Drawing Decision Boundary of the AdaBoost consisting of the 3 following stumps.

Stump 1 : $I(X_2 > 2.5)$ Error $\varepsilon_1 = .2$

voting power $\alpha_1 = .693$ ↵

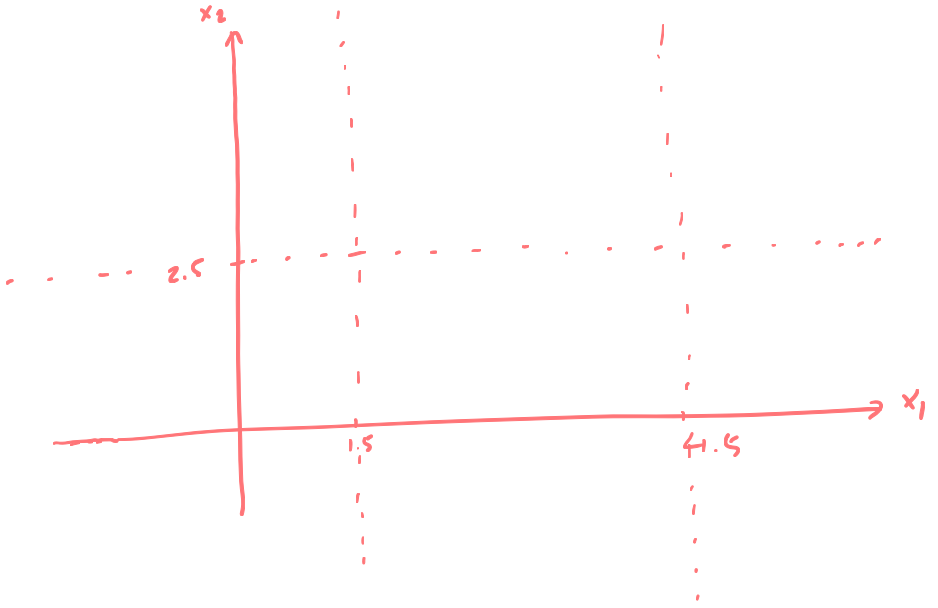
Stump 2 : $I(X_1 < 1.5)$ Error $\varepsilon_2 = .1875$

$\alpha_2 = .733$

Stump 3 : $I(X_1 < 4.5)$ Error $\varepsilon_3 = .115$

$\alpha_3 = 1.018$

voting power $\alpha_1 = .693$ ↵



(x) sign function

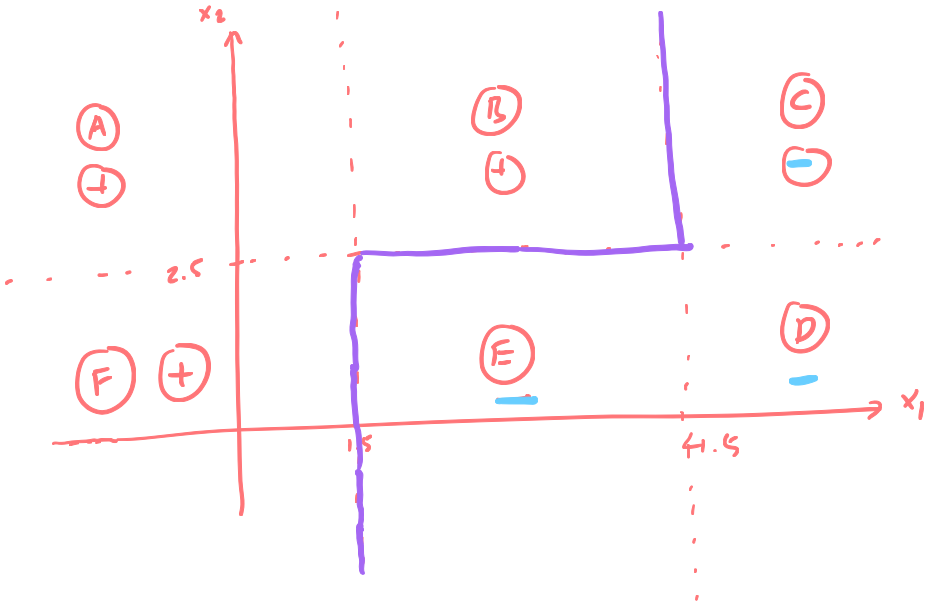
$sign(x)$ → 1 if $x \geq 0$

-1 if $x < 0$

Example : $sign(-6) = -1$; $sign(.67) = 1$

$sign(2022) = 1$ ....

$sign(x) = I(x \geq 0)$



For Region A :

$$\text{sign}\left(\alpha_1 \cdot \text{Stump 1} + \alpha_2 \cdot \text{Stump 2} + \alpha_3 \cdot \text{Stump 3}\right)$$

$$= \text{sign}\left[\alpha_1 \underbrace{I(x_2 \geq 2.5)}_{=1} + \alpha_2 \cdot \underbrace{I(x_1 < 1.5)}_{} + \alpha_3 (x_1 < 4.5)\right]$$

$$= \text{sign}\left(.693 * 1 + .733 * 1 + 1.018 * 1\right)$$

$$= \text{sign}\left(2.441\right) = 1$$

For Region B :

$$= \text{sign}\left[\alpha_1 \underbrace{I(x_2 \geq 2.5)}_{1} + \alpha_2 \cdot \underbrace{I(x_1 < 1.5)}_{-1} + \alpha_3 \underbrace{(x_1 < 4.5)}_{1}\right]$$

$$= \text{sign}(.693 - .733 + 1.018) = \text{sign}(.978) = 1$$

For C :

$$\text{sign}\left[\alpha_1 \underbrace{I(x_2 \geq 2.5)}_{1} + \alpha_2 \cdot \underbrace{I(x_1 < 1.5)}_{-1} + \alpha_3 \underbrace{(x_1 < 4.5)}_{-1}\right]$$

$$= \text{sign}(.693 - .733 - 1.016) = \text{sign}(-1.056) = -1$$

And similarly for other regions.