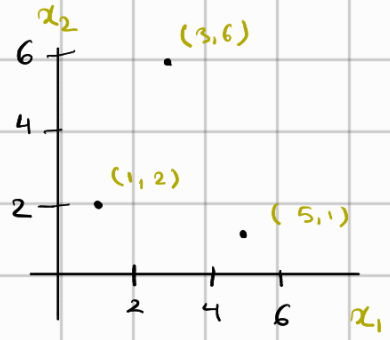
06/02/24

Decision tree

	x_1	x_2	y
1	1	2	1
2	3	6	5
3	5	1	2



$I = \{1, 2, 3\}$

$K = 2$

$K = 1$

$x_2 \geq S[2] = 4$.

No / Yes

$K = 2$

1.5 | 5

$I = K$

$\hat{y}$ = average $(y^{(i)})$

$\hat{y} = \frac{1+5+2}{3}$

$= \frac{8}{3} = 2.66$

for x_1, $S = [2, 4]$

for x_2, $S = [1.5, 4]$

① for x_1, $S[1] = 2$

$I^+ = \{2, 3\}$

$I^- = \{1\}$

$\hat{y}^+ = \{5, 2\}$

$\hat{y}^- = \{1\}$ $\quad \hat{y}^- = 1$

$\hat{y}^+ = (5+2)/2 = 3.5$

$E_1^+ = (3.5-5)^2 + (3.5-2)^2$

$= (1.5)^2 + (1.5)^2$

$= 2.25 + 2.25$

$= 4.5$

$E_1^- = (1-1) = 0$

$E_1 = 4.5$ $\quad (E_1^+ + E_1^-)$

② for x_1, $S[2] = 4$

$I^+ = \{5\}$

$I^- = \{1, 3\}$

$y^+ = \{2\}$ $\quad \hat{y}^+ = 2$

$y^- = \{1, 5\}$ $\quad \hat{y} = 3$

$E_2^+ = (2-2)^2 = 0$

$E_2^- = (3-1)^2 + (3-5)^2$

$= (2)^2 + (2)^2$

$= 8$

$E_2 = 8$

(3) for x_2, $S[1] = 1.5$

$I^+ = \{2, 6\}$

$I^- = \{1\}$

$y^+ = \{1.5\}$, $\hat{y}^+ = 3$

$y^- = \{2\}$, $\hat{y}^- = 2$

$E_3^+ = (3-1)^2 + (3-2)^2$

$= 4 + 4 = 8$

$E_3^- = 0$

$\boxed{E_3 = 8}$

(4) for x_2, $S[2] = 4$

$I^+ = \{6\}$

$I^- = \{1, 2\}$

$y^+ = \{2, 1\}$, $\hat{y}^+ = 1.5$

$y^- = \{5\}$, $\hat{y}^- = 5$

$E_4^+ = (2-1.5)^2 + (1-1.5)^2$

$= (0.5)^2 + (0.5)^2$

$= 0.5$

$E_4^- = 0$

$\boxed{E_4 = 0.5}$

Get min $\{E_{x_1,2}, E_{x_1,4}, E_{x_2,1.5}, E_{x_2,4}$

$\min = E_{x_2,4}$

$j^*, s^* = [x_2, 4]$