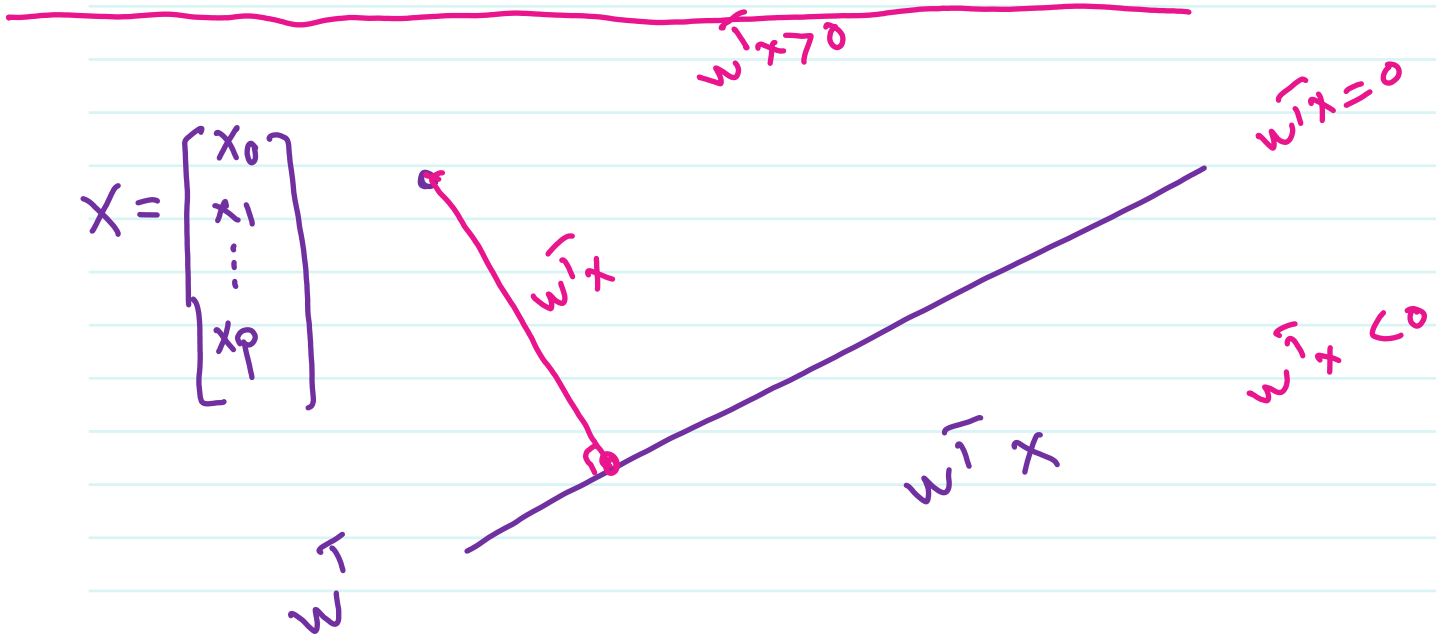
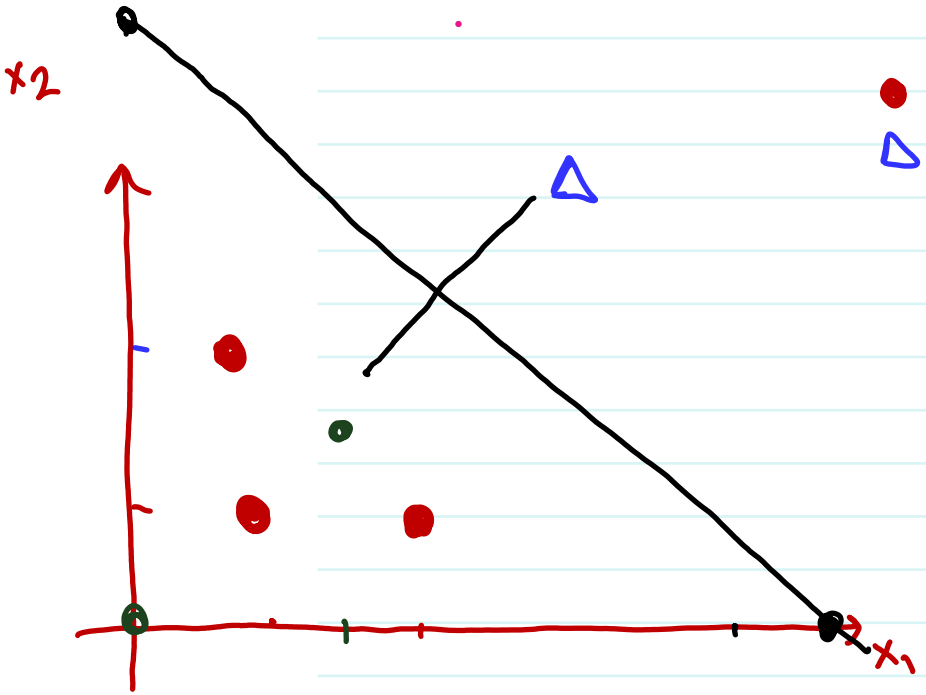
Two weeks from today Exam II – May 1st

presentation : May 3rd

report : May 5th




$0.\bar{5}x_1 + .\bar{5}x_2 = 2.4$




Train

$x_1$ $x_2$

$x_1 = [1, 1]^T$, $class\# - 1$

$x_2 = [2, 1]^T$, $class\# - 1$

$x_3 = [1, 2]^T$, $class\# - 1$

$x_4 = [3, 3]^T$, $class\# + 1$

$n = 4$

- Test set:

$x_5 = [4, 4]^T$, $class\# + 1$ ✓

$x_6 = [0, 0]^T$, $class\# - 1$ ✓

$x_7 = [1.5, 1.5]^T$, $class\# - 1$ ✓

$$L_p = \frac{1}{2}||\beta||^2 - \sum_{i=1}^{n=4} \lambda_i (y_i \cdot \beta^T \mathbf{x}_i - 1)$$

$\beta = [b \quad w_1 \quad w_2]$

$L_p = \frac{1}{2} b^2 + \frac{1}{2} w_1^2 + \frac{1}{2} w_2^2 - (\lambda_1 (-1)(b + w_1 + w_2 - 1)$

$\lambda_2 (-1)(b + 2w_1 + w_2 - 1) +$

$\lambda_3 (-1)(b + w_1 + 2w_2 - 1) +$

$\lambda_4 (+1)(b + 3w_1 + 3w_2 - 1)$

$$\frac{\partial L_P}{\partial w_1} = w_1 + \lambda_1 + 2\lambda_2 + \lambda_3 - 3\lambda_4 = 0$$

$$\frac{\partial L_P}{\partial w_2} = w_2 + \lambda_1 + \lambda_2 + 2\lambda_3 - 3\lambda_4 = 0$$

$$\frac{\partial L_P}{\partial b} = b + \lambda_1 + \lambda_2 + \lambda_3 - \lambda_4 = 0$$

$$\frac{\partial L_P}{\partial \lambda_1} = b + w_1 + w_2 - 1 = 0$$

$$\frac{\partial L_P}{\partial \lambda_2} = b + 2w_1 + w_2 - 1 = 0$$

$$\frac{\partial L_P}{\partial \lambda_3} = b + w_1 + 2w_2 - 1 = 0$$

$$\frac{\partial L_P}{\partial \lambda_4} = -b - 3w_1 - 3w_2 + 1 = 0$$

Unknows

$\lambda_1, \lambda_2, \lambda_3, \lambda_4$

$b, w_1, w_2$

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 2 & 1 & -3 \\ 0 & 1 & 0 & 1 & 1 & 2 & -3 \\ 0 & 0 & 1 & 1 & 1 & 1 & -1 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 2 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 2 & 1 & 0 & 0 & 0 & 0 \\ -3 & -3 & -1 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ b \\ \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

$$A \quad X = B \rightarrow \quad X = A^{-1} \cdot B$$

$w_1 = 0.5$

$w_2 = 0.5$

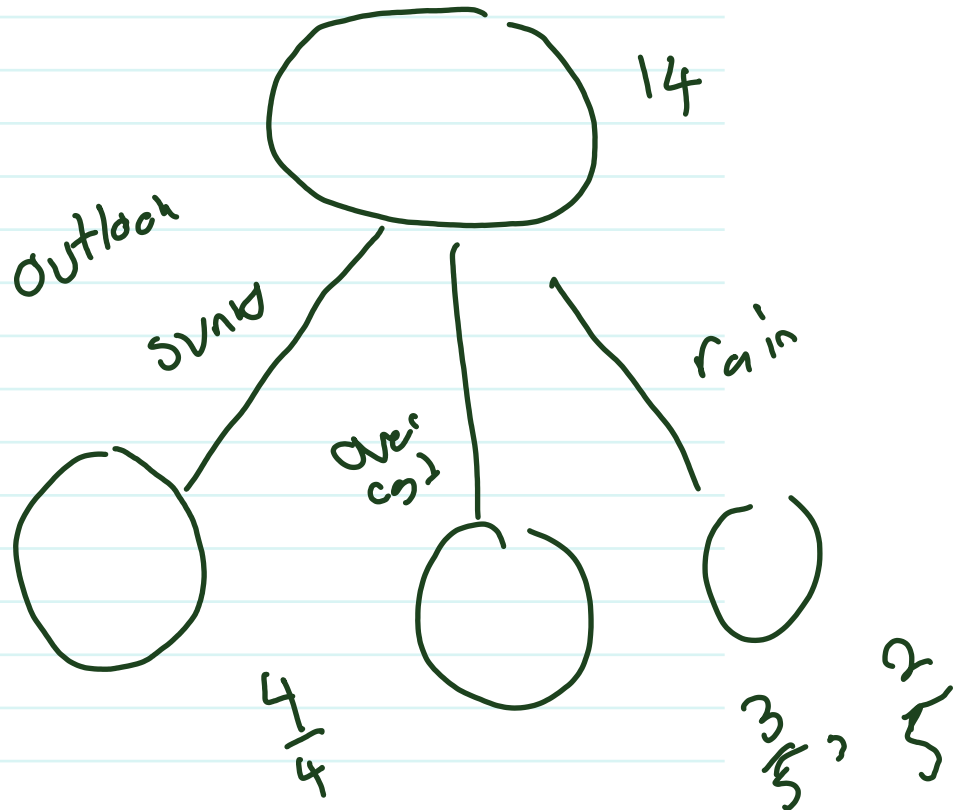
$b = -2.4$

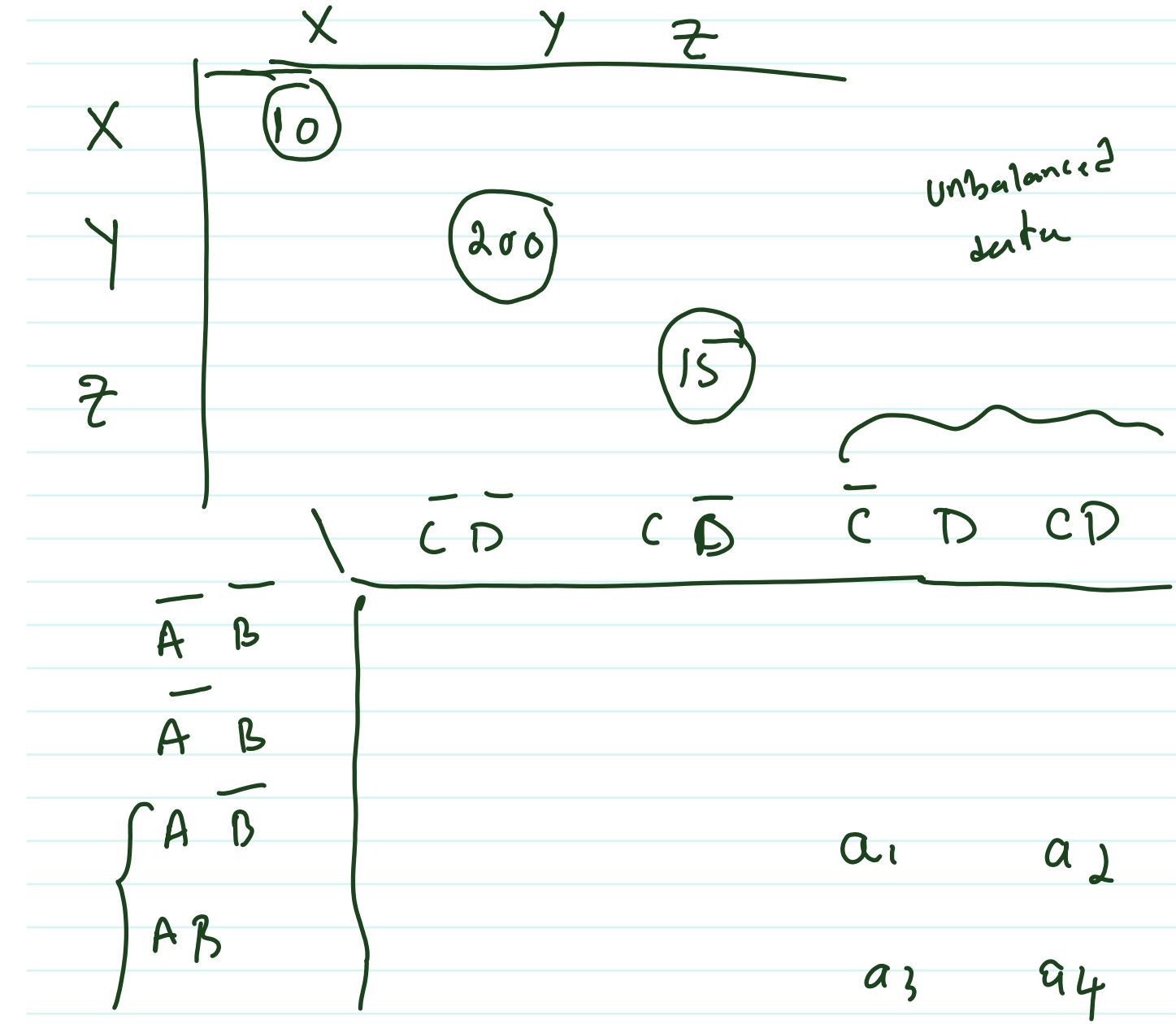
$$0.5\,x_1 + 0.5\,x_2 = 2.4$$

| | Yes | No | |
|---|---|---|---|
| Sunny | 2 | 3 | 5 |
| Overcast | 4 | 0 | 4 |
| rain | 3 | 2 | 5 |
| | 9 | 5 | 14 |

$$Gini = 1 - \sum p_i^2$$

$$= 1 -$$






$$\tilde{P}(A, D) = a_1 + a_2 + a_3 + a_4$$