



Perceptrons

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Artificial Neural Network (ANN)

Machine Learning method

Today, often called **Deep Learning**

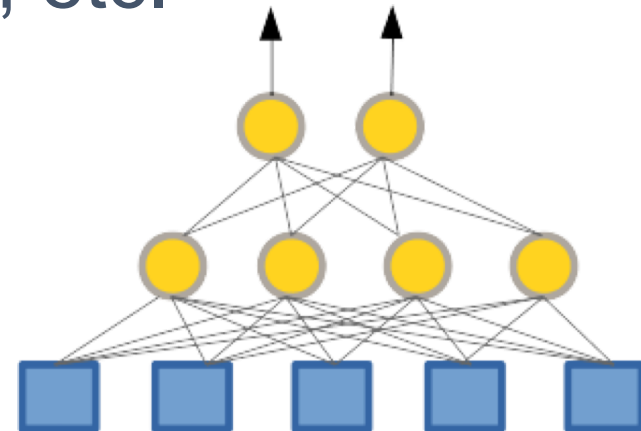
Inspired by Biological Neural Networks

Mimics some of the basic functionalities

Can learn from large amounts of data

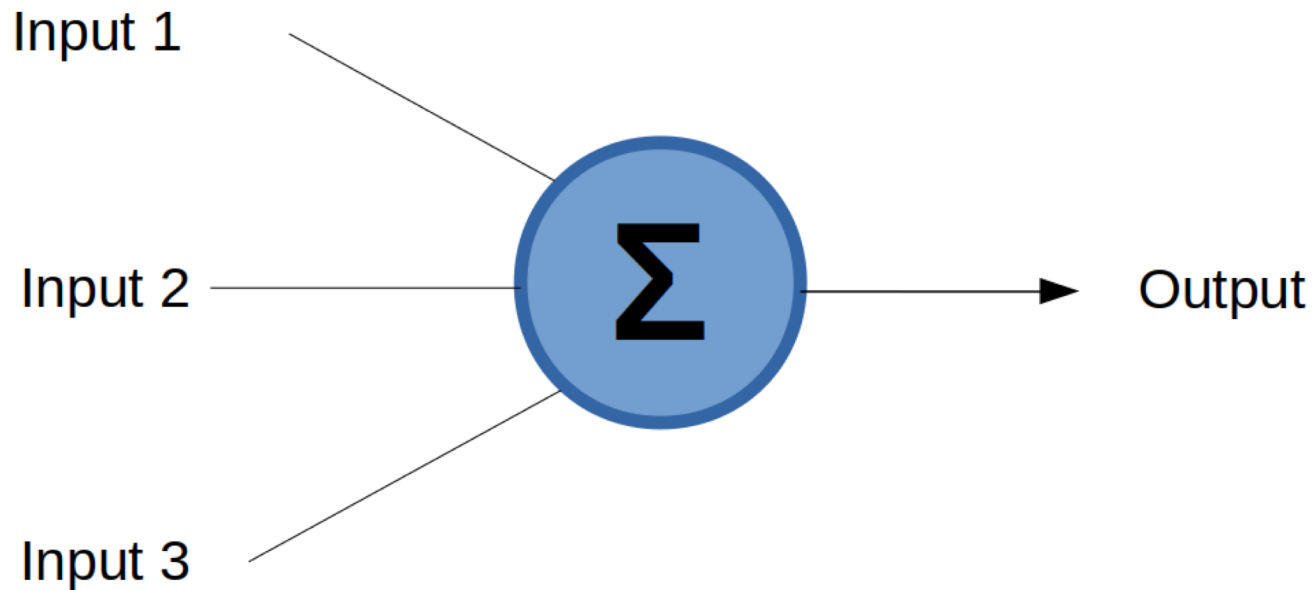
Can handle complex data types

– Images, sound, video, EEG, etc.



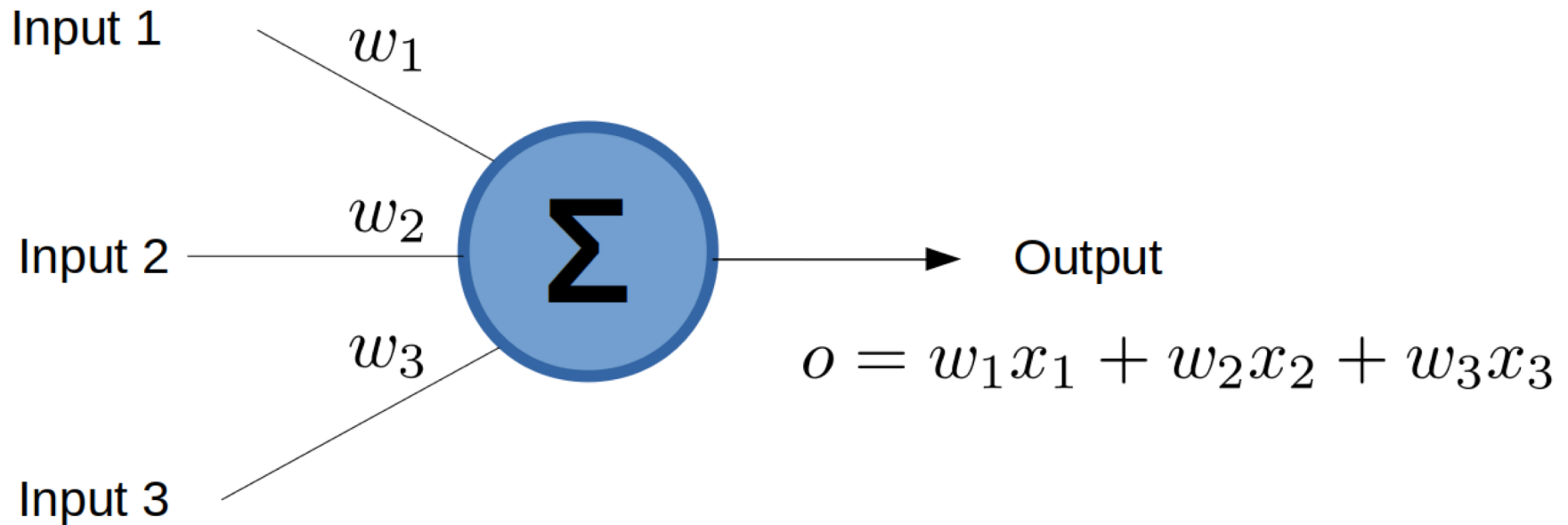
Linear Perceptron

| Inspired by biological neuron



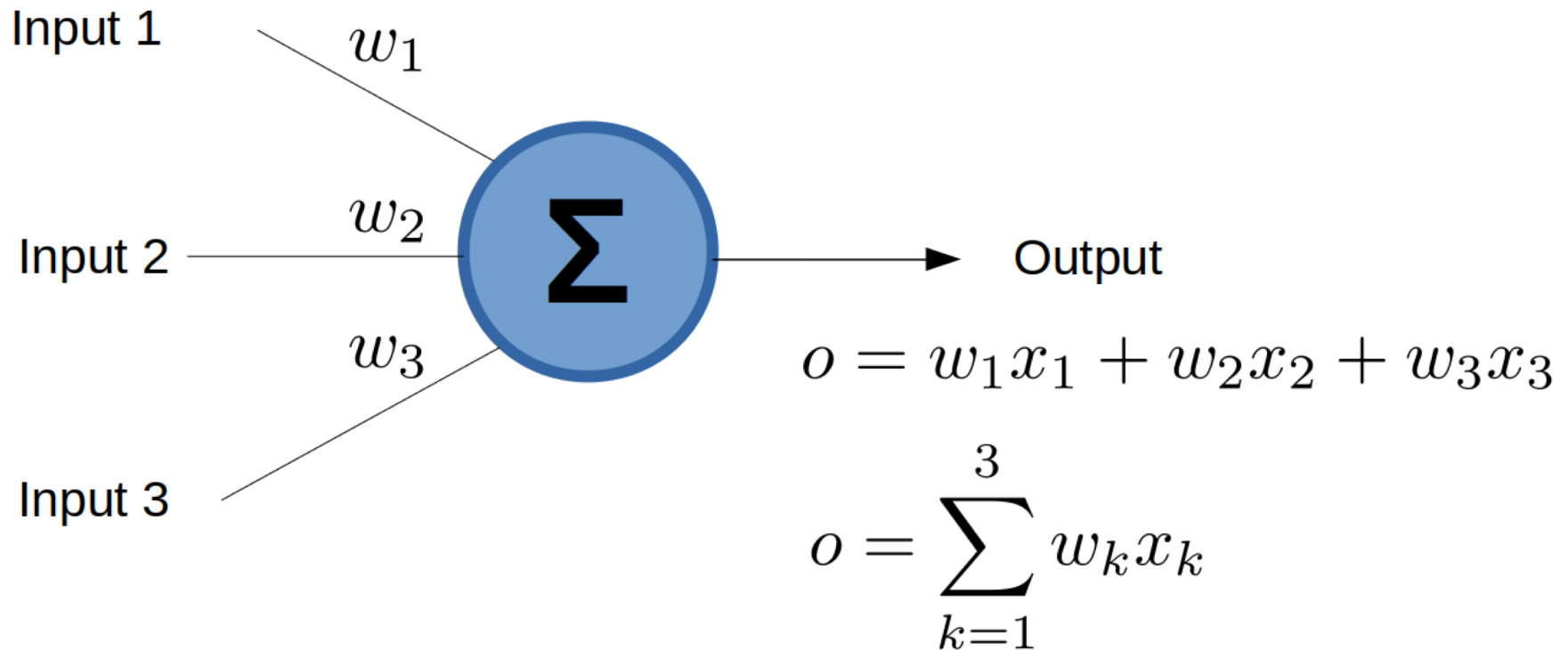
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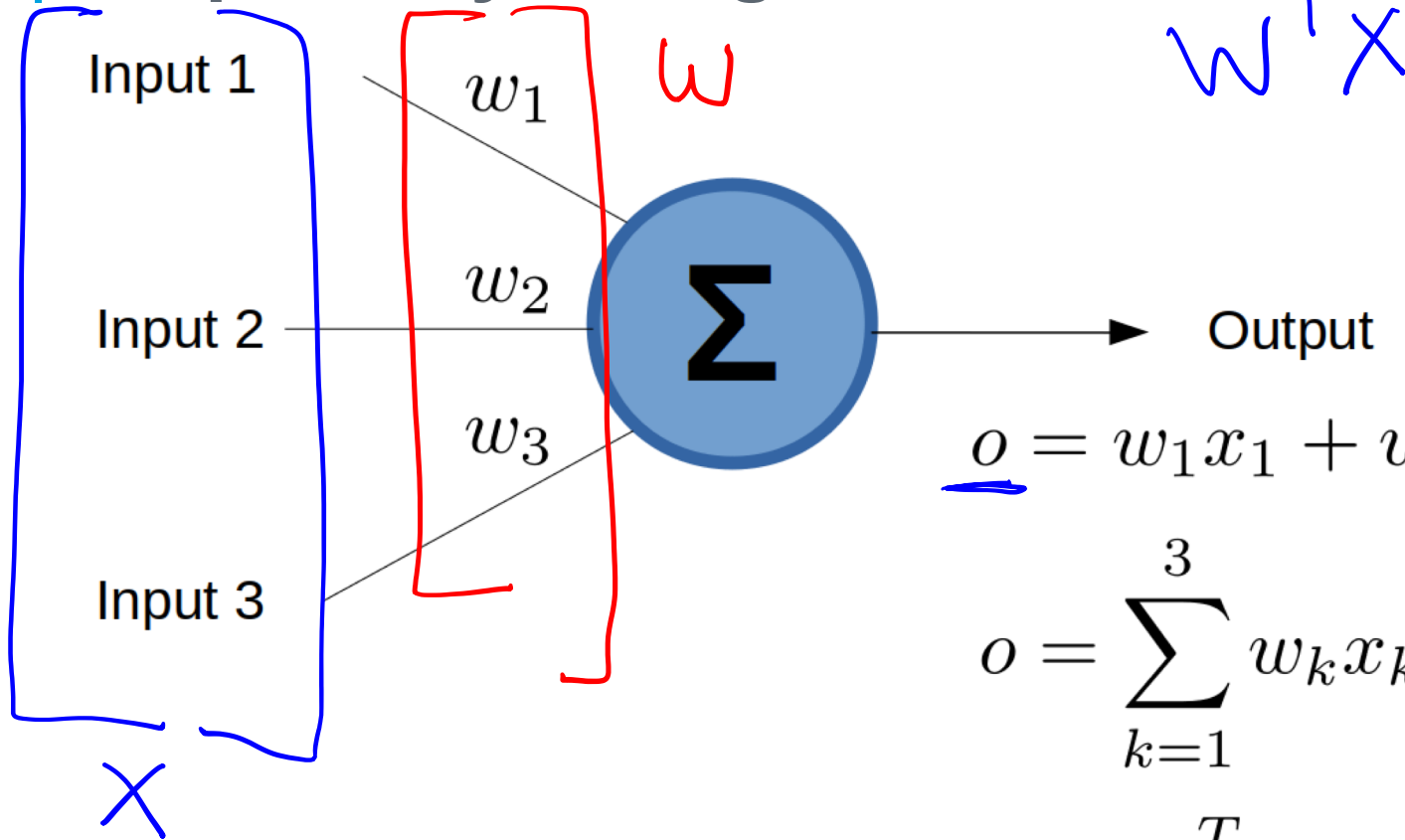
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Linear Perceptron

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$$\mathbf{w}^T \mathbf{x}$$

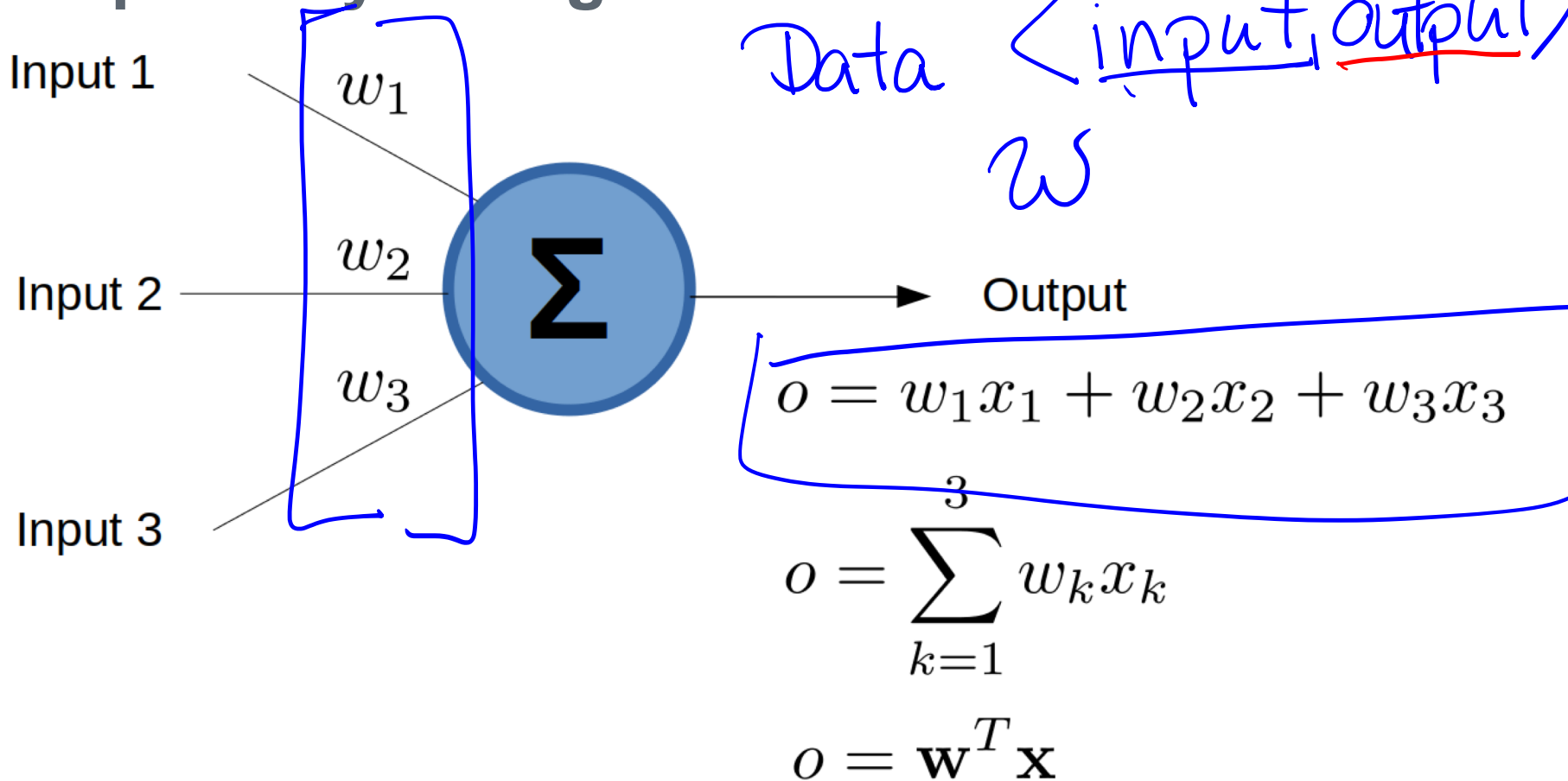
$$\underline{o} = w_1 x_1 + w_2 x_2 + w_3 x_3$$

$$o = \sum_{k=1}^3 w_k x_k$$

$$o = \mathbf{w}^T \mathbf{x}$$

Linear Perceptron

| Inspired by biological neuron



Learning = determining the weights (for now)

The Bias

| Where does the activation threshold come from?

-threshold -threshold

$$w_1x_1 + w_2x_2 + w_3x_3 > \text{threshold}$$

We can rewrite this as:

$$w_1x_1 + w_2x_2 + w_3x_3 - \text{threshold} > \underline{\underline{0}}$$

$$w_1x_1 + w_2x_2 + w_3x_3 + (-1)\textcircled{b} > 0$$

bias

| The bias, b , controls the activation threshold and can now be treated as another weight

Linear Perceptron with Bias

- We add bias to the neuron

- The input to the bias term is always 1

