Subject:
Year. Month. Day.

VC dimention:

(4.2) a) $H^{\mathcal{X}}_{=k} = \{h \in \{0,1\}^{\mathcal{X}} : |\{x : h(x) = 1\}| = k\}$

we have two variable that can consider for vcdim one is the value of k and the other is the x which isn't have value of 1 so we can assume $\text{vcdim}(H_{=k}) = \min\{k, |X| - k\}$. for prove our vcdim we should find C which shattered by H_k.

so let assume $C \subseteq X$ with size of $k+1$ so we don't have any h who $h(x) = 1$ for all $x \in C$

& if the size of C be $|X| - k + 1$ we will not have any h who $h(x) = 0$ for all $x \in C$ $\Rightarrow$ $\text{vcdim} \leq \min\{k, |X| - k\}$

۴.۹ $H = \{h_{a,b,s} : a \leq b,\ s \in \{-1,1\}\}$ where $h_{a,b,s}(x) = \begin{cases} s & \text{if } x \in [a,b] \\ -s & \text{if } x \notin [a,b] \end{cases}$

if we consume $C = \{1, ۲, ۳\}$ it will be shatter by 8 way but if we consume C as $\{x_1, x_{۲}, x_{۳}, x_{۴}\}$ if we consider lable in $y_1 = y_{۳} = -1$ $y_{۲} = y_{۴} = 1$ it won't be any hypothesis in H so $\text{vcdim}(H) \leq 3$

4.6) $\mathcal{X} \to \{0,1\}$

1) if $m<d$ the statement means nothing. if C be a shatter set of d

H contain all the function from C to $\{0,1\}$. according to exercise there

exist distribution D for $L_D(h)=6$

Subject:

Year. Month. Day.

۹.۱ if we have a vector of variables $s=(s_1,\dots,s_m)$

acording to hint minimizing the ERM is equal to minimize the linear objective

$\forall i\in[m]\quad w^T x_i - s_i \le y_i \ ,\quad -w^T x_i - s_i \le -y_i$

۹.۳ follow the hint $d=m$ & $\forall i\in[m]$ let $x_i=e_i$ if $\operatorname{sign}(0)=-1$

$\forall i=1,\dots,d$ $y_i=1$ be the label of x_i $w^{(t)}$ is a ~~vector~~ weight of perceptron

for every $i\in[d]$ $w_i=\sum e_i \Rightarrow \langle w^{(i)}, x_i\rangle=0$.

Year. Month. Day.

۴.۴ 1. show $|H^d_{con}| \leq 3^d + 1 \Rightarrow$ for prove this if we want to decide about each variable x_i beside all negative hypothesiss it should be $|H^d_{con}| = 3^d + 1$

۲. conclude that $Vcdim(H) \leq d \log 3 \Rightarrow vcdim(H^d) \leq \log(|H^d|) \leq 3 \log d$

۳. for prove that H^d shatter the set of unit vectors $\{e_i : i \leq d\}$ we should find $C = \{e_i\}$ is shattered by H^d.