Deep Learning

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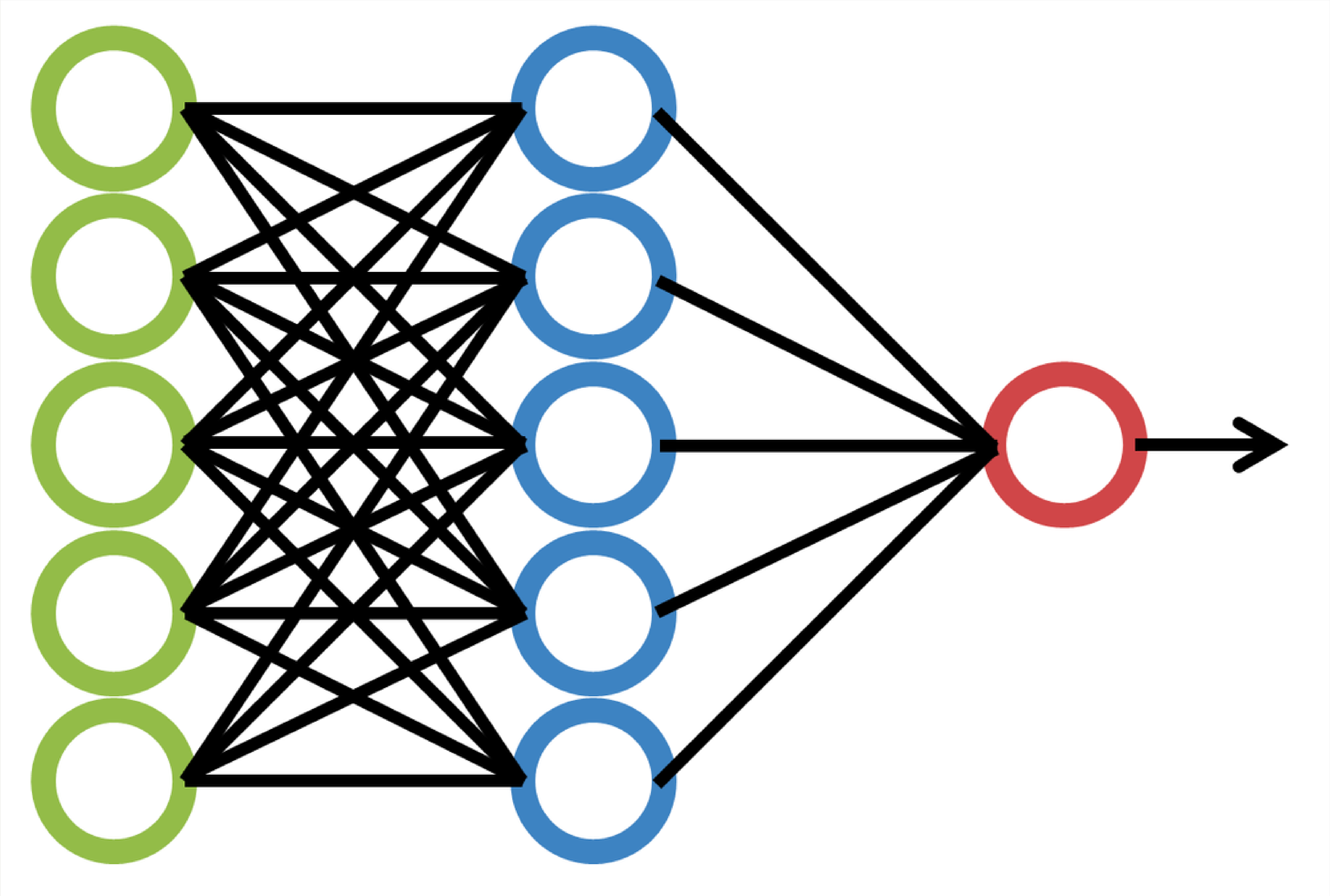

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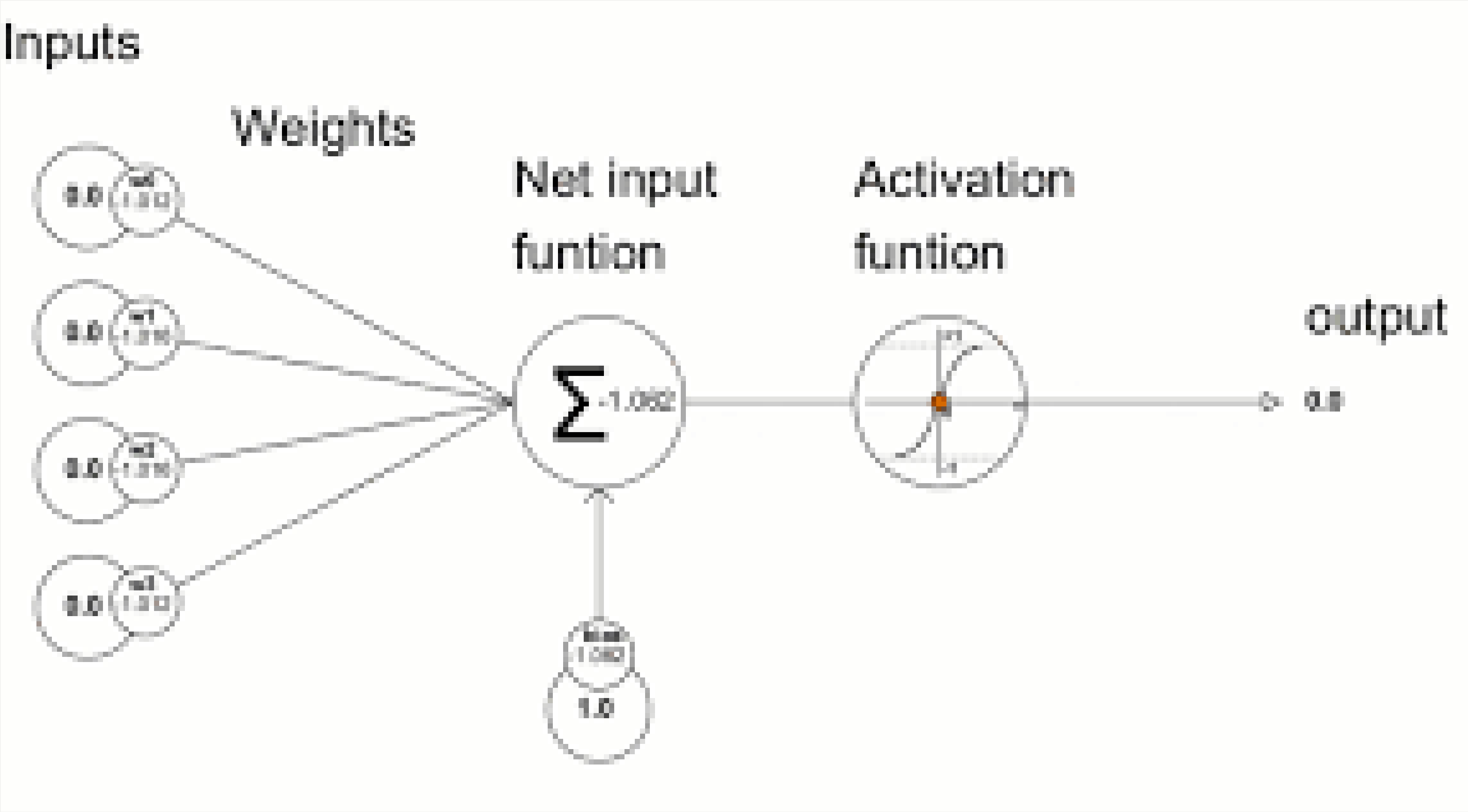
Neural Networks

A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature.



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optimizer

While training the deep learning model, we need to modify each epoch's weights and minimize the loss function. An optimizer is a function or an algorithm that modifies the attributes of the neural network, such as weights and learning rate. Thus, it helps in reducing the overall loss and improving the accuracy.

EXAMPLES

- **Gradient Descent**
- **Stochastic Gradient Descent**
- **Stochastic Gradient descent with momentum**
- **Mini-Batch Gradient Descent**
- **Adagrad**
- **RMSProp**
- **AdaDelta**
- **Adam**

Epoch – The number of times the algorithm runs on the whole training dataset.

Sample – A single row of a dataset.

Batch – It denotes the number of samples to be taken to for updating the model parameters.

Learning rate – It is a parameter that provides the model a scale of how much model weights should be updated.

Weights/ Bias – The learnable parameters in a model that controls the signal between two neurons.

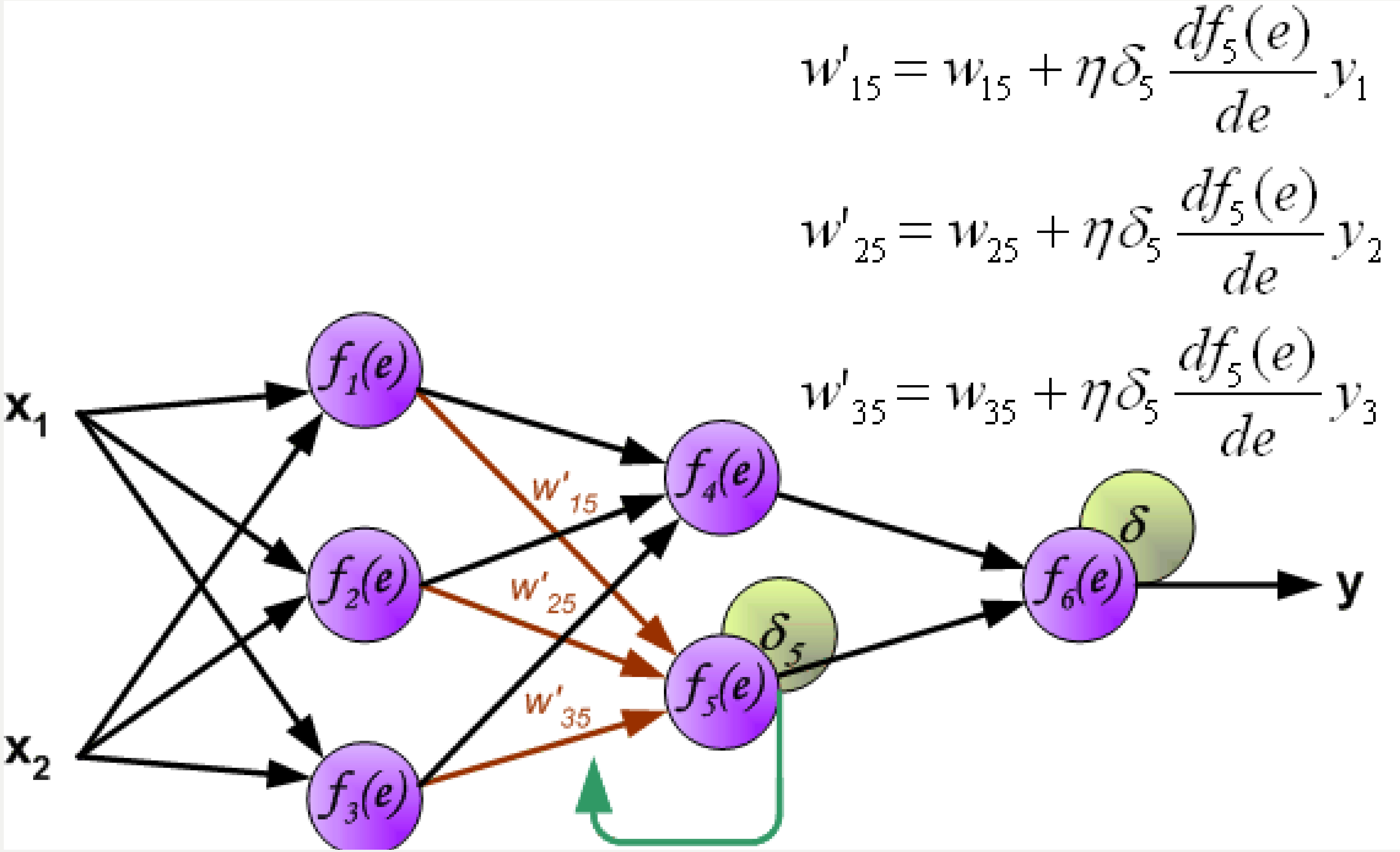
Loss Function

The **loss function** is the function that **computes the distance between the current output of the algorithm and the expected output**. It's a method to evaluate how your algorithm models the data. It can be categorized into two groups. One for **classification** (discrete values, 0,1,2...) and the other for **regression** (continuous values).

EXAMPLES

- Cross-entropy
- Log loss
- Exponential Loss
- Hinge Loss
- Kullback Leibler Divergence Loss
- Mean Square Error (MSE — L2)
- Mean Absolute Error (MAE — L1)
- Huber Loss

Backpropagation



Gradient Descent

Gradient descent is an optimization algorithm which is commonly-used to train machine learning models and neural networks.

Training data helps these models learn over time, and the cost function within gradient descent specifically acts as a barometer, gauging its accuracy with each iteration of parameter updates. Until the function is close to or equal to zero, the model will continue to adjust its parameters to yield the smallest possible error. Once machine learning models are optimized for accuracy, they can be powerful tools for artificial intelligence (AI) and computer science applications.

Similar to finding the line of best fit in linear regression, the goal of gradient descent is to minimize the cost function, or the error between predicted and actual y. In order to do this, it requires two data points—a direction and a learning rate. These factors determine the partial derivative calculations of future iterations, allowing it to gradually arrive at the local or global minimum (i.e. point of convergence).

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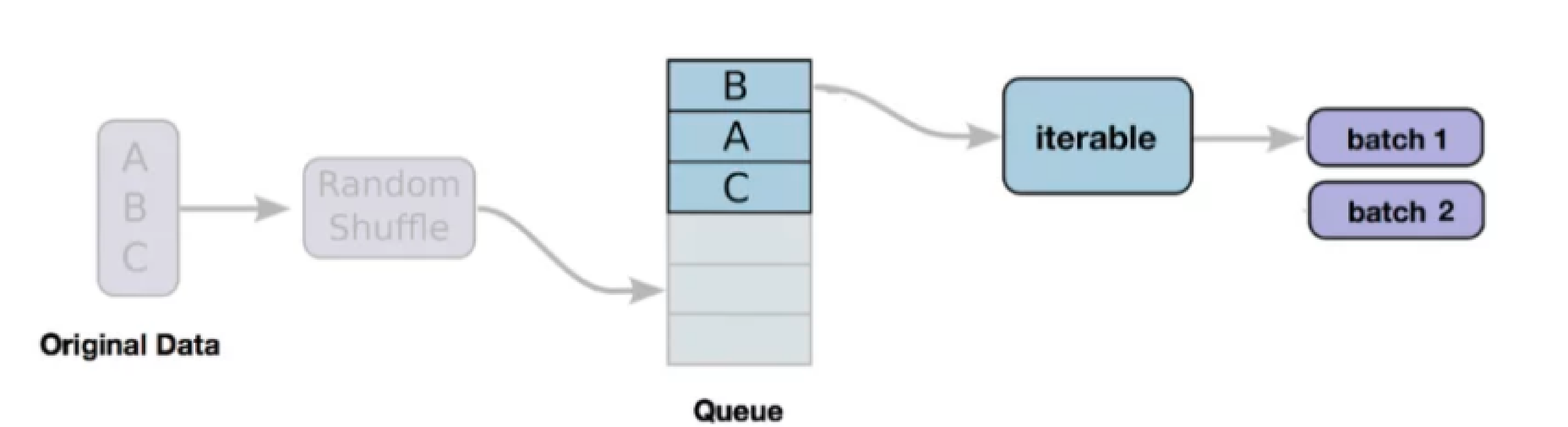
Data Loaders

Data Loaders are one of the most important parts of working with Neural network models in Deep Learning. The main goal of Data Loaders is to load the data and make it usable in the model later for predictions.
We can transform the data, divide it into batches, shuffle and make it iterable which makes it very much usable in the model.



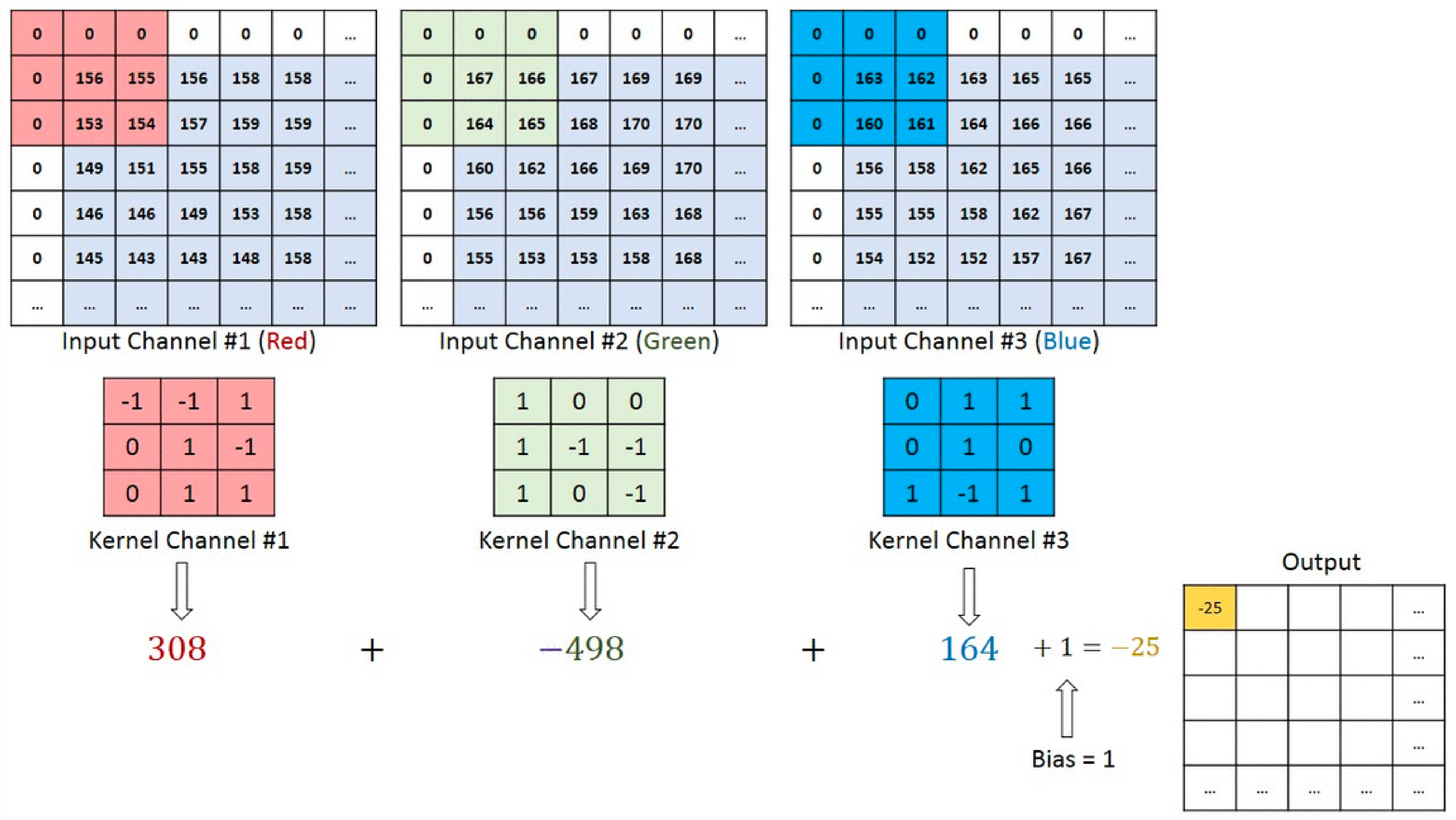
Convolutional Neural Networks

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a CNN is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, CNNs have the ability to learn these filters/characteristics.

The architecture of a CNN is analogous to that of the connectivity pattern of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the Receptive Field. A collection of such fields overlap to cover the entire visual area.

Convolutional Neural Networks

A CNN is able to successfully capture the Spatial and Temporal dependencies in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset due to the reduction in the number of parameters involved and the reusability of weights. In other words, the network can be trained to understand the sophistication of the image better.



Thank you for your attention!