TRIBHUVAN UNIVERSITY

Sagarmatha College of Science & Technology

Lab Report On: Neural Network

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OBJECTIVE

To implement some basic activation function to single neuron perceptron

LAB QUESTION

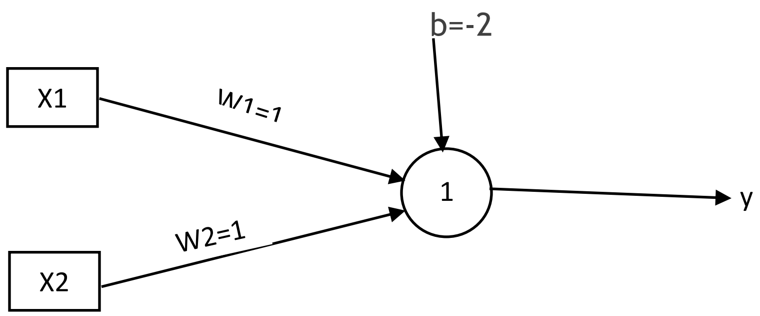
Consider the following neural network. Compute output of the network by assuming each of the following activation function:

a. Step function with threshold 1.

b. Linear function 2x-1

c. Sigmoid Function

d. Tanh Function



SOURCE CODE AND OUTPUT

i) Threshold Activation Function

```
import numpy as np

# a node to calculate the input for the activation function
def node(w, x, b):
    v = w * x
    n = np.sum(v) + b
    print(f"n: {n}")
    return threshold(n)

# threshold activation function
def threshold(n):
    if n >= 0:
        return 1
    else:
        return 0
```

```
weights = np.array([1, 1]) # given in question
bias = np.array([-2.0]) # given in question
print("Enter the inputs: \n")
inputs = []  # store inputs x1 and x2
for i in range(2):
    e = float(input(f"x[{i+1}]: "))
    inputs.append(e)
inputs = np.array(inputs) # input list into np.array
output = node(weights, inputs, bias)
print(f"Output: {output}")
```

Output:

i) Enter the inputs:
x[1]: 1
x[2]: -1
n: [-2.]
Output: 0

ii) Enter the inputs:
x[1]: 2
x[2]: 1
n: [1.]
Output: 1

ii) Linear Activation Function with 2x-1

```
import numpy as np

# a node to calculate the input for the activation function
def node(w, x, b):
    v = w * x
    n = np.sum(v) + b
    print(f"n: {n}")
    return linear(n)

# linear activation function
def linear(n):
    return (2 * n - 1)

weights = np.array([1, 1]) # given in question
bias = np.array([-2.0]) # given in question
print("Enter the inputs: \n")
inputs = [] # store inputs x1 and x2
for i in range(2):
```

```
    e = float(input(f"x[{i+1}]: "))
    inputs.append(e)
inputs = np.array(inputs) # input list into np.array
output = node(weights, inputs, bias)
print(f"Output: {output}")
```

Output:

```
Enter the inputs:
x[1]: 1
x[2]: 0.5
n: [-0.5]
Output: [-2.]
```

iii) Sigmoid Activation Function

```
import numpy as np
from math import exp
# a node to calculate the input for the activation function
def node(w, x, b):
    v = w * x
    n = np.sum(v) + b
    print(f"n: {n}")
    return sigmoid(n)

# sigmoid activation function
def sigmoid(n):
    return (1/(1 + exp(-n)))

weights = np.array([1, 1]) # given in question
bias = np.array([-2.0]) # given in question
print("Enter the inputs: \n")
inputs = [] # store inputs x1 and x2
for i in range(2):
    e = float(input(f"x[{i+1}]: "))
    inputs.append(e)
inputs = np.array(inputs) # input list into np.array
output = node(weights, inputs, bias)
print(f"Output: {output}")
```

Output:

```
Enter the inputs:
x[1]: 2
x[2]: 1
```

```
n: [1.]
Output: 0.73106
```

iv) Tanh Activation Function

```python
import numpy as np
from math import tanh

# a node to calculate the input for the activation function
def node(w, x, b):
    v = w * x
    n = np.sum(v) + b
    print(f"n: {n}")
    return hyp_tangent(n)

# tanh activation function
def hyp_tangent(n):
    return tanh(n)

weights = np.array([1, 1]) # given in question
bias = np.array([-2.0]) # given in question
print("Enter the inputs: \n")
inputs = [] # store inputs x1 and x2
for i in range(2):
    e = float(input(f"x[{i+1}]: "))
    inputs.append(e)
inputs = np.array(inputs) # input list into np.array
output = node(weights, inputs, bias)
print(f"Output: {output}")
```

Output:

```
Enter the inputs:
x[1]: -2
x[2]: -1
n: [-5.]
Output: -0.999909
```

CONCLUSION

Hence, we are able to implement some basic activation functions (i.e. threshold, linear, sigmoid, tanh) to single neuron perceptron.