

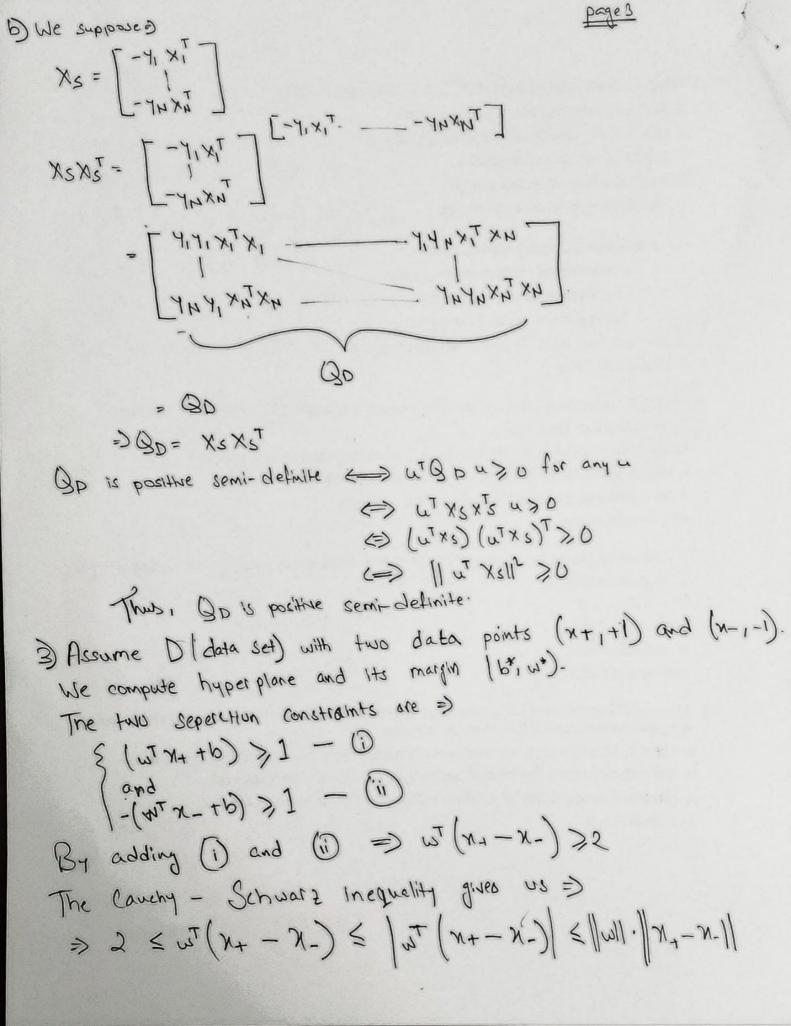
We simplify the expression (1i)=> we have \$\frac{1}{N} & \langle \n \dn = 0 =) \ \frac{1}{N} & \langle \n \dn \rangle 0) X 1m dn <0 $= \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} \sqrt{n} \sqrt{n} > 0$ we have also 2m >0 (m=1; ... , N) $\Rightarrow \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \Rightarrow 0$ Thus we can write => [x1]

[Ly. - - yn]

[-y. - - yn]

[-y. - - yn]

[-y. - - yn] => AD x of > Outo Finally, we conclude that the problem is a standard GP- Problem => Emin JaT BOX-INX



So we get > | / will > 1/m/ - x-11 In this case we want wit to satisfy both constraints (1) & @. This nears that > | J+T | x+ x-) = 11 vt | . | x+ - x- | This can happen only it =) $m_{\star} = K(q^{+} - q^{-})$ but we have || w* || = 1/ x+ - x+ || => K= 1/2+-x-1/5 Finally we may write \Rightarrow $\omega^{\dagger} = \frac{2(x_4 - x_-)}{||x_4 - x_-||^2}$ It remains to be determined b* ? We have => 2 $\left(\frac{(x_4-x_-)^T}{||x_4-x_-||^2}\right)^T x_4 + b^* = 1$ $=) b^* = 1 - \frac{2 x_1^T x_1 - x_2^T x_1}{\|x_1 - x_2\|^2}$ $= \frac{|| x^{+} - x^{-} ||_{S}}{|| x^{-} ||_{S} - || x^{+} ||_{S}}$ 1/N+ - N-1/2 1/N+ - N-1/2 Finally, use can say that (w*, b) batisfies both constraints and minimizers IIvIII, and therefore gives in the optimal hyperplane. 4) We have a data set of three data points in 1223 $X = \begin{pmatrix} 0 & 0 \\ 0 & -1 \end{pmatrix}$ $Y = \begin{pmatrix} -1 \\ -1 \\ +1 \end{pmatrix}$ we combine (1) and (11) => W1 <-1 if we consider $W = \begin{pmatrix} w_1 \\ w_2 \end{pmatrix}$, the quantity we seek to We have equality when $w_1 = -1$ and $w_2 = 0$. Do, when w = (-1,0), the constraint (11) gives w ≥ b>,-1. po me charse p.=-1. Thus, we verify (w*,b+) satisfies all constraints and minimizes I'ull and therefore gives us the optimal hyperplane. MB the margin in this case is 1 =1.