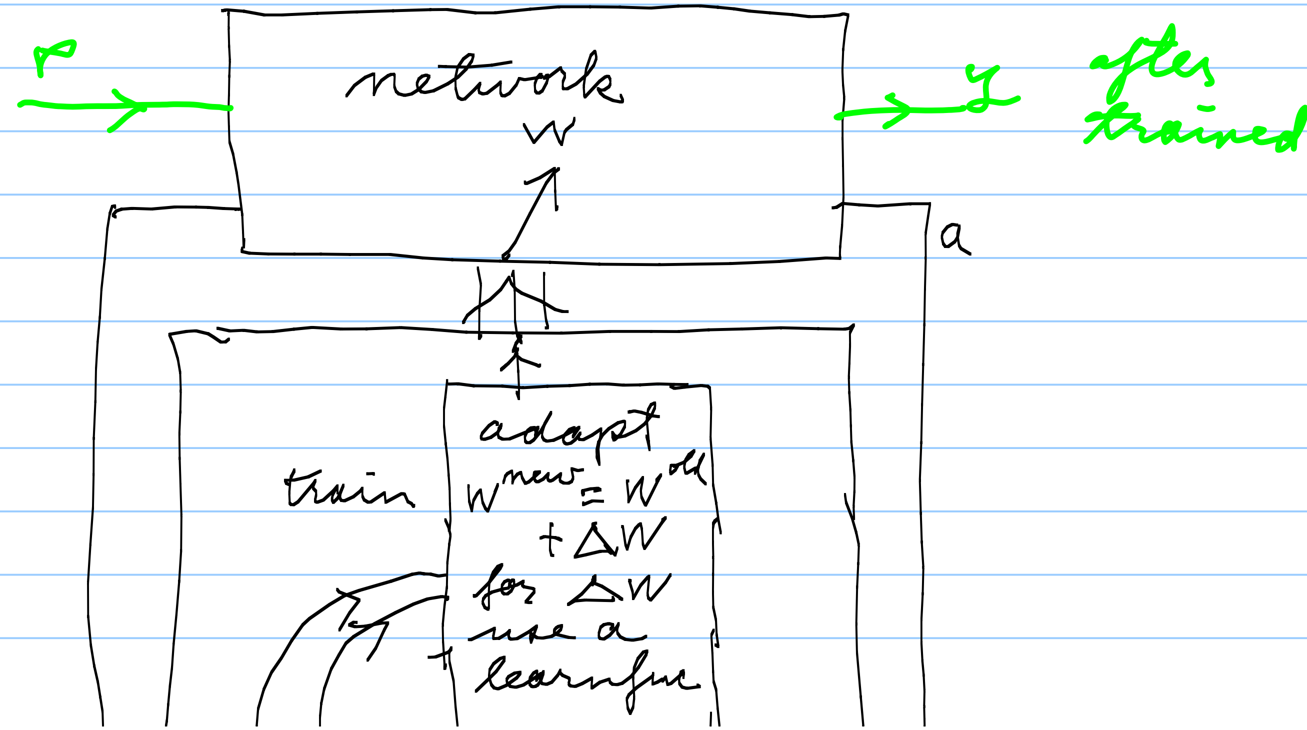
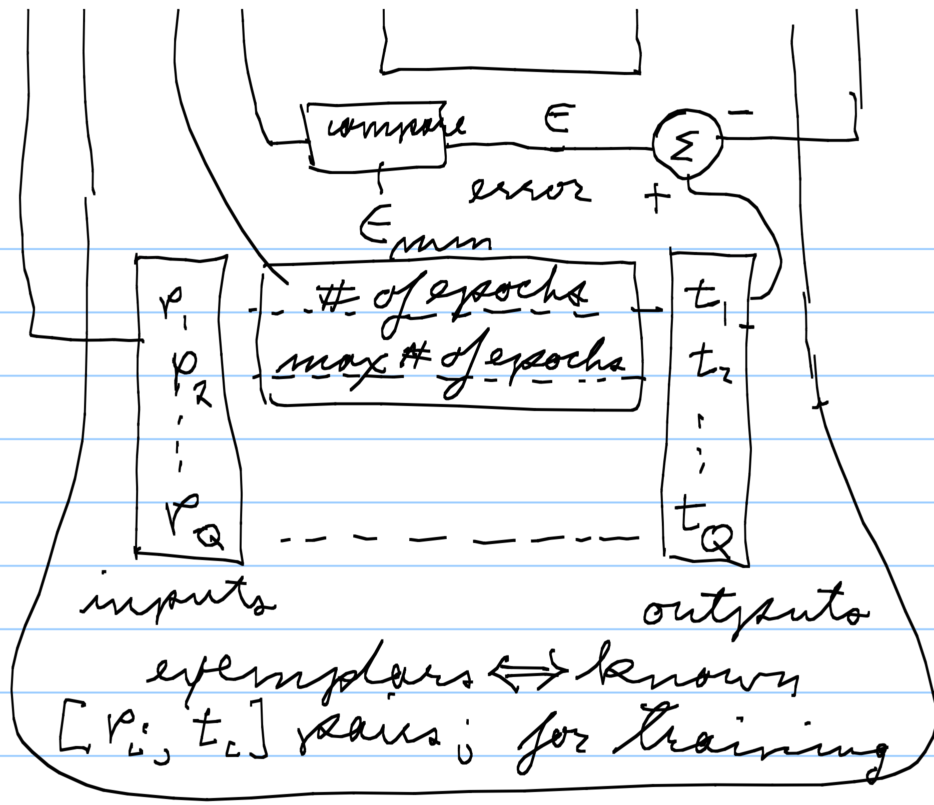
EE434

Note Title 2/10/2004



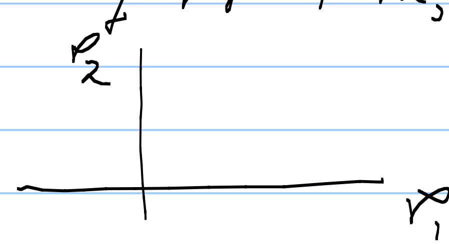


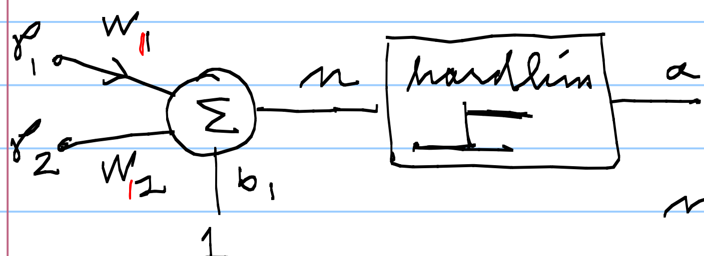
compare
ε
error
+
−
Σ
$\epsilon_{min}$
# of epochs
max # of epochs
$p_1$
$p_2$
$p_Q$
$t_1$
$t_2$
$t_Q$
inputs
outputs
exemplars ⟺ known
$[p_i, t_i]$ pairs, for training

perceptron learning pp. 4-12, 13

2-vector input

$$p = \begin{bmatrix} p_1 \\ p_2 \end{bmatrix}$$




$$a = \begin{cases} 1 & n \geq 0 \\ 0 & n < 0 \end{cases}$$

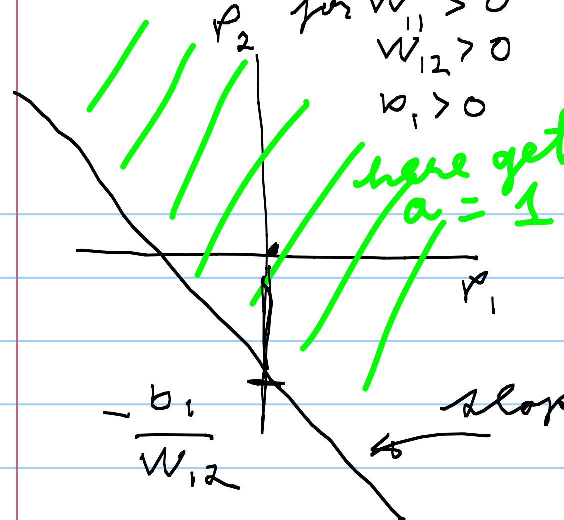
$$n = p_1 w_{11} + p_2 w_{12} + b_1$$
$$= Wp + b$$

1 neuron perceptron

switching surface is where $n = 0$

$p_2 = (-w_{11} p_1 - b_1)/w_{12}$ a line for $p_2$ vs $p_1$

for $W_{11} > 0$
$W_{12} > 0$
$b_1 > 0$



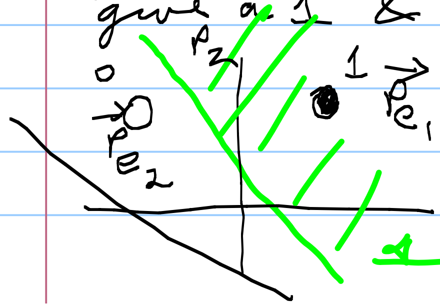

$n > 0$ for $a$ 1

pick a point (nice one here is $p_1 = p_2 = 0$); $n = b = b_1 > 0$

gives a 1 as the output for the upper half plane

slope $= \frac{-W_{11}}{W_{12}}$

for exemplars know which inputs give a 1 & which a zero




need to move the separating surface

note: if exemplars such that can not separate by a line then can not train $\Longleftrightarrow$ exemplars are linearly separable

$n = Wp + b \Rightarrow$ if $n = 0$ then one $p_i$ is a linear combination of the others $\Longleftrightarrow$ in higher dimensions still need to be linearly separable to be able to train.

If can train only need 1 epoch if use "the perceptron training rule" see p. 4-13

$$W^{new} = W^{old} + \epsilon p^T \qquad \text{super } T = \text{Transpose}$$

$$\epsilon = t - a$$

on p. 4-15 proves that if the exemplars are linearly seperable then can train the network via one cycle through the exemplars