Artificial Intelligence Lab

Practical - 08

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Batch : A-3

```
def activation_function(value):

  # using relu as Activation Function

  if value >= 0:
      value = 1
  else:
      value = 0

  return value
```

```
def Perceptron(inputs, output, learning_rate=0.1, max_iterations=1000):

  random1 = random.random()
  random2 = random.random()
  random3 = random.random()

  random1 = (random1*10)
  random2 = (random2*10)
  random3 = (random3*10)

  w = [random1, random2]
  b = random3

  for i in range(max_iterations):

    error = 0

    for i in range(len(inputs)):

      input = inputs[i]
      actual = output[i]

      x1 = input[0]
      x2 = input[1]
      w1 = w[0]
      w2 = w[1]


      calculated = w1*x1 + w2*x2 + b

      calculated = activation_function(calculated)

      if(calculated == actual):
        continue

      delta = actual - calculated

      error = error + 1

      w[0] += learning_rate * delta * x1
      w[1] += learning_rate * delta * x2
      b += learning_rate * delta

    if(error == 0):
      return w, b, i

  return w, b, max_iterations+1
```

```
import random

INPUTS = [
    [0,0],
    [0,1],
    [1,0],
```

```
    [1,1],
]

OUTPUT_AND_GATE = [0, 0, 0, 1]
OUTPUT_OR_GATE = [0, 1, 1, 1]
OUTPUT_NAND_GATE = [1, 1, 1, 0]
OUTPUT_NOR_GATE = [1, 0, 0, 0]
```

```
w_and, b_and, iter_and = Perceptron(INPUTS, OUTPUT_AND_GATE)
print(f'AND gate : {iter_and} iterations')
print(w_and, b_and, iter_and, "\n\n")



w_or, b_or, iter_or = Perceptron(INPUTS, OUTPUT_OR_GATE)
print(f'OR gate : {iter_or} iterations')
print(w_or, b_or, iter_or, "\n\n")



w_nand, b_nand, iter_nand = Perceptron(INPUTS, OUTPUT_NAND_GATE)
print(f'NAND gate : {iter_nand} iterations')
print(w_nand, b_nand, iter_nand, "\n\n")




w_nor, b_nor, iter_nor = Perceptron(INPUTS, OUTPUT_NOR_GATE)
print(f'NOR gate : {iter_nor} iterations')
print(w_nor, b_nor, iter_nor, "\n\n")
```

```
AND gate : 3 iterations
[1.8962348957507325, 3.8607381079387038] -3.919698062194163 3


OR gate : 3 iterations
[2.381834414345759, 3.6339867038171434] -0.026758243660676778 3


NAND gate : 3 iterations
[-0.07463223699163568, -1.384815149819241] 1.4532101832477258 3


NOR gate : 3 iterations
[-0.05622202588735026, -0.10922260489956559] 0.020659336619802654 3
```