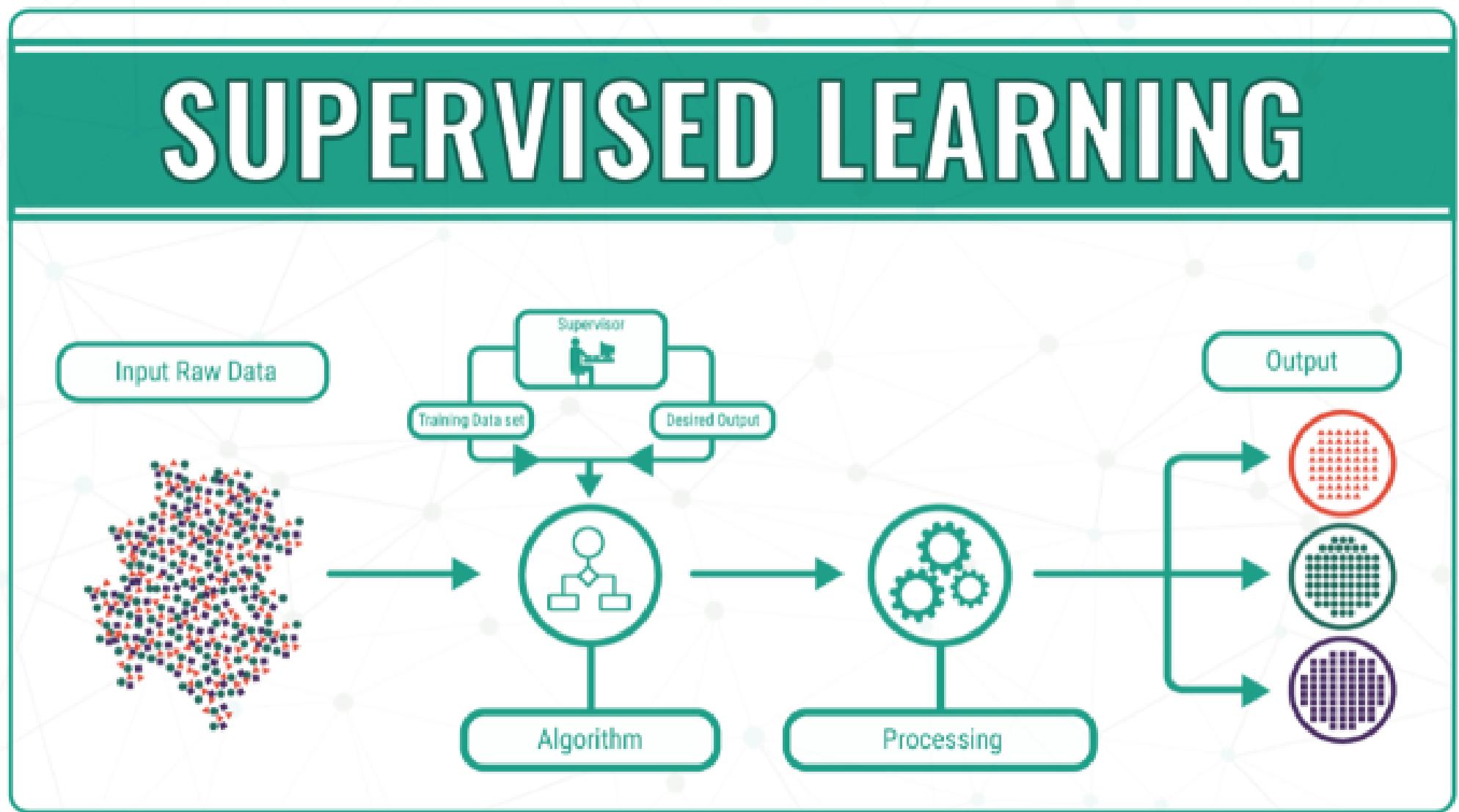


Types of Learnings in Neural Networks



Supervised Learning

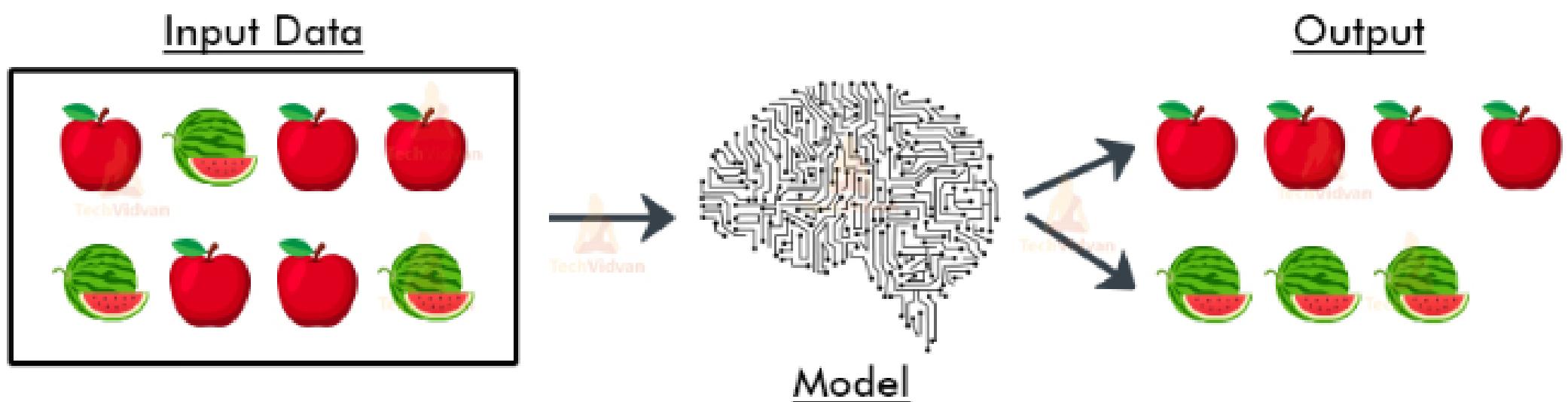
As the name suggests this is a supervised learning, where input training pairs are compared to the desired output. The model's output is adjusted until it matches the desired output, with feedback from the environment.



Unsupervised Learning

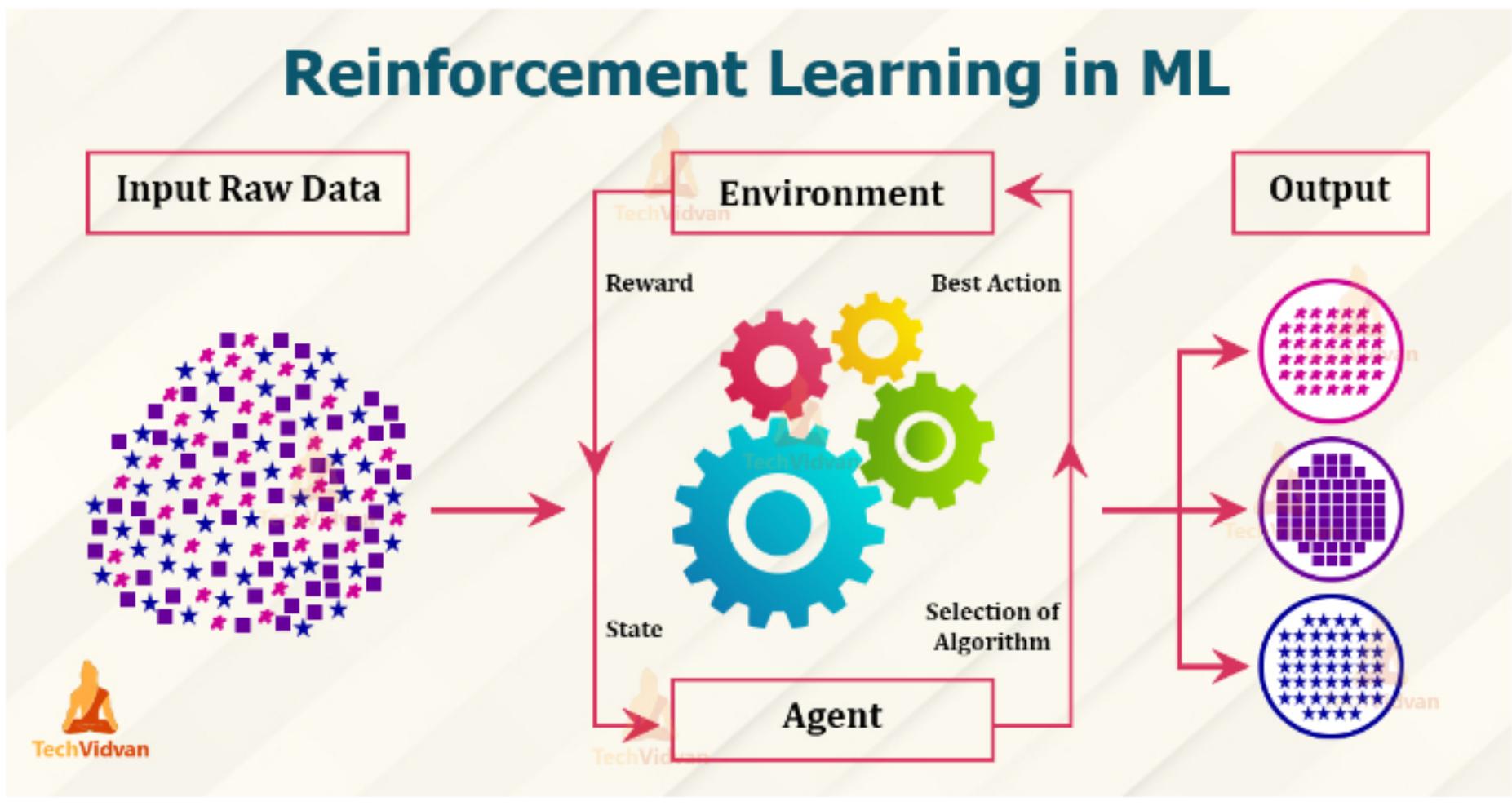
Unlike supervised learning, there is no supervisor or a teacher here. The model learns on its own and forms inputs into classes based on similarity. It can predict to which class a new input belongs or form a new class if necessary.

Unsupervised Learning in ML



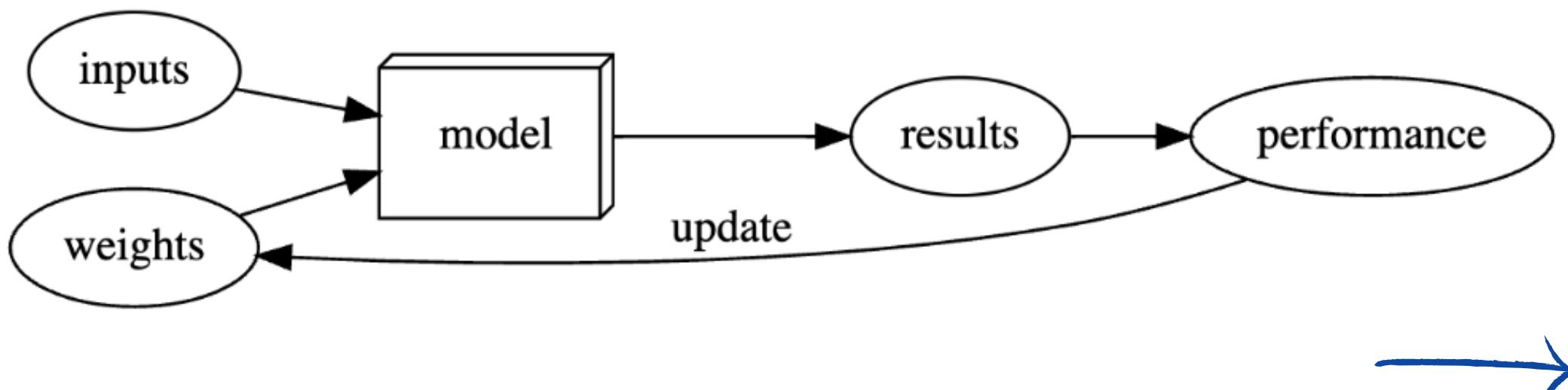
Reinforcement Learning

The model combines Supervised and Unsupervised learning, utilizing critique feedback to guide its learning. It learns on its own and can predict or form new classes based on similarity. It is similar to supervised learning in receiving feedback, but different in receiving critique rather than desired output information.



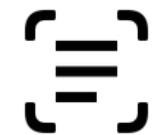
How does a Neural Network work?

1. Information is fed into the input layer which transfers it to the hidden layer
2. The interconnections between the two layers initialise the weights
3. For each input, use the above weights to predict outcome.
4. Out of all these predictions, find out how good the model is.
5. Calculating the gradient, which measures for each weight, how changing the weight would change the loss
6. Change all weights based on the above calculation
7. Go back to step 2 and repeat
8. Iterate until the decision to stop.



What are the applications of neural networks?

1. Recognizing Characters



2. Verifying signatures



3. Recognizing Human Face



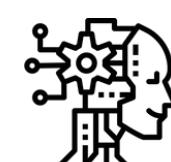
4. Marketing and Sales



5. Detecting Stock Market Trends



6. Building Artificial Assistance



7. Healthcare



8. Agriculture



**That's a wrap.
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