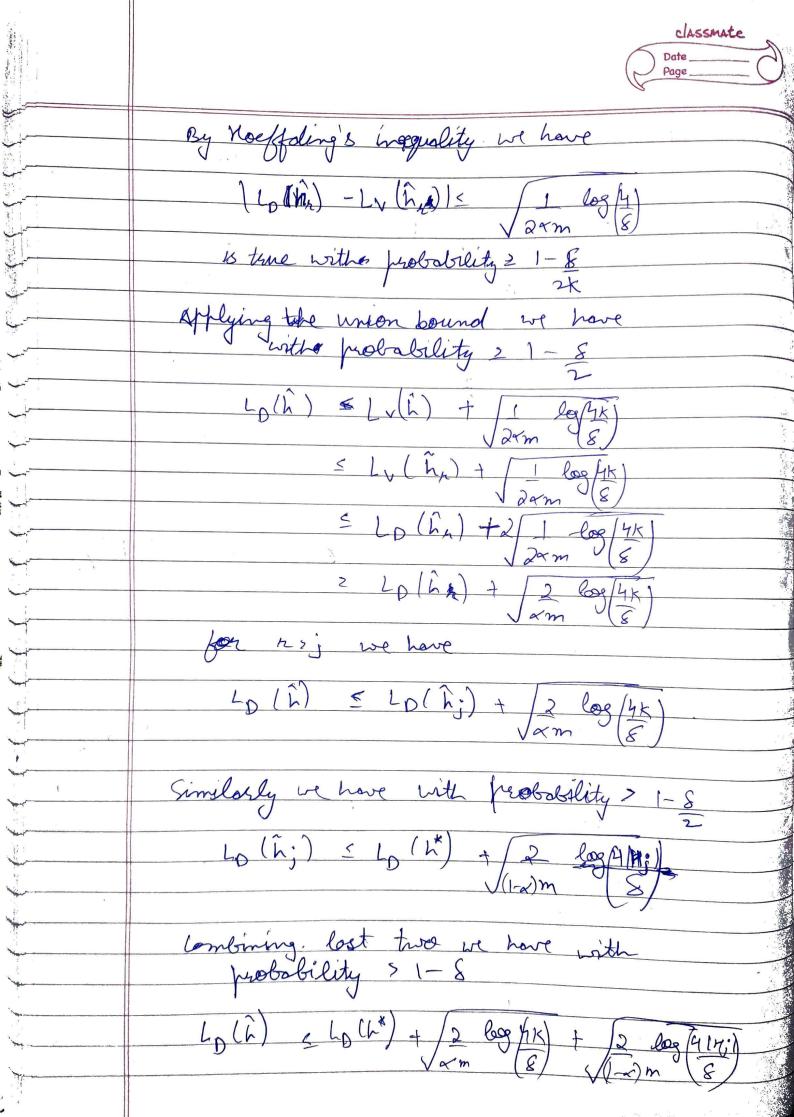


FOML Assignment-5 A I 21 BTE (M1011 Gunjit Mittsl Loss function Ldh) is given by L. (h) = | { i t {1,...,m} : h(Gr) } y:\$[ ERM problem for domain & z and input Sample St & zm is given by  $L_s(h) = 1$   $\mathcal{E}_s(h, p)$  |S| PESThe sample complexity of learning a finite class is upper bounded by my (E, 8) = c log (C/H/8)/EC Mere C21 in realizable use and c22 in the non lerforming exhaustive search the run time is

KINI (log (CINI/S)/EC Let us consider the enomple in which M, & H2. - EMK and M? 1 2 2 Vick Learning Mx in Agnostic-lac model provides the following bound for an ERM hypothesis h:  $L_D(h) = \min_{h \in M_K} L_D(h) + \frac{2(k_H + log(1/8))}{m}$ Using model selection, ssuming i is the minimal index which contains he to organin to (h) and fining rECHAS





Substituting [Mij] 2 we get  $L_{D}(\hat{\lambda}) \leq L_{D}(\hat{\lambda}) + 2 \log |4| + 2 \left(\frac{1}{4} \log |4|\right)$ From this we can observe that when the optimal index j is much smaller than k using model selection is the better 5.3 & Old.3 According to the representer theorem the minimiser of training error lies in sponts.

spon & \( \psi(\pi\_1) \graphi(\pi\_2) \dots \psi(\pi\_m) \quad \cdots \end{array}. i The ERM problem can be rewritten as \$ min 11 8 x 9 4 (x 31)2+1 5 (< Ex; 4(x;), 4(x;)> - 40}

2 min 2 (x;)> - 40} Using gram matrix we can write it as min 1 x T 61 x + 1 x (< x, 6; > - y;) 2 x ERM 2m 121 Since it is conven re differentiate it and get As G is symmetric

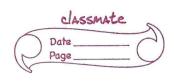
25 by is investible

(1'I+br) x z y

Since by is positive semi definite and \$>0

1'I+br is positive definitive and \$>0

in the second se	Classmate Date
	Page
<u> </u>	
Ů	: (A'I+6T) is invertible
	the minimiser will be
	X Z (d'I+GT) Y
	CMB.4 Ret 4 = 61,2 NS -> RN  4 = (13,01-5)
4	$\frac{1}{2} = \left( \frac{1}{2}, \frac{1}{2}, \frac{1}{2} \right)$
J.	where is the one vectors in R's
	then
J	
	< \p; \p; > z < (\int, o^-i), (\int, o^-i) >  z min \( \frac{1}{2}, \text{o}^{n-j} \) >
	$z \times (i, j)$
02	State that for a PDS kernel K, for any
	n, n t x
÷	$K(n,x)^2 \leq k(n,x) K(n',x)$
	For the Kennel K'(x,y) 2 K(x, 4)
	~ (m) ~ (y)
<u></u>	Let to be kernel of
	above keemel.
	Fet (or be kernel of  Let (or be the gram matrin of the  above kernel,  longistering any column Motrin &  with column vectors Golama Com E RMXI
	with column vectors Golz Com E RMXI



CT 60 C 2 & C; C; K(xi, 34;) since both the numerators and denominators evalute to >0 which implies K'(a,y) is PDS Q6·2 a)  $\chi(x,y) = \cos(x-y)$  over  $\chi \chi$   $\cos(x-y)$  cos  $\chi$  cos  $\chi$  cos  $\chi$  sin  $\chi$ K (n,y) con be written as inner product of

\$\frac{1}{2} \left[ \cos n \right] \frac{1}{2} \left[ \cos y \ri K(ny) 5 (of (n²-y²) ovér RXR C+ 6, C = & (; C; C; C; 2, 2) Joking 2,2 x,1 & y,2 z y,1 2 } (; (; cos (x; ) - y; )) which is the same as proving was (n-y) is PDS K(n,y) 2 { cos (n,2-y;2) Stree each term in X(n,y) is PDS X(n,y) will also be PDS

