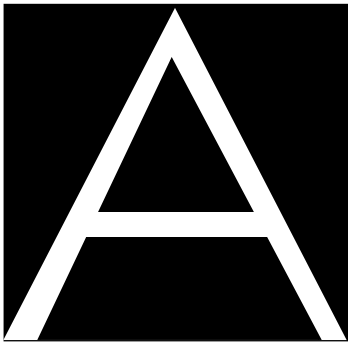
EEL 6814

HMW # 2
Due September 26, 2023

1- In a 16x16 grid, select by hand the parameters of a two hidden layer MLP with signum units (threshold nonlinearity) as shown in Fig. 1 (assume that the center of the figure is (0,0)). State the smallest number of hidden units the network needs in each layer and explain their role in creating the mask. Assume that black is 0 and white is 1. Can you achieve the same goal with a single hidden layer network? Justify your answer.



2- Code the backpropagation algorithm and test it in the following 2 class problem. Use a single hidden layer MLP and specify the size of the hidden layer and tell why you select that number of hidden PEs.

x1	x2	d
1	0	1
0	1	1
-1	0	1
0	-1	1
0.5	0.5	0
-.5	0.5	0
0.5	-.5	0
-.5	-.5	0

I expect that the system learns this pattern exactly. Is there just one possible solution to exactly separate the two classes of given points? How can you make the solution unique? Show experimentally how your suggestion works.

PS: this problem is called the STAR problem.