

Lab 6

Problem Statement: Single-Class Perceptron Learning

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ROLLNO: 31

CLASS: TY - IT A

BATCH: 2

Code:

```
package AI;

public class PerceptronLearning {

    public static void main(String[] args) {

        double[][] X = {

            {1, -2, 1.5, 0},

            {1, -0.5, -2, -1.5},

            {0, 1, -1, 1.5}

        }; // input matrix

        double[] w = {1, -1, 0, 0.5}; // initial weight vector
        int[] d = {1, -1, 1}; // desired output
        double c = 1; // learning rate > 0
        double net, output;

        int i, j, k;

        double error;

        int cycles = 0;

        System.out.print("Initial weight vector: ");
```

```

for (double x : w) {
    System.out.print(x + " ");
}

System.out.println();

do {
    cycles++; // Increment the cycle count

    // Print cycle information
    System.out.println("Epoch: " + cycles);

    error = 0; // Reset error for the current cycle

    for (i = 0; i < 3; i++) {
        net = 0;

        // Calculate net
        for (j = 0; j < 4; j++) {
            net += X[i][j] * w[j];
        }

        // o
        output = sgn(net);

        if (output != d[i]) {

```

```

        for (k = 0; k < 4; k++) {
            w[k] += c * (d[i] - output) * X[i][k];
        }
    }

    double xError = d[i] - output; // Calculate error
    for the current input

    System.out.println("Error for X" + (i + 1) + ": "
+ xError);

    // Print weight vector for the current input
    System.out.print("Weight vector : ");
    for (double x : w) {
        System.out.print(x + " ");
    }
    System.out.println();

    error += xError; // absolute error
}

System.out.println("Total Error: " + error);

} while (error != 0); // Continue till error i!= 0

System.out.println("Cycles required: " + cycles);

System.out.println("Final weight vector: ");

```

```
        for (double x : w) {  
            System.out.print(x + " ");  
        }  
    }  
  
    public static int sgn(double netValue) {  
        if (netValue > 0)  
            return 1;  
        else  
            return -1;  
    }  
}
```

Output:

Initial weight vector: 1.0 -1.0 0.0 0.5

Epoch: 1

Error for X1: 0.0

Weight vector : 1.0 -1.0 0.0 0.5

Error for X2: -2.0

Weight vector : -1.0 0.0 4.0 3.5

Error for X3: 0.0

Weight vector : -1.0 0.0 4.0 3.5

Total Error: -2.0

Epoch: 2

Error for X1: 0.0

Weight vector : -1.0 0.0 4.0 3.5

Error for X2: 0.0

Weight vector : -1.0 0.0 4.0 3.5

Error for X3: 0.0

Weight vector : -1.0 0.0 4.0 3.5

Total Error: 0.0

Cycles required: 2

Final weight vector:

-1.0 0.0 4.0 3.5

Process finished with exit code 0