CSCI 4100 Fall 2018
Assignment 12 Answers

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Problem 1

(a) Identity:

$$layer1 = \begin{bmatrix} -0.0322 & -0.0322 \\ -0.0322 & -0.0322 \\ -0.0322 & -0.0322 \end{bmatrix} \tag{1}$$

$$layer1 = \begin{bmatrix} -0.216 \\ -0.137 \\ -0.137 \end{bmatrix} \tag{2}$$

tanh:

$$layer1 = \begin{bmatrix} -0.0267 & -0.0267 \\ -0.0322 & -0.0267 \\ -0.0267 & -0.0267 \end{bmatrix} \tag{3}$$

$$layer1 = \begin{bmatrix} -0.179 \\ -0.114 \\ -0.114 \end{bmatrix} \tag{4}$$

(b) Identity:

$$layer1 = \begin{bmatrix} -0.0322 & -0.0322 \\ -0.0322 & -0.0322 \\ -0.0322 & -0.0322 \end{bmatrix} \tag{5}$$

$$layer1 = \begin{bmatrix} -0.216 \\ -0.137 \\ -0.137 \end{bmatrix} \tag{6}$$

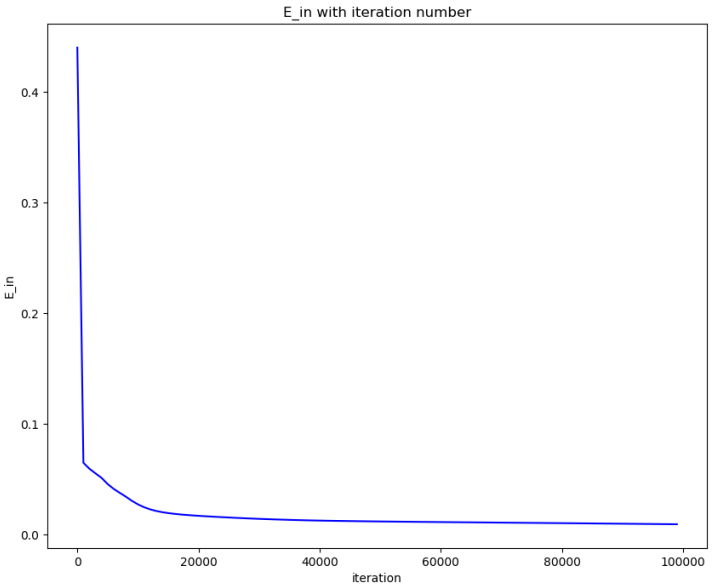
tanh:

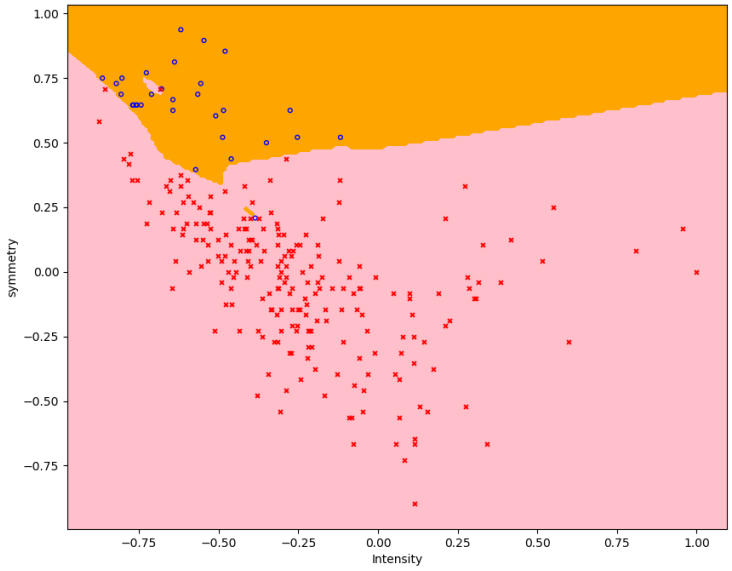
$$layer1 = \begin{bmatrix} -0.0267 & -0.0267 \\ -0.0322 & -0.0267 \\ -0.0267 & -0.0267 \end{bmatrix} \tag{7}$$

$$layer1 = \begin{bmatrix} -0.179 \\ -0.114 \\ -0.114 \end{bmatrix} \tag{8}$$

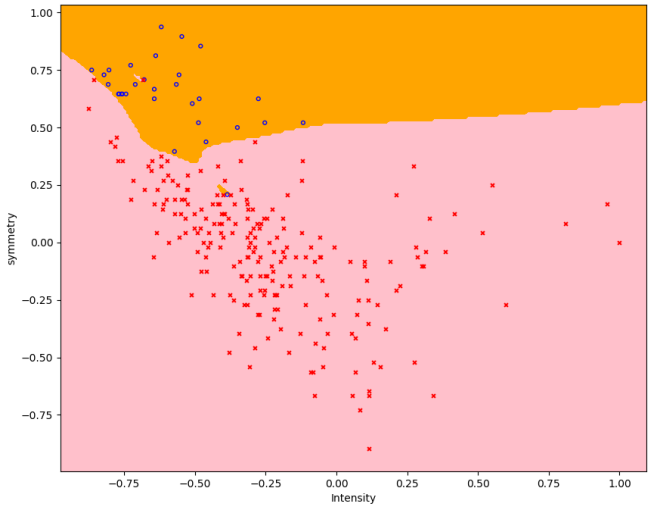
Problem 2

(a)

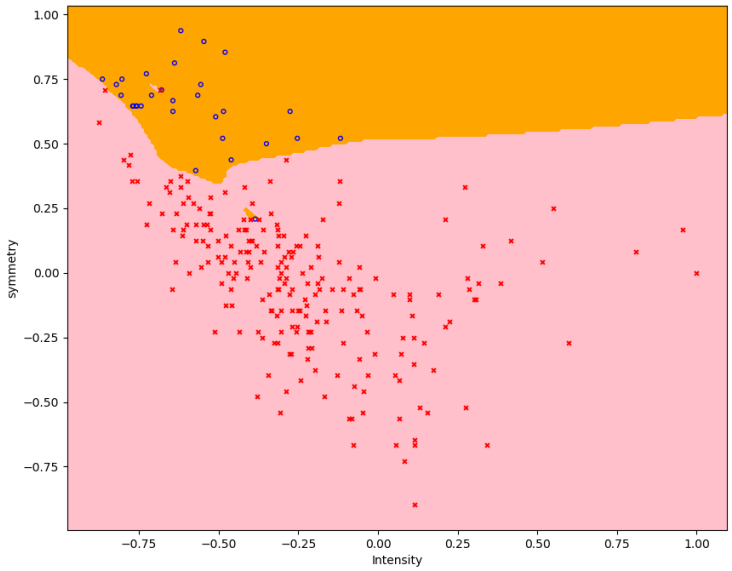



1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
symmetry
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
Intensity

(b)

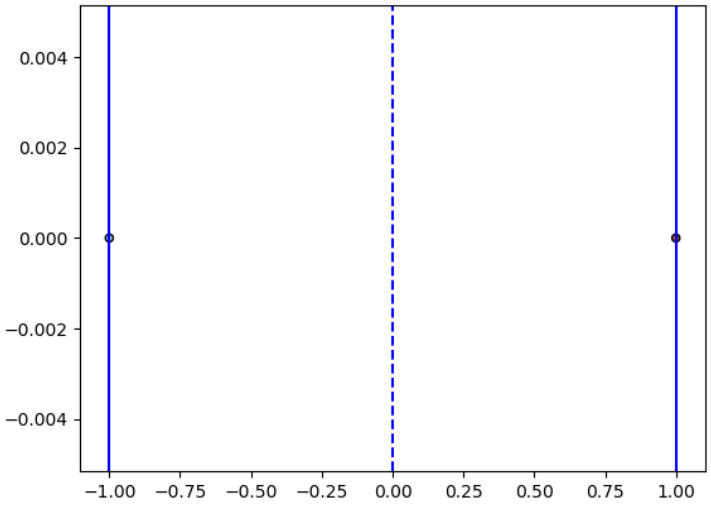

1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
symmetry
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
Intensity

(c)

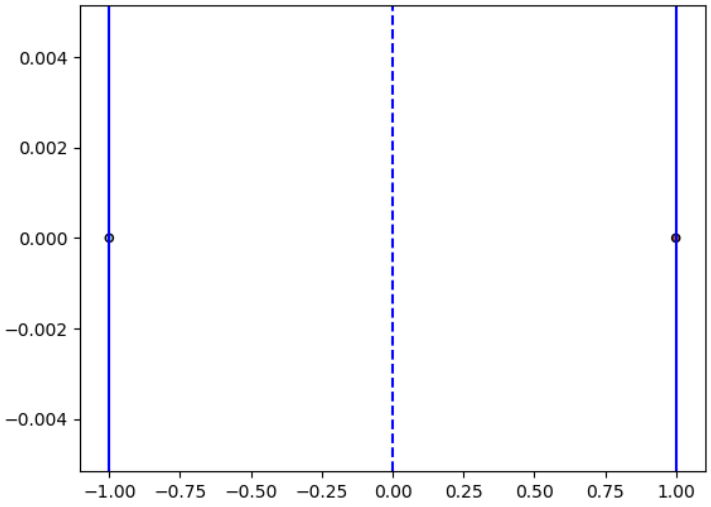

1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
symmetry
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
Intensity

Problem 3

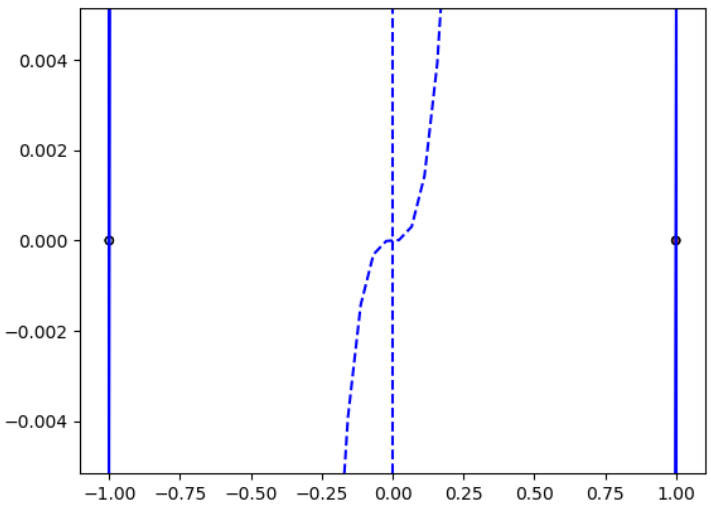
(a) x = 0



(b)



(c) z1 = [1, 0], y1 = 1, z2 = [-1, 0], y2 = -1

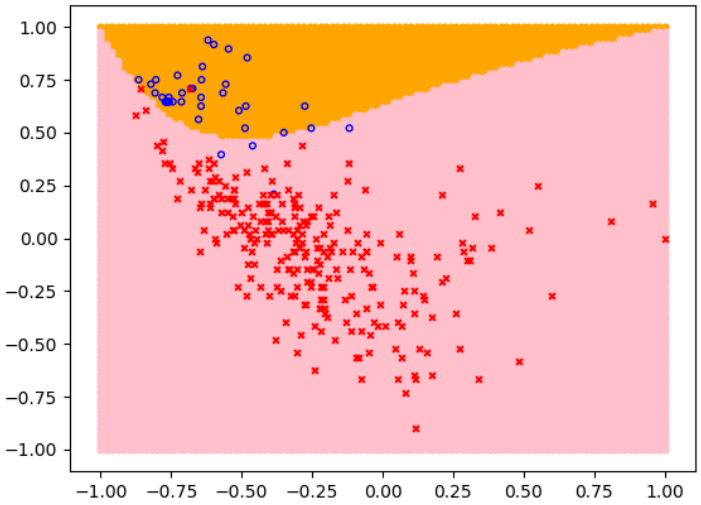


(d) $F = x_0^3 y_0^3 - x_0^3 y_1 - x_1 y_0^3 + x_1 y_1 + x_0 x_1 y_0 y_1$

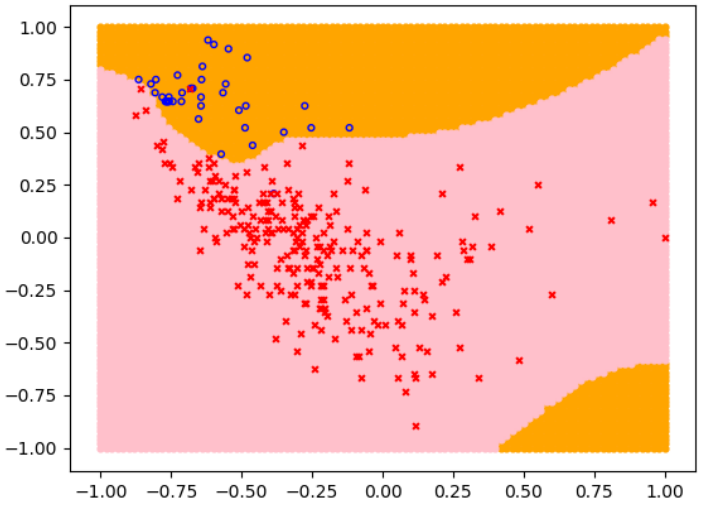
(e) $h(x) = sign(x^3 - y)$

Problem 4

(a) small C = 0.001:

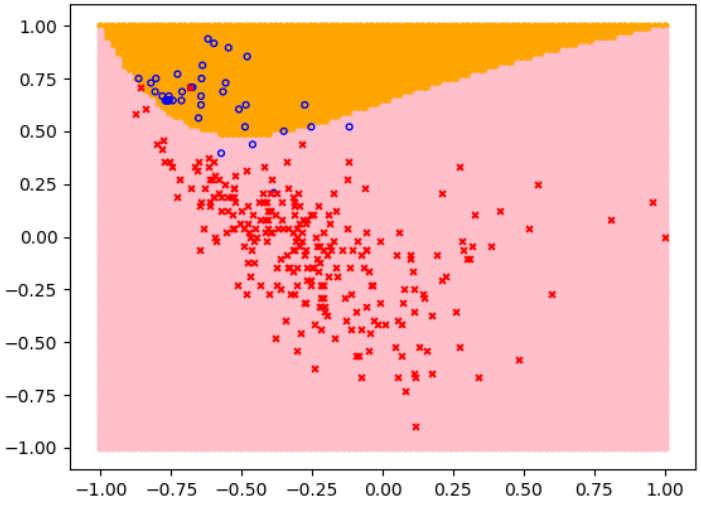


large C = 100:



(b) Generally, a large C can produce a result with high complexity. However, when C is too large, underfitting happened.

(c) C = 100 has the lowest $E_{test} = 0.01278$



Problem 5 E_{test} for five methods:

	E_{test}
Linear Model	0.030669
KNN	0.0202267
RBF	0.0092242
Neural network	0.02867
SVM	0.01278

Above five E_test are quite small, and RBF model produced the best boundary with the smallest E_test. The reason could be that in my case, RBF model use relatively large K value of 44, hence the decision boundary is much more strict than other methods.