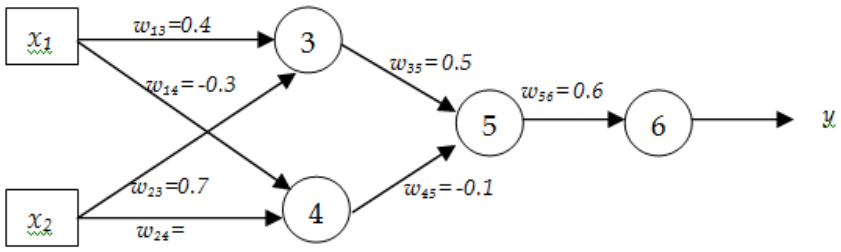
Assignment 2

1. Consider a MLP given below. Let the learning rate be 1. The initial weights of the network are shown in the MLP. Assume that first training tuple is (1, 0) and its target output is 1. Calculate weight updates by using back-propagation algorithm for each of the following case.
    a. Logistic activation function
    b. Tanh activation function



2. Realize NOT and NAND function using perceptron. Can we realize XNOR function using perceptron? If yes, realize it using perceptron. Otherwise, realize XNOR function using MLP.
3. Normalize the following data using Min-Max, mean, and Standard Normalization.

Height(x_1)	*Weight(x_2)*
5.8	78
4.9	45
4.6	35
5.7	65
5.4	58
4.7	38

4. Show first three cases of learning rate reduction for each of the following techniques. Assume initial value of learning rate is 0.5.
    a. Time Based Decaly (assume decay-rate=2)
    b. Step Delay (assume: drop-rate=0.75 and epochs-drop=2)
    c. Exponential Decay (assume K=0.2)
5. Consider following simple ANN with logistic activation function. Calculate weight updates for the given training sample using
    a. Adagrad
    b. RMSProp

c. Adam

Assume: $\alpha = 0.2 \quad \beta = \beta_1 = \beta_2 = 0.9$

x_1	x_2	t
1.5	2.2	0.4
1.2	1.8	0.6
0.7	1.1	0.8
1.3	2.5	0.3

6. Imagine we have a data sample with 8 observations: {(1,2), (2,4), (3,9), (4,16), (5,25), (6,36), (7,47), (8,64)}. Show all possible models when 4-fold cross-validation is used.
7. Consider following 6x6 image and 3x3 filter as below. Compute convolved feature map and then compute pooled feature map using 2x2 windows. Use Max pooling.

255	200	120	89	0	180
210	230	170	165	87	76
49	120	115	125	165	140
20	35	32	42	37	78
55	65	75	45	35	69
190	180	160	150	155	165

1	1	0
0	1	0
0	1	1