CS 412 - Introduction to Machine Learning

Assignment 10

91a) Slope of line 1 (LI) : Marginal Hyperplane

$$\frac{1}{1-1}$$
 $\frac{3}{4}$

Slope of line 2 (12): Marginal Hyperplane

$$\begin{array}{c} \cdot \left(\begin{array}{c} 9 - 6 \\ 8 - 4 \end{array} \right) = \left(\begin{array}{c} 3 \\ 4 \end{array} \right)$$

.. The slope of the hyperplane (L3) will also be 3/4.

Distance between L1 and L2 = perpendicular distance between the two points on

$$\frac{\text{the lines}}{(7-4)^2 + (2-6)^2}$$

Distance between the 2 points = 5

: Margin (?) =
$$(\frac{5}{2})$$
 = 2.5

$$1|\omega_1 + 5\omega_2 + \omega_0 = 1$$
 ... (ii)

$$25\omega_1 = 6$$
 $\omega_1 = (6/25) = 0.24$

$$4 \left(\frac{6}{25}\right) + 3W_1 = 0$$

$$W_2 = -8/25 = -6.32$$

as b) thoose three support vectors, with out ensign of Solving eq. (1) whose stages south the Enghouse $7 \begin{pmatrix} 6 \\ 25 \end{pmatrix} + 2 \begin{pmatrix} -8 \\ 25 \end{pmatrix} + \omega_0 = 1$ $\begin{pmatrix} 42 \\ 25 \end{pmatrix} + \begin{pmatrix} -16 \\ 25 \end{pmatrix} + \begin{pmatrix} -16$: Wo = - 1 = 10 = 0:04 1 = 0W + xwe + 100T (ii) . 1:00 + 5002 + pull 25 (iii) . -= owt = wat + was .: W1 = 0.24 solving equations (i) q (ii) W2= -0.32 Wo = -0.04 (vi) 444 343 : 0 Estring eq. (11) & (11) (v) .. (v) (A1) & (m ba butness 450 = (35/3) = W Substituting with (IV) 0 : ME+ (8) + ;

Was -8/42 = -0.82

1		
	•	
8	Q1 · c)	Removals are independent
		old C
	i)	Nos q is que and more more hyper p'son.
9	The second secon	As we have 4 points on the marginal hyperplanes
9		As we have 4 points on the marginal hyperplanes & we only need 3 points as support vectors to solve for wo, w1, w2. The fourth point is redundant
9		solve for wo we We The fourth point is redundant
		OUIVE 15
9	ii)	No of the fin
9		It is not a support vector and and in soil
2		ell don esob
5	iii)	No ON (VI
1	1	(10,0) is not a support vector
4		between the two marginal hyperplanes.
-	iv)	74
		As we are deleting 2 support vectors on one side. It will change the decision boundary.
1		It will change the decision boundary.
100		
	y	Yes
100		Both are support vector. The decision boundary
10		will suit.
70		
70		CONTRACTOR OF THE PROPERTY OF
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Ten		

	Removate die pict quendent	1-10
a1. d)	dayada ban and and	
5	No	6
	Il I a got lie between two morginal hype planes.	Ch.
	As we print on the marginal hatberdanes	
	Yes motory traggue to stand & bord who my	
ii)	Yes huperplanes.	
dant	Since it is within the two morginal hyperplanes.	
		Ci.
(iii	4es No	4
)	Since it is within the two marginal hyperplanes.	
	does not lie	
, ,		(in
14)	No	4
	Because both the points do not lie	
	between the two marginal hyperplanes.	In
V)	Yes	(VI
	Since both points are within the two	
	maiginal hyperplanes	
	Yes	W
	Both are support verter The decision boundary	
	will suit to	

2 - 2 - 2 - 2

92.	
	subplot 1 2 3 4 5 6
	subplot 1 2 3 4 5 6 model de f b a c e
	based on as-a)
a)	Linear SVM meaning a linear boundary.
	small value of C(0.1), .: more errors are allowed
	As a focuses on loss (how much it violates the margin)
	4 fig - The line does not separate properly.
Ь) Linear SVM meaning a linear boundary.
	lorge value of c (10) : less errors
	3 fig - The line separates properly.
3	_ v
C	Decision function of quadratic kernel
•	f(x) = Eix; (xi.x + (xi.x)*) + b
9	·· f(x) = 0
•	= x can either be an ellipse or a hyperbolic curve
9	i fig. 5.
9	
	d) Deasion function
•	flx) = Ejajexp(-7/12j-2/12)
	if & is large , kernel value is small and vice veusa.
	tess number of support vectors
	more
	7=1/4 for fig.1, classification is difficult if kund

Value is small.

02. r is large, more number of support vectors based on 02.d) Linear EVIM meaning a linear boundary small value of c(0.1) : more error are 41158 As a focuse on loss (how much it violates the margin fig - The line does not separate mappelly - pilt Lucioi sym meaning a linear boundary. Q2 F) None of the above -fig.2. 8 tig The line separates properly. Decision function of quadratic Kernel 9+ (x(x)+xix)+xix) 12/3 - (x)+ 0 = (x)