Dhrur Chakraboty UID: 204-962-098 Prof. Sankararaman

6 - 24	CM146: PSET 3
14.7	(b) since R(N,2) = N. 2 a land, we use scaling to un
1	» Kernelsi _ L & K their to at . L = (10) }
(0.1	K(n, z) is a kernel! We can see that it is symmetric
(4)	since k(n, x) = k(z, n) and the interpretation of the words
. Jan	menailes the stanter-Now we ishow positive temi-definitives.
1-t-c	ence sets Kitel kingto ock (nyte)) rest printophens h (nyte) =
	word or in E(k(2, n) ick(2,2)) stor tout one k(2, n)
	$det(K-\lambda I) = (k(n,n)-\lambda)(k(z,z)-\lambda)-k(n,z) = 0$
	$=) \lambda^2 - \lambda (k(n,n) + k(z,z)) + k(n,n)k(z,z) - k(n,z)^2 = 0$
	Ming quadratic egan to retire for 1/2 5 4 (k(n,n)k(z,z)-k(n,z))
- Tal 3	(h, n) + k(z, 2) + N(k(n, n) + k(z, 2) - 4(k(n, n) k(z, 2) - k(n, 2))
	(12/1/5 + 14/1/5 +1), (22/1/5+12/5/5+1) =
(30,30	(h(x, x) + k(x, x) + (h(x, x) + h(x, x)) = ((k(x, x) + h(x, x)) + (h(x, x) + h(x, x)) +
	(learly, k(n,n)+k(2,2) tota (k(n,n)+k(2,2))2-4(k(n,n)k(2,2)-k(n,2))
The West	Missist positive son Apro (as kis the and An >0 4 n EIR)
2 2 2 4	Now considering 12 = k(n,n)+k(2,2) - n(k(n,n)+k(2,2)?-4 (k(n,n)k(2)-k(n,2))
- + 22 Ju	Show wowthan be the ship to th
300	We mant + k(n,n)+k(=,=) ? N(k(n,n)+k(=,=))-4(k(n,n)k(=,=)-k(n,=)2)
2 - 8 - 8 /	2 2 Man 5 5 2 2 2 2 4 38 1 2 1 2 1 4 5 8 4
- 19 PM 6	(k(n,n)+k(2,2))2=(k(n,n)+k(2,2))2-4(k(n,n)k(2,2)-k(n,2)2)
(- 4) 4 120	So (s(m) = 1 = The different sets
18 NJ M	1 (sind 0 7 - 4 (k(n,n)k(n,2) - k(n,2)2)
	Mis well and the second
41 301	k(h, n) k(z z) Z (k(h) z)2
27-11 LUM 1	But we know this gines the interestion of a document
27 37774	with thelf is recessarily greater them/ canal to a different
. ***	discurrent & 150. K(m/w) 2 K(m/z) and K(m/z) 2 K(m/z).
7	Since Kis symmetric and show only the non-re
	eignivalue it is possibilé same-de frite.
	· · k(n/z) is a terrel!

CM146: 52EL 3 Since k(n,2d = n. = is a ternel, we use realing to with f(n) = 1 to get that 1 n. 2 1 is also a kernel. Alongra K(n, t) = 1 tirclarly a kernel, mul 11211 Multiplying this knowed by littlet thrice and using the product rule, ((1sta) (n) (57)) is a kernel. $= \lambda^2 - \lambda (k(m,n) + k(r,s)) + k(m,r) k(r,s) - k(n,s)^2 = c$ (c) \$ 100 kg (n/2) = (1+ BN: =)3 huming signaling paid (sassificial) H. S(G = CHABITATES () + B(M) = +M = 1)3 : n, 2 ER2 = (1+Bn, 2, +Bn222)2(1+Bn,2,+Bn222) = (1+ p2n, 22 + B2n, 22+2Bn, 2+2Bn, 2+2B2n, 21n, 21n, 21 1-600 1 1 (16 10) + 1 (16 10) 1 + (16 10) 1 + (16 10) 1 + (16 10) 1 + (16 10) 1 + (16 10) = 1+ B n, 22+ B2 x2 22+ 2pn, 5+ 2pn, 2+ 2pn, 2+ 2pn, 2+ 2pn, 2+ 2pn, 2+ Smy + β3 n/2 + β3 m/n/2/2/2 + 2β2 n/2 + 2β2 n D- ((+ 1) (+ (1) 1) 2 B3 n 2 2 2 (n 2 + Bn 2 + Bn 2 2 3 n 2 2 4 B3 n 3 2 3 + 2 8 3 n, 2, n, 2, + 2 63 n, 2 22 + 2 83 n, 2 n, 2 22 xn) 5- (x 2) 5((x 1) 5) + = ((+38m+69+)36m,22,2+5/83 n,3=13++36m,2+662n/2,n,22 + 3 8 3 2 21 2 12 + 3 8 2 2 + 2 8 3 1 2 1 1 2 1 2 + 8 3 2 3 2 3 (R(non) + R(R, E)) = (R(R, E)) = 4(R(n, L) K(E, E) - R(ny) The difference between kg(x, z) 50 (g(x) = - NZB my (1/1) 1 and k(n, z) is that ks has the scaling factor B of & scales the rector. 11 13 B 3 12 min 1 1/ ti condition 2 10

Up: 204-90 2-09 Pool sanknownown

2)	2) Tighter Baluar was ally								
(a)	(a) Want to minimized 1-11011 = with ynoThin ? 1 ise - OT (ase) = 1								
	$\Rightarrow 1+a\theta_1+e\theta_2\leq 0.$								
(4).1	10 (6, x) = 11 110112+ x (6 (de)+1) of line on smil (d)								
<u>- ckd 6, -</u>	to exect date intakaily executed they training the								
- Jajur	To So DU = O + x (a,e)T = o = Tx (a)								
- I hay you da	Jenstey & fold that have the firm of								
	Now Indianiaing jover & just here of boot here								
1.24	man 1 / - x(a) 12 + x d (- d (a) (a e) +1)								
L' (e/11 e what e how all.)									
of Like Son	$= \max_{\alpha} \int (\alpha^2 \alpha^2 + \alpha^2 e^2) - (\alpha^2 \alpha^2 + \alpha^2 e^2) + \alpha$								
6.114.6.11261	100,000 mint 2001 5000-17 (punions) (b)								
0.637	1.5								
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14.9.19	renor heret (e) 2,48 1.58.18 001								
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(b)	Given n,= (1), n= (1), y,= 1 and y, =-1 we must								
sut su	On all performance metals core, its and cores of								
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347	Wester Plant Out of the State o								
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01=000	2) Handwit = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1								
	(2) NG+27 N53								
(८)	The constraints with the roffset term are 0,10,71-6 (20,51-6)								
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- 120 D	to to supply the solution of t								
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2) Twitter	Analysis us	ing IVMs			(4'17) (Ţ.			
3.2)	Haper	parameter Si	lection for	- Plat lin	cer la Cione	1 sum	(25)			
	- 1+0°C+0°D+1°C									
(b)	b) Since we wish to find hyperparameter that generalize best									
	to whele data, spluitically nearwed wire training/text dot a									
	we want the autable we are telting on to have rimitar									
	arti	hulion: A	fold that	doent i	have the	same pro	portions			
	coma	lead to	overfilting	and is	an would	be an or	uth ev			
	morco	ver, a told	mytho was	stly the	1 tre sa	imple teac	Leu			
	The	hodel n	othing.	11 (3)	1 7					
	1 con	335×4202×) - (191	xtola) xxx		•			
(d)	C		FI-score	AUROC	prairion	sensitivity	mai 6:4:34			
	(0-)	20.89-/.	× 82.972.	1,50%	70:897.	= 100%	67.			
	10-2	71.071.	83.06%	50.31%	71.04	(00%,	0.637.			
	(0-1		87.551.			692.947.	50.817.			
	(0	8t.46.4.		75.317.		× 90.171.	60.45%.			
	(01	81.827.	87.66%	75.92%	85.951.	0190.177.	61.627.			
	102	81.827.	87.664.	75.92%	85.951.	90.171.	61.67%.			
	best C	(%)	(%)	10	(0	0.00	(O			
سرس	1	(2 long) =		= m (1		hiven	(4)			
	On au	performani	e metrics	C=10	and c	= 100 gin	e the			
	Same V	ralue, kut	13 12 min	actually	the best	For ah	metor ex			
	o which	c sewithing	ty lov ser	witinty.	maker	values hi	be			
	C= 101	Right C = ()	200 perto	um Sel	ter but 4	me is it	2 to At			
	mar	4 onther a	grer bu	phible to	overlitter	y We a	se C=10			
as low & best 10										
3.3)	Hypun	noter sele	chang for	MANIRB	F-Kerrel	SVM)	(5)			
13.3) Hypomater selections formantikertkendnorvan (5)										
(a) The & parameter "delives how fair the influence of a ringle										
training example reaches, lower values menory four and motor										
value meaning close." (from stream dow). Basically as & increase										
Here are the contract of shell and Alarmania of the										
the support vectors included of whiteher decrease we can true it to avoid over fitting and increase generalization.										
The fit to overful over the over the over game attacked										

MAN.

		3 h lk.									
(b) In my gri	It my grid, both C and & range from 107 to 10 in									
	1-03-0-1	The value to C for the livear									
	ner mer am	rapher and truly pertorqued anik well hardoner this									
	always fo	allows for a very large range of values for both parameters.									
	metr)			Y							
	accur			0.0							
	F1-5C			0.01							
	AUR			6.0							
		ion 85.837		0.01							
	- swit		0.001	0.001							
	s perifi	city 60.477	(00	0,01							
	Just as i	n the linear	kernel,	sourt:	nity is an outlier						
	WOLK C - C	with C= 0.001 and T=0.001 performing beak for it. Movement									
	400 every	other briton	mance n	retric.	C=100 and X=0.01						
	are the	for every other performance metric, C=100 and y=0.01 are the best hyperparameters in our grid.									
3.4) Test set	Performance									
(a) We use C	=10 for the	linear	kernel.	som a F performed						
	the best o	in all metri	U AK C	xcept su	witivity (as did c=10	2)					
	L'milany,	a C-100	0 = 0	01 die	the boilt be all.	A a t					
	all metric	for the R	BF two	d NM	I, we use these						
	hy shrpana	welry to tr	an it.		y voc ivoge						
	01										
(ϵ)	wetric	linear 1	RBF	_ As	we can see the RBF						
`	accuracy		75.71%	Lever	nel clarifier perform	,					
	F1-score	43.75-1.	45.16%	shick	itly better than the	J					
	AUROC	62.59%	63-61-1.	100	our kurnel NM on	,					
	precision	63.647.	70.00%	ا ا م	metrics (except sensitive						
	souritrinity		33.33%	We	would ideally deploy	1 192.					
	specificity		13.881.	1 this	model over the linear	one					
	-										