SVM Slack variable a eng q = 1 - 4 (wix; -b) on Min = max(0,1-y; (wix, +b)) + 211wii Soln The moni mization taking We

SVM a eny slack variable $\xi_i = 1 - y_i \left(\omega^* x_i - b \right)$ on Min = m mx (0,1-4; (wix, +b)) + 211wii begin by taking the minimization traction to as what is subject to A: 1=1:-- V => = 1 - y: (w=z; -b) Thus for Eigo we have the above without go Y: 7=4, -- ~ 1- 9; = 4; (w7x; -b)

We begin by taking the mainizarm trackin to as > /11w1 + C & 91 when is subject to => == 1 - y: (w===b) +: 1=2,-... Thus for \$1,70 , we have the above without as 1- 9; 4 y; (w7x; -b) +; 7=4, -- ~ In the case the opt variable are w, b, &, Next we look at silli possible devakors
Change in wix and b as follows for Wx+5=1=1/10 = 0= 16 (= W12+5=0

名:= 1- y: (いす x; -b) Y: 1=2,--., r Thus for \$170, we have the above without as 1-9; = 4; (w1x; -b) V; 7=4, -- n In the case the opt variable are w, b, E, Next we look at sall possible devictions.
Thange on with and b as follows w12+6=1=:/p> W12-15=0 w12+b = -A+ We let wix +1 =0, then the optimization problem will now become min / 11 211 + C & 9; 0, 6, 9;

of the ight = 1 = 1 - 4: (w= 1 - b) V: 1=2 -- 1 - Mus too Fi 70, we have the above without as 1- 9; & y; (w7x; -b) V; 7=4, -- n In the case the opt variable are w, b, E, Next we look at All possible devakons for Change on wix and b as follows W12+6=1 WT2+6=0 w12+b = -A We let wix +1 =0, then the optimization problem Will NOW become 0, 6, 9;

which is subject to A- 4 (w = -6) + 9; &0 8 with - 9, 60 H =) Next we compute the associated languagean I in relation to the optimization problem 95 follows (M, 1, 9, w, b) = / || w ||^2 + C \(\frac{2}{3} \\ \frac{2}{1-1} \\ \frac{1}{1-1} \\ \frac - E X; 8; of toplier and culing 11; any the language a multipliers for the convalida

I Next we compute the associated languagian In welakin to the optimization problem as publen as [(u,1,9,w,b)=/11w112+ (= q; + \(\frac{1}{2}, \frac{1}{2}, 1=1 = x x; 4; culiare =) M; are the language multipliers for the separability Con straint are the language multiplies for the Constraints (d= is (w) : p + g -1 =) We can now take the deriventive, of the above languagean function you . xit to both & and b

1=1" \$ X: \$1 celun the language multipliers for the = 1/1: are the language multiplies to the Constraints I lander of the deriverties, of the above languages function (w. x.t to both of and b 36 = 0 1/=) E M; y; = 0 1/2 / 1/2 (2011) => dL =0 => wixi= (Cd+x+1) 1=2,--,1 24, nude hia - 4; - 4; (w x; - 6) + 1 < 6 0 9; 70 Using the complementary slackness

of the two the language multiplies for the Constraints The can now tore the downthre, of the above to both & and b 3 2 L = 0 =) E M; Y; = 0 => al =0 => Mix; = C di +10 1= 1, -, 1 29, whe him - 4; -4; (w/x; -6) +1 < 5 00, 4; 70 +1 Il sing the complementary sharkness condition in interval 0 & Mi C C i.e. i.e. i.e. (wixi-b) = 0, we need to find

the dual function for all u; where is given to 9(u,1) = inf L (u,1, q, w, b) But from the languagean tunition we have the Jam E (C-M; - 1;) &; Taking the inframm with 9: and impossing to Conditor C= M: + li V: on the mi

The dual function for all M; where is given by $q(u,\lambda) = \inf L(u,\lambda, \xi, \omega, b)$ $\omega, b, \xi,$ But from the languagean function we have the Jam E (C-M; - X;) = Taking the infraum with 9: and imposing the Condition C= M: +1: V: on the interval DEMIEC, the dual publish become, Max 2(M) = \(\frac{1}{2} \langle \frac{1}{2} Sul-

Max 2(11) = \(\frac{1}{2} \limin \) \(\frac{1}{2} \limin \limin \) \(\frac{1}{2} \limin \l 0 = u; = c V; i= 4, --, 1 Subject to and publien is gun Associated primal Minimize / | will + C & q; Subjet b

Taking the infimum could quand imposing the condition C= M; + di V; on the interval Subject to and Associated primal problem is minimize / 11 w112 + C & q; Subjet b 1-9, 6 4; (w/z;-