

▼ Perceptrons - Making Predictions

Creating a gate with Perceptron

```
import numpy as np
```

▼ AND Gate

```
def AND(x1, x2):  
    # 교수님이 w가 다 더해서 1이 되어야 한다는 의미는. 다 더해서 1을 넘어도 상관없으나, 나중에 즉  
    x = np.array([x1, x2])  
    w = np.array([0.5, 0.5]) # w는 가중치를 의미합니다. 기울기라고 봐도 괜찮습니다.  
    b = -0.7 # bias == 절편  
    # activation 계산  
    tmp = w[0]*x[0] + w[1]*x[1] + b # tmp = np.sum(w*x) + b  
    print("AND({0},{1}) # activation : {2}".format(x1,x2,tmp))  
    if tmp <= 0:  
        print("result = 0")  
        return 0  
    else:  
        print("result = 1")  
        return 1
```

```
AND(0,0)  
AND(0,1)  
AND(1,0)  
AND(1,1)
```

```
➡ AND(0,0) # activation : -0.7  
result = 0  
AND(0,1) # activation : -0.2  
result = 0  
AND(1,0) # activation : -0.2  
result = 0  
AND(1,1) # activation : 0.3  
result = 1  
1
```

▼ NAND Gate

```
def NAND(x1, x2):  
    x = np.array([x1, x2])  
    w = np.array([-0.5, -0.5])  
    b = 0.7  
    tmp = w[0]*x[0] + w[1]*x[1] + b  
    print("NAND({0},{1}) # activation : {2}".format(x1,x2,tmp))  
    if tmp <= 0:  
        print("result = 0")  
        return 0  
    else:  
        print("result = 1")  
        return 1
```

```
NAND(0,0)  
NAND(0,1)  
NAND(1,0)  
NAND(1,1)
```



▼ OR Gate

```
def OR(x1, x2):  
    x = np.array([x1, x2])  
    w = np.array([0.5, 0.5])  
    b = -0.2  
    tmp = np.sum(w*x) + b  
    print("OR({0},{1}) # activation : {2}".format(x1,x2,tmp))  
    if tmp <= 0:  
        print("result = 0")  
        return 0  
    else:  
        print("result = 1")  
        return 1
```

```
OR(0,0)  
OR(0,1)  
OR(1,0)  
OR(1,1)
```



▼ XOR Gate

```
def XOR(x1, x2):  
    s1 = NAND(x1, x2)  
    s2 = OR(x1, x2)  
    y = AND(s1, s2)  
    if y <= 0:  
        print("#####")  
        print("XOR({0},{1}) # result = 0".format(x1,x2))  
        print("#####")  
        return y  
    else:  
        print("#####")  
        print("XOR({0},{1}) # result = 1".format(x1,x2))  
        print("#####")  
        return y
```

```
XOR(0,0)
```

XOR(0,1)
XOR(1,0)
XOR(1,1)



XOR cannot be expressed as a single layer Perceptron.

