# Assignment No-03

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**Title-** Perceptron Neural Network to recognize even and odd numbers. Given numbers are in ASCII from 0 to 9.

**Program:**

import numpy as np

class Perceptron:

def init (self, input\_size, lr=0.1): self.W = np.zeros(input\_size + 1) self.lr = lr

def activation\_fn(self, x): return 1 if x >= 0 else 0

def predict(self, x):

x = np.insert(x, 0, 1) z = self.W.T.dot(x)

a = self.activation\_fn(z) return a

def train(self, X, Y, epochs): for \_ in range(epochs):

for i in range(Y.shape[0]): x = X[i]

y = self.predict(x) e = Y[i] - y

self.W = self.W + self.lr \* e \* np.insert(x, 0, 1)

X = np.array([

[0,0,0,0,0,0,1,0,0,0], # 0

[0,0,0,0,0,0,0,1,0,0], # 1

[0,0,0,0,0,0,0,0,1,0], # 2

[0,0,0,0,0,0,0,0,0,1], # 3

[0,0,0,0,0,0,1,1,0,0], # 4

[0,0,0,0,0,0,1,0,1,0], # 5

[0,0,0,0,0,0,1,1,1,0], # 6

[0,0,0,0,0,0,1,1,1,1], # 7

[0,0,0,0,0,0,1,0,1,1], # 8

[0,0,0,0,0,0,0,1,1,1], # 9

])

Y = np.array([0, 1, 0, 1, 0, 1, 0, 1, 0, 1])

# Create the perceptron and train it perceptron = Perceptron(input\_size=10) perceptron.train(X, Y, epochs=100)

# Test the perceptron on some input data test\_X = np.array([

[0,0,0,0,0,0,1,0,0,0], # 0

[0,0,0,0,0,0,0,1,0,0], # 1

[0,0,0,0,0,0,0,0,1,0], # 2

[0,0,0,0,0,0,0,0,0,1], # 3

[0,0,0,0,0,0,1,1,0,0], # 4

[0,0,0,0,0,0,1,0,1,0], # 5

[0,0,0,0,0,0,1,1,1,0], # 6

[0,0,0,0,0,0,1,1,1,1], # 7

[0,0,0,0,0,0,1,0,1,1], # 8

[0,0,0,0,0,0,0,1,1,1], # 9

])

for i in range(test\_X.shape[0]):

x = test\_X[i]

y = perceptron.predict(x)

print(f'{x} is {"even" if y == 0 else "odd"}')

# Output:

[0 0 0 0 0 0 1 0 0 0] is even

[0 0 0 0 0 0 0 1 0 0] is odd

[0 0 0 0 0 0 0 0 1 0] is even

[0 0 0 0 0 0 0 0 0 1] is odd

[0 0 0 0 0 0 1 1 0 0] is even

[0 0 0 0 0 0 1 0 1 0] is even

[0 0 0 0 0 0 1 1 1 0] is even

[0 0 0 0 0 0 1 1 1 1] is even

[0 0 0 0 0 0 1 0 1 1] is even

[0 0 0 0 0 0 0 1 1 1] is odd