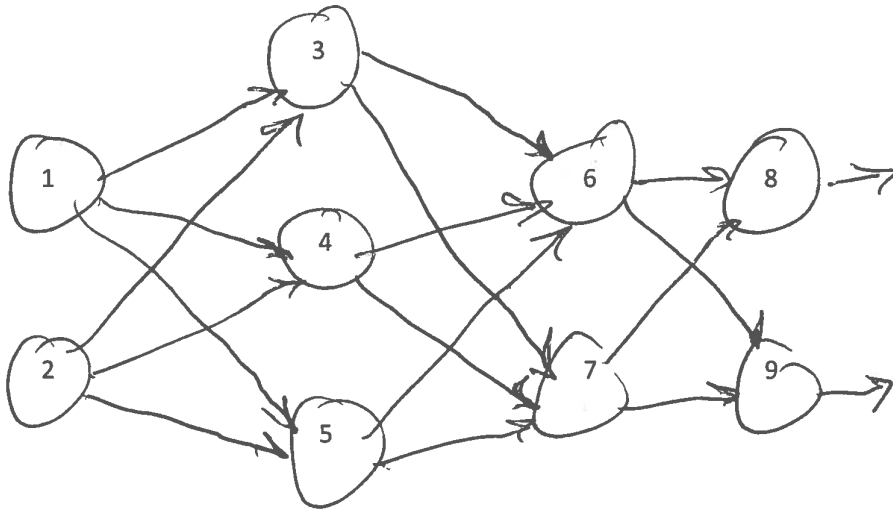


CST 380/478 Final

- I. Given the following Neural network, use the given training vector and learning rate to calculate the output vector and adjust the weights accordingly.



$W_{0,i} = 1$ for all i .

$$W_{1,3} = 2 \quad W_{2,3} = 3 \quad W_{3,6} = -2 \quad W_{4,6} = 1 \quad W_{5,6} = 3$$

$$W_{1,4} = 1 \quad W_{2,4} = 2 \quad W_{3,7} = 2 \quad W_{4,7} = 3 \quad W_{5,7} = 1$$

$$W_{1,5} = -2 \quad W_{2,5} = -1$$

$$W_{6,8} = 5 \quad W_{7,8} = 2$$

$$W_{6,9} = 3 \quad W_{7,9} = 1$$

The training vector is $\langle 3, 2 \rangle$ and the expected output is $O_8 = 0.1$, and $O_9 = 0.9$ The learning rate is 2.

- II. Given the following Binary image use the connected component algorithm in the handout to label the pixels. Give the final equivalence classes and show the labeled image.

0	0	1	1	1	0	0	1	1	1
0	0	1	1	1	0	0	1	1	0
1	1	1	0	0	0	0	1	0	0
1	1	1	0	0	0	0	0	0	0
0	0	0	0	1	1	1	0	0	1
1	1	0	0	1	1	0	0	1	1
1	1	0	0	0	1	1	0	1	1
1	1	1	0	0	0	1	0	0	1
0	1	1	1	0	0	1	0	0	1
0	0	0	1	1	1	1	0	1	1

- III. Given the following Histogram with 16 gray levels, perform the histogram equalization algorithm and give the mappings to the new histogram and draw the new histogram.

							*					*			
						*	*	*				*	*	*	
						*	*	*			*	*	*		
			*		*	*	*	*	*		*	*	*		
		*	*		*	*	*	*	*	*	*	*	*	*	*
	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

- IV. Apply the 3x3 Sobel operators to the following 9-neighborhood and compute the norm and direction of the gradient vector.

3	4	10
4	11	12
11	12	12

- V. Given the following set of edge pixels, graph the Hough transform for each point and find the accumulation points and the corresponding linear equations.

(1, 3), (2, 3), (4, 5), (3, 2), (2, 5), (5, 11), (1, 4), (4, 1), (3, 7)