

LAB 1

Implementation of gates using MCPitts neuron

```
import numpy as np

def mc_pitts_neuron(x, w, theta):
    return 1 if np.dot(x, w) >= theta else 0

# AND gate
w_and = np.array([1, 1])
theta_and = 2

for x in [(0, 0), (0, 1), (1, 0), (1, 1)]:
    print(x, mc_pitts_neuron(np.array(x), w_and, theta_and))

print("Prem Massand,431")
print("Date:22/01/2026")
```

```
(0, 0) 0
(0, 1) 0
(1, 0) 0
(1, 1) 1
Prem Massand,431
Date:22/01/2026
```

```
import numpy as np

def mc_pitts_neuron(x, w, theta):
    return 1 if np.dot(x, w) >= theta else 0

# OR gate
w_or = np.array([1, 1])
theta_or = 1

for x in [(0, 0), (0, 1), (1, 0), (1, 1)]:
    print(x, mc_pitts_neuron(np.array(x), w_or, theta_or))
print("Prem Massand,431")
print("Date:22/01/2026")
```

```
(0, 0) 0
(0, 1) 1
(1, 0) 1
(1, 1) 1
Prem Massand,431
Date:22/01/2026
```

```
import numpy as np

def mc_pitts_neuron(x, w, theta):
    return 1 if np.dot(x, w) >= theta else 0

# NAND gate
w_nand = np.array([-1, -1])
theta_nand = -1

for x in [(0, 0), (0, 1), (1, 0), (1, 1)]:
    print(x, mc_pitts_neuron(np.array(x), w_nand, theta_nand))
print("Prem Massand,431")
print("Date:22/01/2026")
```

```
(0, 0) 1
(0, 1) 1
(1, 0) 1
(1, 1) 0
Prem Massand,431
Date:22/01/2026
```

Implementation of artificial neuron

```
import numpy as np

def art_neuron(x,w,b,activation='step'):
    z=np.dot(x,w)+b
    if activation=='step':
        return 1 if z>=0 else 0
    elif activation=='sigmoid':
        return 1/(1+np.exp(-z))
    elif activation=='relu':
        return max(0,z)

x=np.array([1,2,3,4])
w=np.array([0.1,0.2,0.3,0.4])
b=0.5
print('step output:',art_neuron(x,w,b,'step'))
print('sigmoid output:',art_neuron(x,w,b,'sigmoid'))
print('relu output:',art_neuron(x,w,b,'relu'))
print("Prem Massand,431")
print("Date:22/01/2026")
```

```
step output: 1
sigmoid output: 0.9706877692486436
relu output: 3.5
Prem Massand,431
Date:22/01/2026
```

```
import numpy as np

def mc_pitts_neuron(x, w, theta):
    return 1 if np.dot(x, w) >= theta else 0

w_and = np.array([1, 1, 1])
theta_and = 3

for x in [(0, 0,0), (0, 0,1), (0,1,0), (0,1,1),(1,0,0),(1,0,1),(1,1,0),(1,1,1)]:
    print(x, mc_pitts_neuron(np.array(x), w_and, theta_and))

print("Prem Massand,431")
print("Date:22/01/2026")
```

```
(0, 0, 0) 0
(0, 0, 1) 0
(0, 1, 0) 0
(0, 1, 1) 0
(1, 0, 0) 0
(1, 0, 1) 0
(1, 1, 0) 0
(1, 1, 1) 1
Prem Massand,431
Date:22/01/2026
```

```
import numpy as np

def mc_pitts_neuron(x, w, theta):
    return 1 if np.dot(x, w) >= theta else 0

# NOT gate
w_not = np.array([-1])
theta_not = 0

for x in [(0,), (1,)]:
    print(x, mc_pitts_neuron(np.array(x), w_not, theta_not))

print("Prem Massand,431")
print("Date:22/01/2026")
```

```
(0,) 1
(1,) 0
Prem Massand,431
Date:22/01/2026
```

LAB 2

↳ 5 cells hidden

