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an **Artificial Neuron**

possible **Neural Network**

s are the building blocks of **Machine Learning**.

enblatt

t (1928 – 1971) was an American psychologist notable in the field of

ce.

d something really big. He "invented" a **Perceptron** program, on an IBM 704 computer at Cornell Aeronautical Laboratory.

Scientists had discovered that brain cells (**Neurons**) receive input from our senses by electrical signals.

The Neurons, then again, use electrical signals to store information, and to make decisions based on previous input.

Frank had the idea that **Perceptrons** could simulate brain principles, with the ability to learn and make decisions.

one **binary** output (0 or 1).

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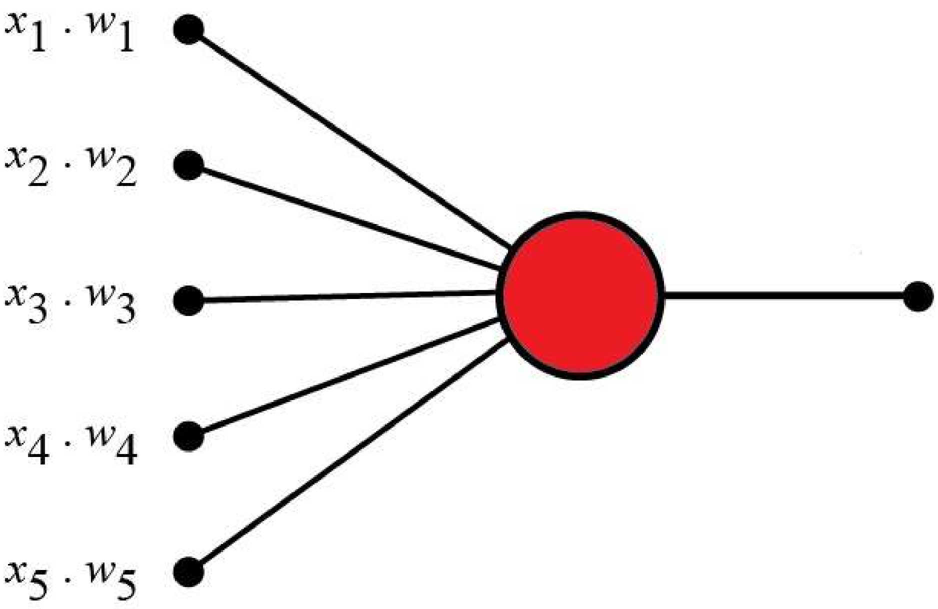
The idea was to use different **weights** to represent the importance of each **input**, and that the sum of the values should be greater than a **threshold** value before making a decision like **yes** or **no** (true or false) (0 or 1).



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Perceptron Example

Is the artist good? Is the weather good?

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What weights should these facts have?

Criteria	**Input**	**Weight**
Artists is Good	**x1** = 0 or 1	**w1** = 0.7
Weather is Good	**x2** = 0 or 1	**w2** = 0.6
Friend will Come	**x3** = 0 or 1	**w3** = 0.5
Food is Served	**x4** = 0 or 1	**w4** = 0.3
Alcohol is Served	**x5** = 0 or 1	**w5** = 0.4

The Perceptron Algorithm

Frank Rosenblatt suggested this algorithm:

1. Set a threshold value
2. Multiply all inputs with its weights
3. Sum all the results
4. Activate the output

1. Set a threshold value:

- Threshold = 1.5

2. Multiply all inputs with its weights:

- x1 * w1 = 1 * 0.7 = 0.7
- x2 * w2 = 0 * 0.6 = 0
- x3 * w3 = 1 * 0.5 = 0.5
- x4 * w4 = 0 * 0.3 = 0
- x5 * w5 = 1 * 0.4 = 0.4

3. Sum all the results:

- 0.7 + 0 + 0.5 + 0 + 0.4 = 1.6 (The Weighted Sum)

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Note

If the weather weight is 0.6 for you, it might be different for someone else. A higher weight means that the weather is more important to them.

If the threshold value is 1.5 for you, it might be different for someone else. A lower threshold means they are more wanting to go to any concert.

Example

```
const threshold = 1.5;
const inputs = [1, 0, 1, 0, 1];
const weights = [0.7, 0.6, 0.5, 0.3, 0.4];

let sum = 0;
for (let i = 0; i < inputs.length; i++) {
  sum += inputs[i] * weights[i];
}

const activate = (sum > 1.5);
```

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Perceptron Terminology

- Perceptron Inputs (nodes)
- Node values (1, 0, 1, 0, 1)
- Node Weights (0.7, 0.6, 0.5, 0.3, 0.4)
- Activation Function (sum > treshold)

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The nodes have both a **value** and a **weight**.

Node Values (Input Values)

Each input node has a binary value of **1** or **0**.

This can be interpreted as **true** or **false** / **yes** or **no**.

In the example above, the node values are: `1, 0, 1, 0, 1`

Node Weights

Weights shows the **strength** of each node.

In the example above, the node weights are: `0.7, 0.6, 0.5, 0.3, 0.4`

The Activation Function

The activation function maps the the weighted sum into a binary value of **1** or **0**.

This can be interpreted as **true** or **false** / **yes** or **no**.

In the example above, the activation function is simple: `(sum > 1.5)`

Note

It is obvious that a decision is NOT made by **one neuron** alone.

Many other neurons must provide input:

- Is the artist good
- Is the weather good

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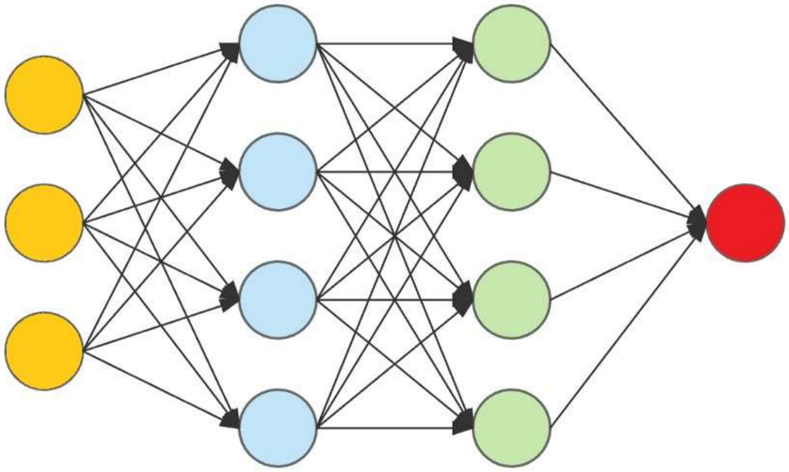
Neural Networks

The **Perceptron** defines the first step into **Neural Networks**:



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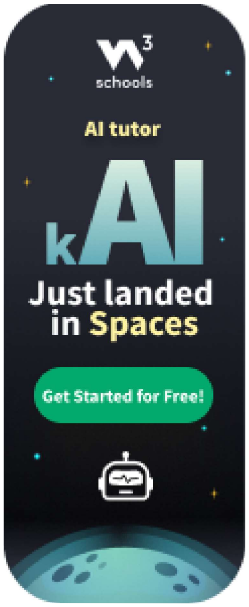

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