

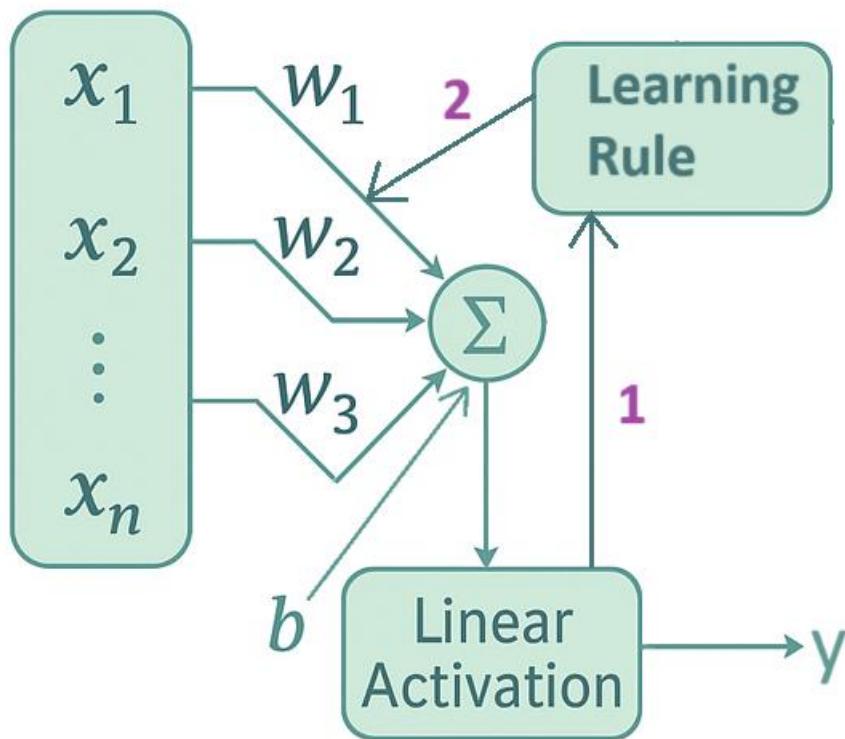
# Adaline

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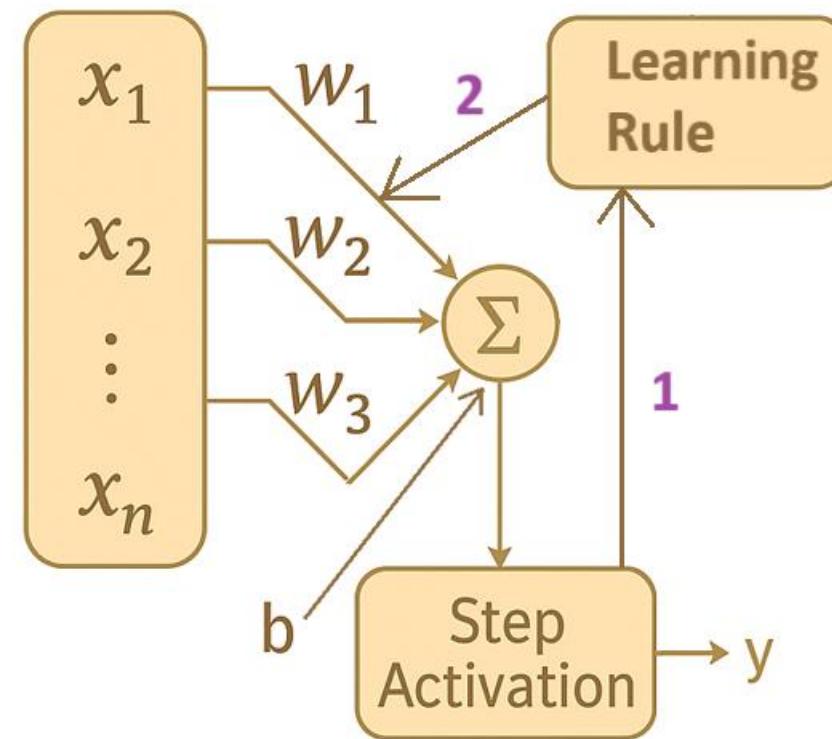
## ADALINE Model (Adaptive Linear Neuron)

- The ADALINE model is a type of **single-layer neural network** used for **classification and prediction tasks**.
- The main **difference from the perceptron** is in its **activation and learning rule**:
  - ADALINE uses a **linear activation** followed by error correction based on **mean squared error (MSE)**.
  - Perceptron uses a **step activation** and updates weights only when a sample is misclassified.

## ADALINE MODEL



## PERCEPTRON MODEL



1 ---> Wrong Prediction    2---> Updated Weights

Linear ————— Step

## 2. Architecture (from image)

Looking at the left side of the image (ADALINE model):

### 1. Inputs ( $x_1, x_2, \dots, x_n$ )

- These are the feature values provided as input to the network.

### 2. Weights ( $w_1, w_2, \dots, w_n$ )

- Each input has a corresponding adjustable weight.
- During learning, these weights are tuned according to the **Learning Rule** shown in the diagram.

### 3. Bias ( $b$ )

- An extra input added with fixed value = 1.
- Helps in shifting the decision boundary.

#### 4. Summation Unit ( $\Sigma$ )

- Computes the **net input**:

$$net = \sum_{i=1}^n w_i x_i + b$$

#### 5. Activation Function (Linear)

- In ADALINE, the output of the summation goes through a **linear activation**.
- So the actual output is:

$$y = net$$

#### 6. Learning Rule

- The learning block (green in the image) updates the weights based on prediction error.
- The diagram flow shows:
  - **Step 1 → Wrong prediction** (output  $\neq$  desired).
  - **Step 2 → Updated weights** (applied back into the system).