

Bradley Reardon
6202 – HW 4
5/25/21

E.1

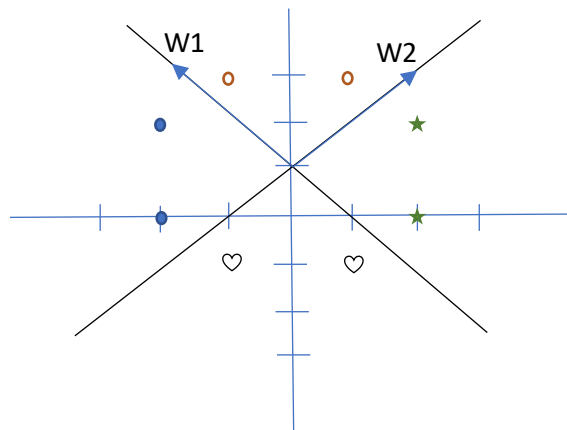
- i. The “best decision boundaries” means they are places evenly distanced between the two groups they are separating.

$$\mathbf{W1} = [-1 \ 2]$$

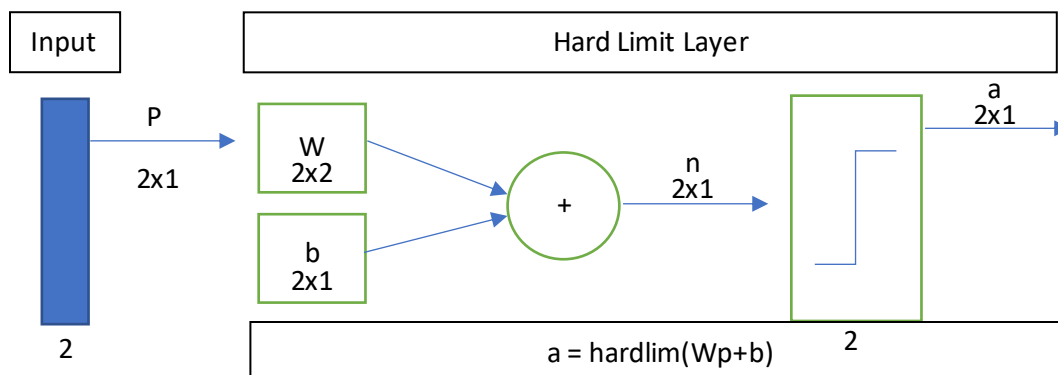
$$\mathbf{W2} = [1 \ 2]$$

$$\mathbf{b} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 2 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} -2 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \end{bmatrix} \quad \text{hardlims} \begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$



ii.

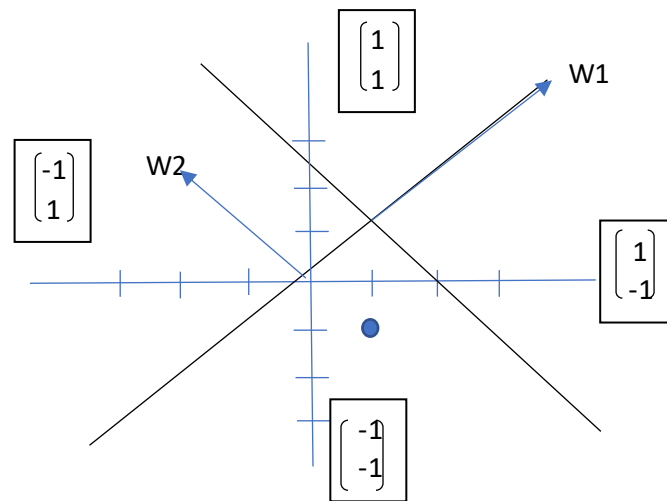


iii.

E.2

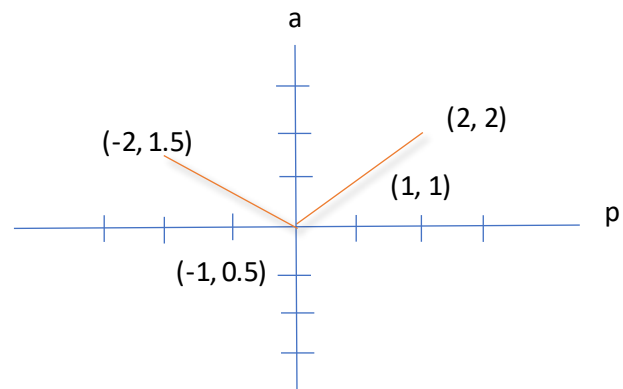
i. Four classes

ii.



iii. $n = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \end{bmatrix} + \begin{bmatrix} -2 \\ 0 \end{bmatrix} = \text{hardlims} \begin{bmatrix} -2 \\ -2 \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$

E.3.



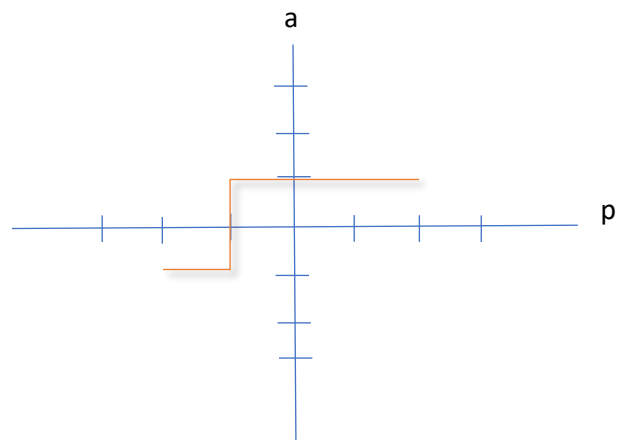
$$a.1 = \begin{pmatrix} -1 \\ 1 \end{pmatrix} * 1 + \begin{pmatrix} 0.5 \\ 1 \end{pmatrix} = \begin{pmatrix} -0.5 \\ 2 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$$

$$a.2 = [1 \ 1] * \begin{pmatrix} 0 \\ 2 \end{pmatrix} + [-1] = 1$$

E.4

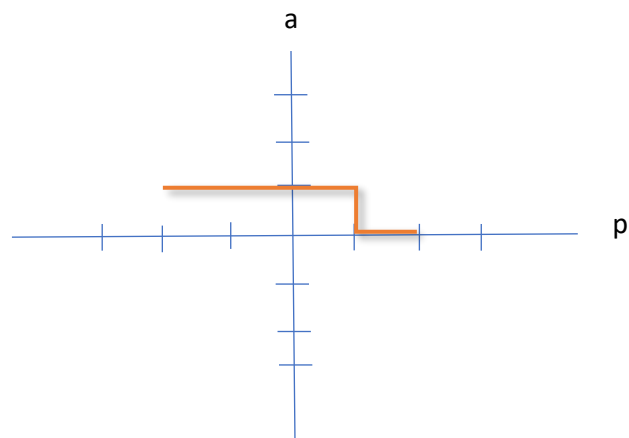
i. `a = hardlims(p+1)`

`p = -2:2`



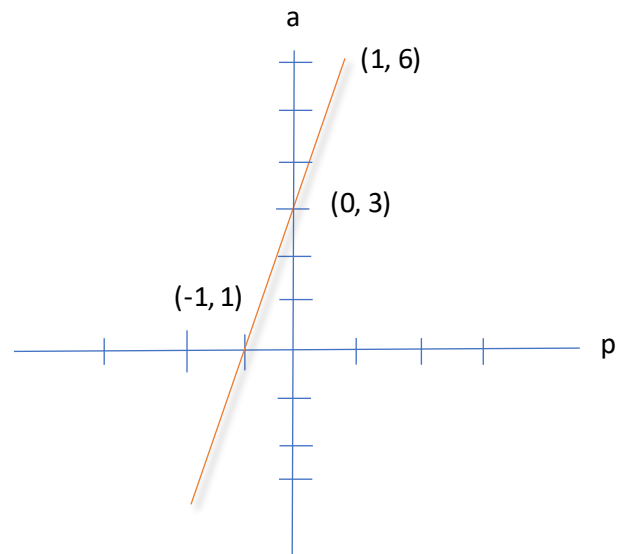
ii. `a = hardlim(-p+1)`

`p = -2:2`



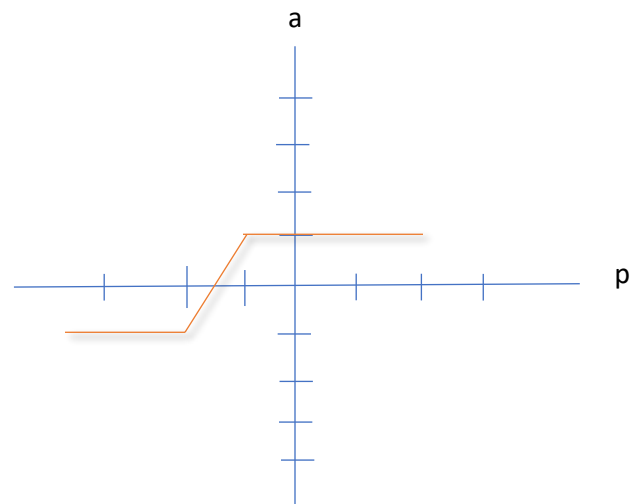
iii. $a = \text{purelin}(2p+3)$

$p = -2:2$



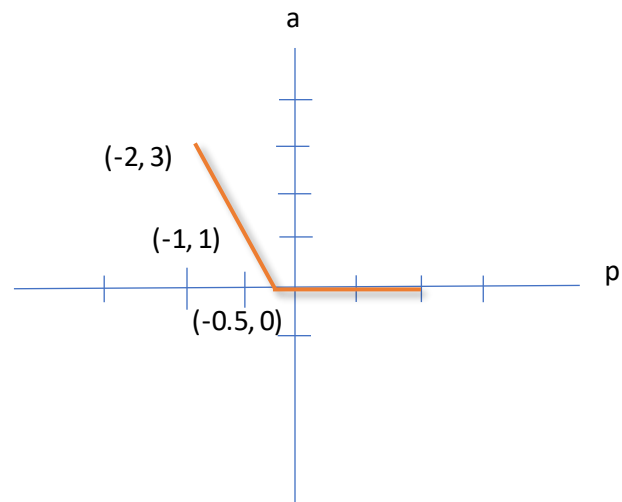
iv. $a = \text{satlins}(2p+3)$

$p = -2:2$



v. $a = \text{poslin}(-2p-1)$

$p = -2:2$



E5.

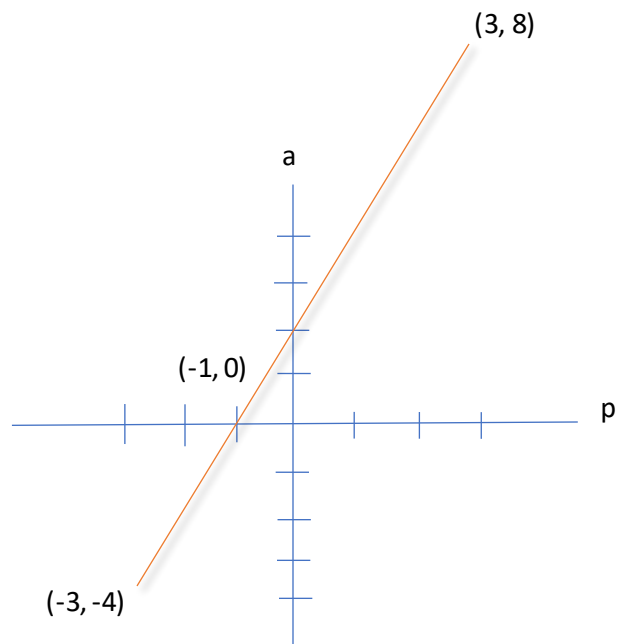
$$a.1.1 = \text{satlin}(2p + 2)$$

$$a.1.2 = \text{satlin}(p - 1)$$

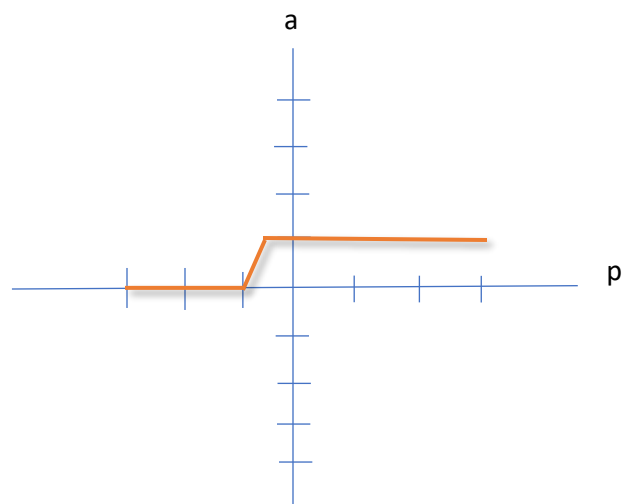
$$a.2 = \text{purelin}(a.1.1 - a.1.2)$$

$$p = -3 : 3$$

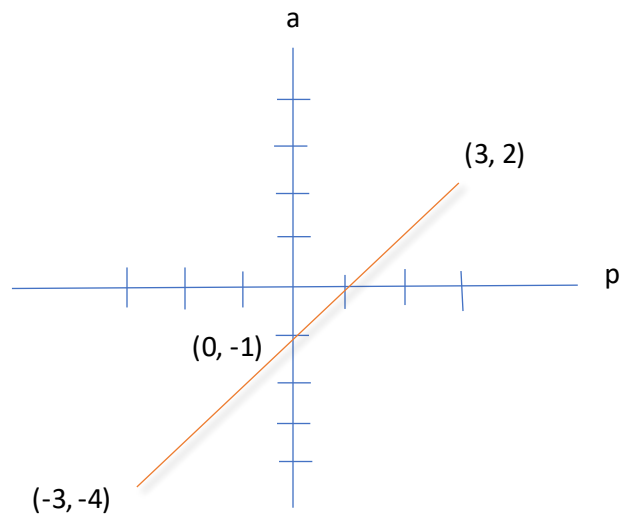
i. n_1^1 $2p+2$



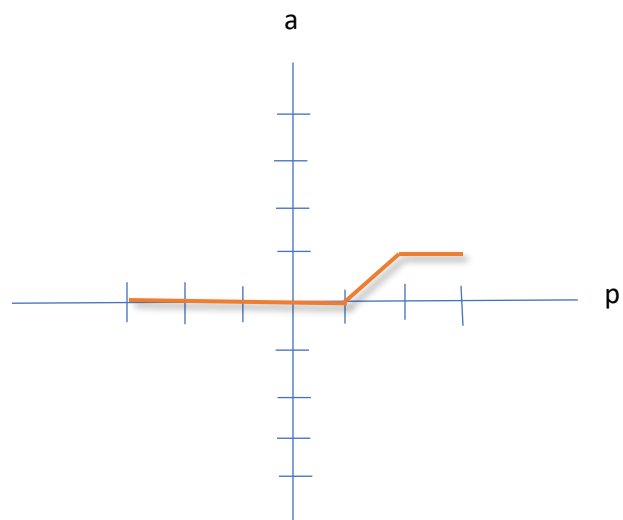
ii. a_1^1 $\text{satlin}(2p+2)$



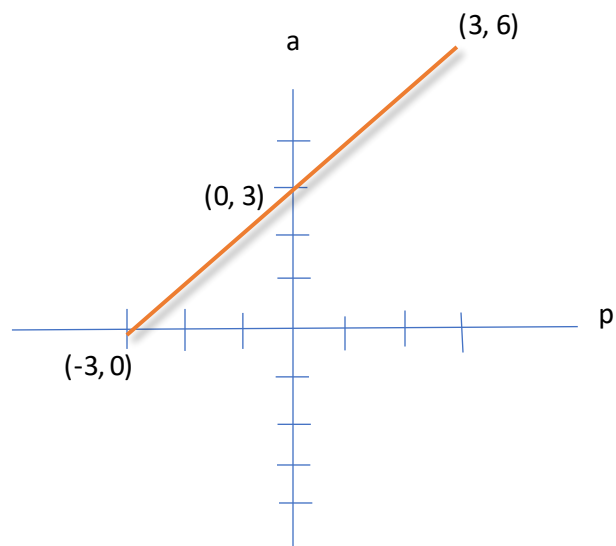
iii. $n_2^1 p - 1$



iv. $a_2^1 \text{satlin}(p-1)$



v. $n_1^2 ((a.1.1 * p) + (a.1.2 * -p))$



vi. a_1^2 purelin((a.1.1*p) + (a.1.2*-p))

