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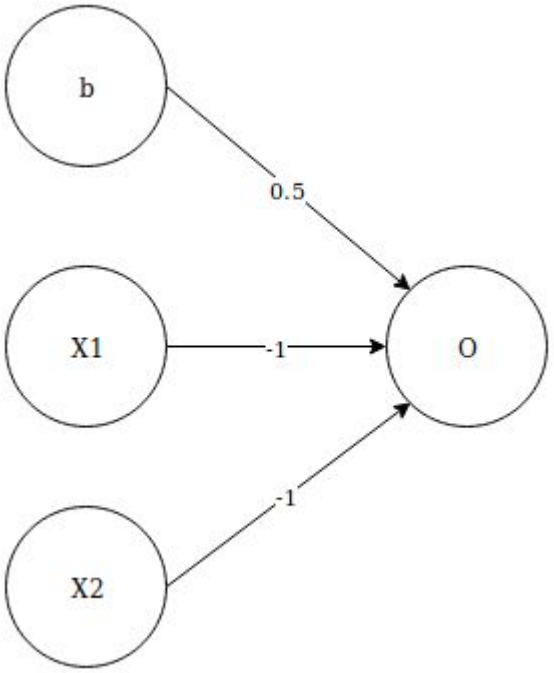
CS212 Part 2 Lab 1

Task 1: Not OR or NOR



Task 2:

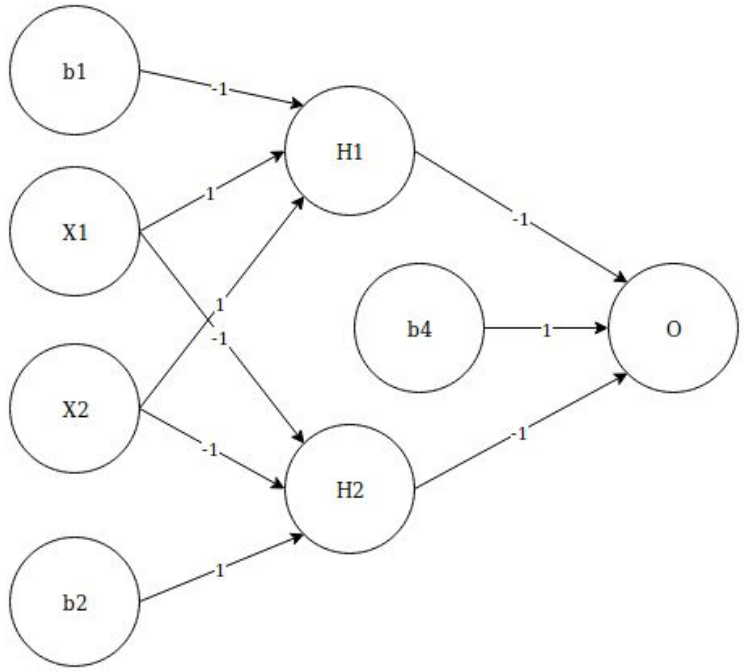
Code:

```
public class Perceptron {

    double W1, W2, b; String name;
    public Perceptron(double W1i, double W2i, double bi, String ni){
        W1 = W1i; W2 = W2i; b = bi; name = ni;
        System.out.println("Perceptron '" + name + "' created: W1 = " +
                           W1 + " W2 = " + W2 + " b = " + b);

    }

    double output(double X1, double X2){
        double a =(X1*W1) + (X2*W2) + b;
       System.out.println("Perceptron '" + name + "' running: X1 = " + X1
+" X2 = " + X2 + " activation = "  + a = " output = " + (a<0?0:1));
       return a<0?0:1;
    }

    public static void check(boolean e) {
        if (!e){
               System.out.println("unexpected result");
               System.exit(0);
        }
    }
    public static void main(String[] args) {

       Perceptron Pand = new Perceptron(1,1,-1.5, "and");
        check(Pand.output(0,0) == 0);
        check(Pand.output(0,1) == 0);
        check(Pand.output(1,0) == 0);
        check(Pand.output(1,1) == 1);

        Perceptron Por = new Perceptron(1,1,-.5,"or");
        check(Por.output(0,0) == 0);
        check(Por.output(0,1) == 1);
        check(Por.output(1,0) == 1);
        check(Por.output(1,1) == 1);

        Perceptron Pnor = new Perceptron(-1,-1,.5,"nor");
        check(Pnor.output(0,0) == 1);
        check(Pnor.output(1,0) == 0);
        check(Pnor.output(0,1) == 0);
        check(Pnor.output(1,1) == 0);

       }

}
```

Output:

```
serpial@serpial-laptop:~/Documents/twotwelvetask$ java Perceptron
Perceptron 'and' created: W1 = 1.0 W2 = 1.0 b = -1.5
Perceptron 'and' running: X1 = 0.0 X2 = 0.0 activation = -1.5 output = 0
Perceptron 'and' running: X1 = 0.0 X2 = 1.0 activation = -0.5 output = 0
Perceptron 'and' running: X1 = 1.0 X2 = 0.0 activation = -0.5 output = 0
Perceptron 'and' running: X1 = 1.0 X2 = 1.0 activation = 0.5 output = 1
Perceptron 'or' created: W1 = 1.0 W2 = 1.0 b = -0.5
Perceptron 'or' running: X1 = 0.0 X2 = 0.0 activation = -0.5 output = 0
Perceptron 'or' running: X1 = 0.0 X2 = 1.0 activation = 0.5 output = 1
Perceptron 'or' running: X1 = 1.0 X2 = 0.0 activation = 0.5 output = 1
Perceptron 'or' running: X1 = 1.0 X2 = 1.0 activation = 1.5 output = 1
Perceptron 'nor' created: W1 = -1.0 W2 = -1.0 b = 0.5
Perceptron 'nor' running: X1 = 0.0 X2 = 0.0 activation = 0.5 output = 1
Perceptron 'nor' running: X1 = 1.0 X2 = 0.0 activation = -0.5 output = 0
Perceptron 'nor' running: X1 = 0.0 X2 = 1.0 activation = -0.5 output = 0
Perceptron 'nor' running: X1 = 1.0 X2 = 1.0 activation = -1.5 output = 0
```

Task 3: XNOR or not XOR



Task 4:

Code:

```
public static void main(String[] args) {
    System.out.println("Learning XNOR ...");

    Perceptron H1 = new Perceptron(1,1,-1, "H1");
    Perceptron H3 = new Perceptron(-1,-1,1, "H2");
    Perceptron O = new Perceptron(-1,-1,1, "O");

    double x1 = 0; double x2 = 0;
    double o1 = H1.output(x1,x2);
    double o3 = H3.output(x1,x2);
    check(O.output(o1, o3) == 1);

    x1 = 1; x2 = 0;
    o1 = H1.output(x1,x2);
    o3 = H3.output(x1,x2);
    check(O.output(o1, o3) == 0);

    x1 = 0; x2 = 1;
    o1 = H1.output(x1,x2);
    o3 = H3.output(x1,x2);
    check(O.output(o1, o3) == 0);

    x1 = 1; x2 = 1;
    o1 = H1.output(x1,x2);
    o3 = H3.output(x1,x2);
    check(O.output(o1, o3) == 1);
}
```

Output:

```
serpial@serpial-laptop:~/Documents/twotwelvetask$ java Perceptron
Learning XNOR ...
Perceptron 'H1' created: W1 = 1.0 W2 = 1.0 b = -1.0
Perceptron 'H2' created: W1 = -1.0 W2 = -1.0 b = 1.0
Perceptron 'O' created: W1 = -1.0 W2 = -1.0 b = 1.0
Perceptron 'H1' running: X1 = 0.0 X2 = 0.0 activation = -1.0 output = 0
Perceptron 'H2' running: X1 = 0.0 X2 = 0.0 activation = 1.0 output = 1
Perceptron 'O' running: X1 = 0.0 X2 = 1.0 activation = 0.0 output = 1
Perceptron 'H1' running: X1 = 1.0 X2 = 0.0 activation = 0.0 output = 1
Perceptron 'H2' running: X1 = 1.0 X2 = 0.0 activation = 0.0 output = 1
Perceptron 'O' running: X1 = 1.0 X2 = 1.0 activation = -1.0 output = 0
Perceptron 'H1' running: X1 = 0.0 X2 = 1.0 activation = 0.0 output = 1
Perceptron 'H2' running: X1 = 0.0 X2 = 1.0 activation = 0.0 output = 1
Perceptron 'O' running: X1 = 1.0 X2 = 1.0 activation = -1.0 output = 0
Perceptron 'H1' running: X1 = 1.0 X2 = 1.0 activation = 1.0 output = 1
Perceptron 'H2' running: X1 = 1.0 X2 = 1.0 activation = -1.0 output = 0
Perceptron 'O' running: X1 = 1.0 X2 = 0.0 activation = 0.0 output = 1
```