

Praktikum Kecerdasan Buatan

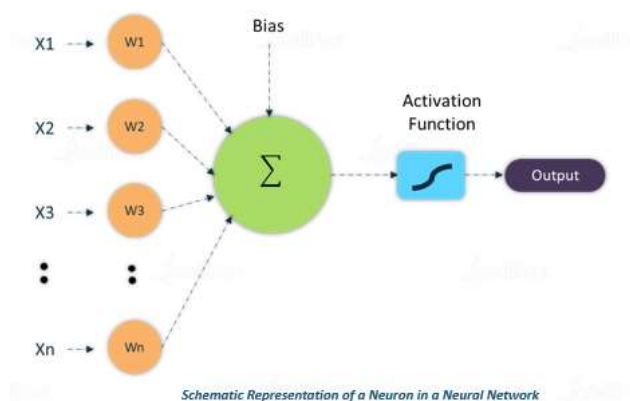
Artificial Neural Networks : Single Perceptron

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What is Perceptron?

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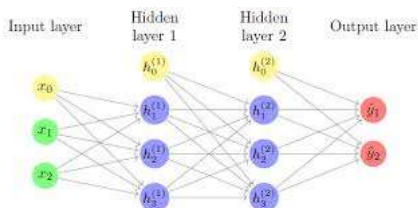


The Fundamentals of Neural Networks

What's a Neural Network?

A neural network is loosely based on how the human brain works:

Many neurons connected to other neurons Passing information through their connections and firing when the input to a neuron surpasses a certain threshold.



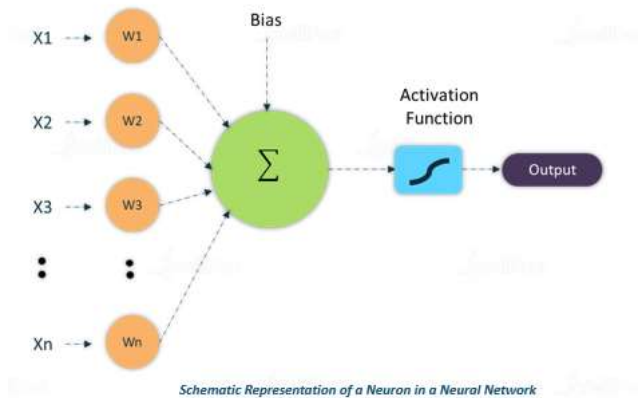
- **Perceptron is a single layer neural network.**
- **Neural Networks is a multi-layer perceptron.**
- Perceptron is a linear classifier (binary).
- It is used in supervised learning.
- It helps to classify the given input data.

How perceptron works ?

Ilustrasi sebuah perceptron

Here $x_1, x_2, x_3, \dots, x_n$ are inputs and $w_1, w_2, w_3, \dots, w_n$ are weights.

It takes an input, processes it, passes it through an activation function, and returns the output.



The perceptron consists of 4 parts:

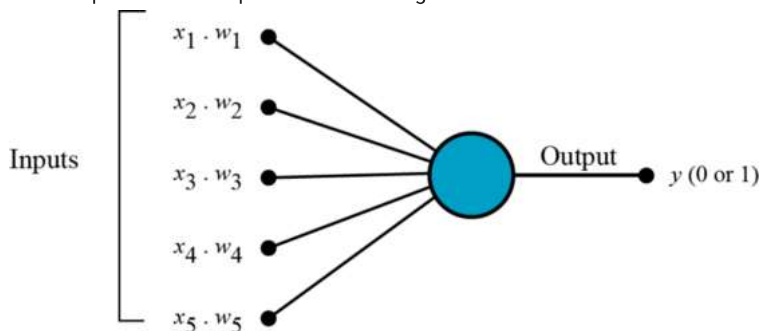
1. Input values or One input layer
2. Weights and Bias
3. Weighted sum
4. Activation Function

- The Neural Networks work the same way as the perceptron.
- So, if you want to know how neural network works, learn how perceptron works.

How perceptron work?

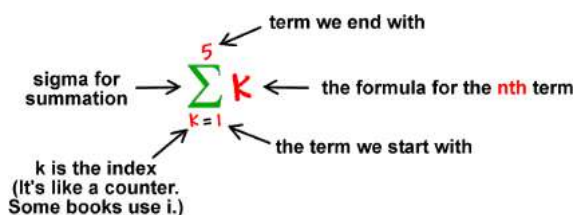
The perceptron works on these simple steps

1. All the inputs x are multiplied with their weights w . Let's call it k .



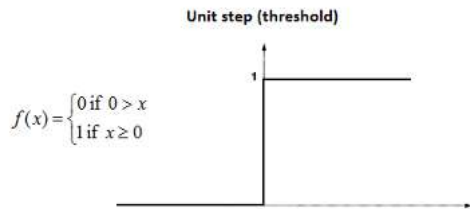
Gambar: Multiplying inputs with weights for 5 inputs

2. Add all the multiplied values and call them **Weighted Sum**.



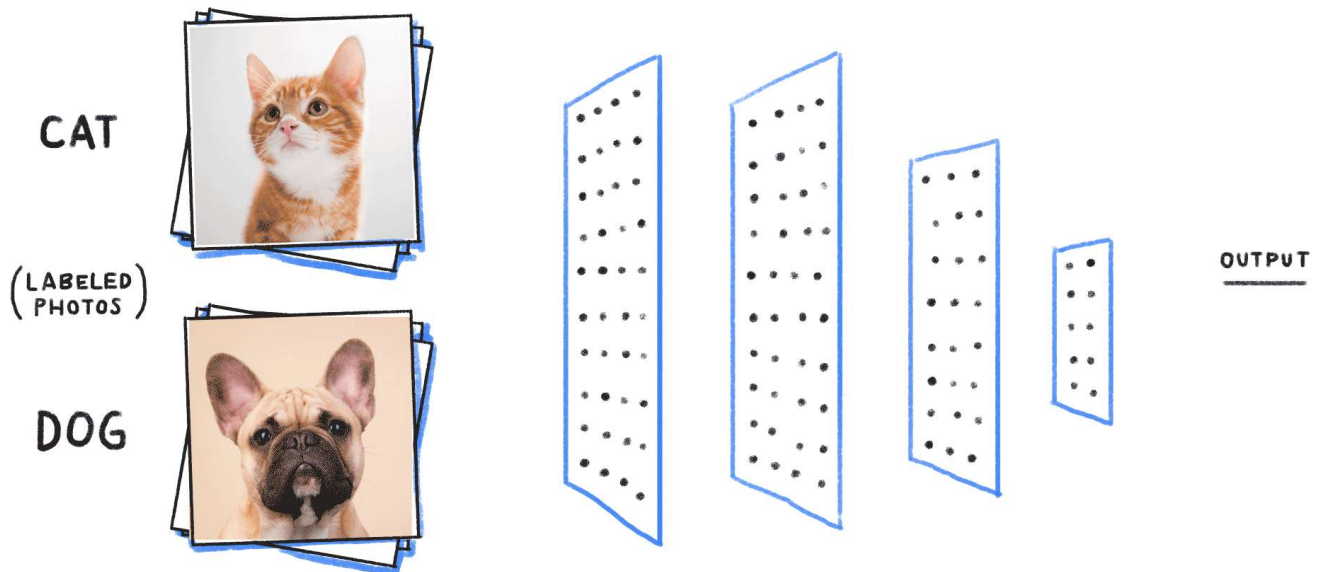
Gambar: Adding with Summation

3. **Apply** that weighted sum to the correct **Activation Function**. For Example: Unit Step Activation Function.



Gambar: Unit Step Activation Function

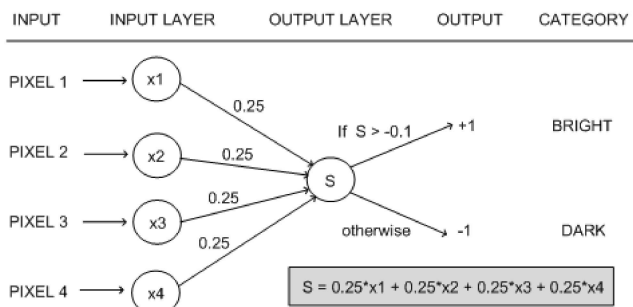
How multi perceptron works ? A normal neural network looks like this



Why do we need Weights and Bias?

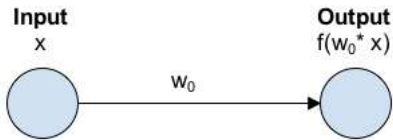
Why do we need Weights and Bias?

- Weights shows the strength of the particular node.
- A bias value allows you to shift the activation function curve up or down.

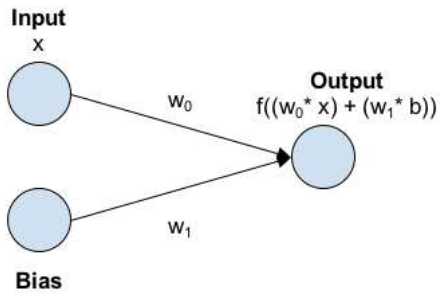


Why do we need Bias? The role of bias in Neural Networks

- The activation function in Neural Networks takes an input 'x' multiplied by a weight 'w'.
- Bias allows you to shift the activation function by adding a constant (i.e. the given bias) to the input.
- Bias in Neural Networks can be thought of as analogous to the role of a constant in a linear function, whereby the line is effectively transposed by the constant value.
- In a scenario with no bias, the input to the activation function is 'x' multiplied by the connection weight 'w0'.

No Bias

- In a scenario with bias, the input to the activation function is 'x' times the connection weight 'w0' plus the bias times the connection weight for the bias 'w1'.
- This has the effect of shifting the activation function by a constant amount ($b * w_1$).

Bias

▾ Why do we need Activation Function?

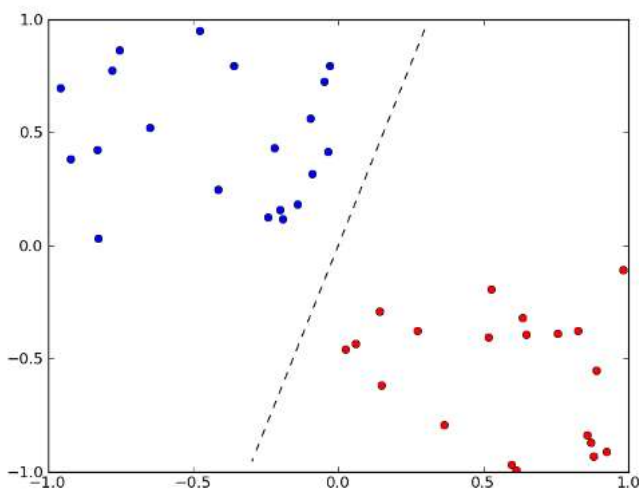
Why do we need Activation Function?

- It is used to determine the output of neural network like yes or no.
- The activation functions are used to map the input between the required values like (0, 1) or (-1, 1).
- It maps the resulting values / output in between 0 to 1 or -1 to 1 etc. (depending upon the function: RELU, sigmoid, tanh etc).

▾ Where we use Perceptron?

Where we use Perceptron?

- Perceptron is usually used to classify the data into two parts.
- Therefore, it is also known as a Linear Binary Classifier.



▾ References

- <https://towardsdatascience.com/what-the-hell-is-perceptron-626217814f53#:~:text=Perceptron%20is%20a%20single%20layer,classify%20the%20given%20input%20data>.
- <https://www.pico.net/kb/the-role-of-bias-in-neural-networks/>
- <https://intellipaat.com/community/253/role-of-bias-in-neural-networks>