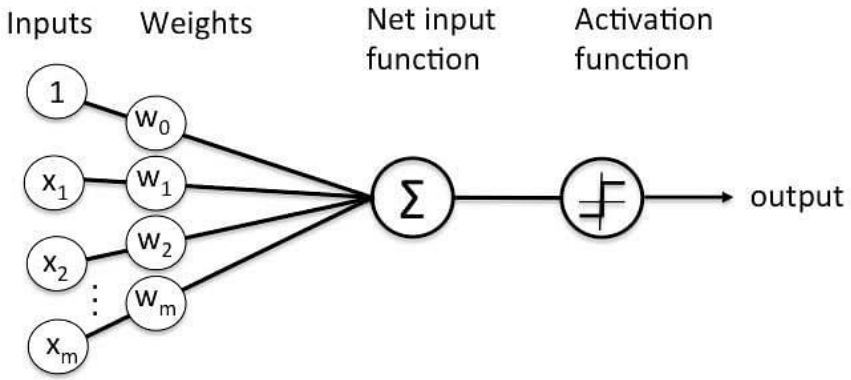
The Hashemite University
Prince Al Hussain Bin Abdullah II Faculty for Information Technology

Neural Networks & Deep Learning	**2010042323**
Assignment #: 01	**Topic:** Perceptron Programming
Deadline: Saturday 2/11/2024 11:59 PM	**Submission Medium:** MS Teams

Dr. Mo'taz Abdul Aziz Al-Hami **Expected time to code this assignment:** 3 Hour

Perceptron is one of the simplest Artificial neural network architectures. It was introduced by Frank Rosenblatt in 1957s. It is the simplest type of feedforward neural network, consisting of a single layer of input nodes that are fully connected to a layer of output nodes. It can learn the linearly separable patterns.



Write a Python code that shows the action of the perceptron algorithm for the given dataset at the end of this assignment. Start with an initial set of weights W = (0,0,0) and bias = 0. Use the following different learning rates:
1- η = 0.1.
2- η = 0.2.
3- η = 0.3.

Perceptron is a function that maps its input "x," which is multiplied with the learned weight coefficient; an output value is generated by.

$$\text{output} = \begin{cases} 0 & \text{if } \sum_j w_j x_j \leq \text{threshold} \\ 1 & \text{if } \sum_j w_j x_j > \text{threshold} \end{cases}$$

Assume the threshold value in the perceptron is 0

Goals of this Assignment

1. Identify and recognize the concepts of Neural Networks, Neurons, Activation functions, and Loss functions.
2. Train and Evaluate different neural network architectures.

About Dataset

We have chosen a simple numpy array to implement the single layer perceptron algorithm. We have considered a total of 13 samples with three features and one class label. The class label is defined in binary 0 and 1. The training dataset contains eight data samples, while the validation dataset contains five.

```
data = np.array([[1.00, 0.08, 0.72, 1.0],
                 [1.00, 0.10, 1.00, 1.0],
                 [1.00, 0.26, 0.58, 1.0],
                 [1.00, 0.35, 0.95, 0.0],
                 [1.00, 0.45, 0.15, 1.0],
                 [1.00, 0.60, 0.30, 1.0],
                 [1.00, 0.70, 0.65, 0.0],
                 [1.00, 0.92, 0.45, 0.0]])
```

Fig 1.1: Train Data

```
test_data = np.array([  [1.00, 0.42, 0.85, 0.0],
                        [1.00, 0.65, 0.55, 0.0],
                        [1.00, 0.20, 0.30, 1.0],
                        [1.00, 0.20, 1.00, 0.0],
                        [1.00, 0.85, 0.10, 1.0]])
```

Fig 1.2: Test Data