$S_L = \{(x_i, y_i) : x_{ij} \le t\}$, $S_R = \{(x_i, y_i) : x_{ij} > t\}$

$$(j^*, t^*) = \underset{j,t}{\operatorname{argmin}} \; |S_L| \, \ell(S_L) + |S_R| \, \ell(S_R)$$

$\hat{p}_c$ = emp frac of class c in a set

Why? $\ell(S) = \sum_c \hat{p}_c(1 - \hat{p}_c)$ ← Gini

Feat 1	Feat 2	Label
0	0	0
1	0	1
1	0	0
1	1	1
1	0	0
1	1	1
1	0	0
1	1	1
1	1	0
1	1	1

Wrong way

Feat 1: $0 + \frac{4}{9}\left(\frac{5}{9}\right) \doteq 0.247$

Feat 2: $\frac{4}{5}\left(\frac{1}{5}\right) + \frac{4}{5}\left(\frac{1}{5}\right) = 0.32$

$0.16 \qquad 0.16$

Right way

Feat 1: $1 \cdot 0 + 9 \cdot \frac{4}{9}\left(\frac{5}{9}\right) = 1.78$

Feat 2: $5 \cdot \frac{4}{5} \cdot \frac{1}{5} + 5 \cdot \frac{4}{5} \cdot \frac{1}{5} = 1.6$