ESTIN

Machine Learning

S4   2023-2024
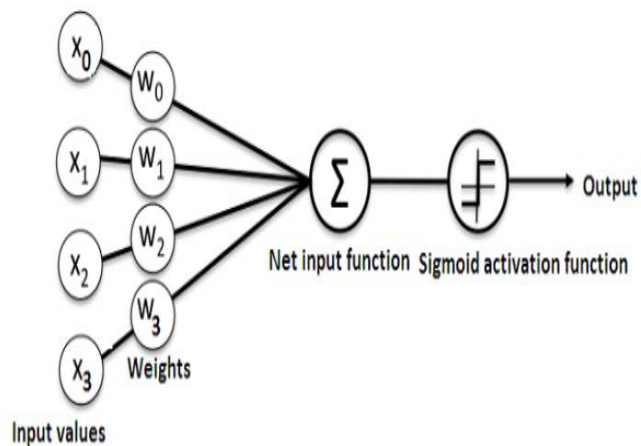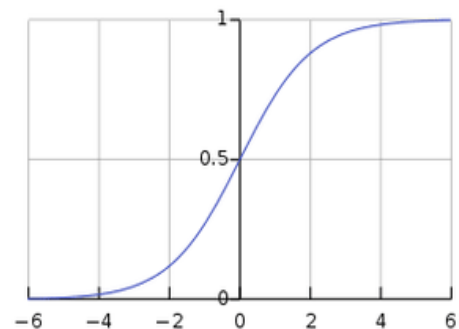

> ## Lab (Neural networks)

Artificial neuron   Sigmoid function

Exercise1:

Given a data table

Feature 1	Feature 2	Feature 3	Label
0	0	1	0
0	1	1	0
1	0	1	1
1	1	1	1

❖ Train the neuron (**perceptron**) using the data above. Use **sigmoid** as the **activation function.**

❖ Predict classes of each observation.
❖ Predict the class of this observation: [1, 0, 0].

Here is the algorithm:

$Def\ sigmoid\_a(x, deriv = False):$
  $if\ (deriv == True):$
   $return\ x(1 - x)$
  $\textbf{\textit{return}}\ 1/(1 + np.\exp(-x))$

$X = np.array([\ [0,0,1], [0,1,1], [1,0,1], [1,1,1]\ ])$
$y = np.array([[0,1,1,0]]).T$

1. Initialize the weights W_i to small random numbers.
   $W = 2 * \text{np.random.random}((3,1)) - 1$
2. While $(i \leq number\ of\ iterations)\ do$

   Calculate the output of the classifier: $Out = sigmoid\_a(np.dot(X, W)$
   Calculate the error: $err = y - Out$
   Update the weights according to:
    $W = W + np.dot(X.T, err * sigmoid\_a(Out, deriv = True))$
  end