

$$F(S, R) = N \cdot \sum_{k=1}^K \sum_{e=1}^E \frac{(p_{ke} - p_k p_e)^2}{p_k \sigma_e^2}$$

	U_1	U_2	U_3	U_n				
1					T_1	T_2	T_3	
2					P_{11}	P_{12}	P_{13}	$P_1 = P_e = P_{11} + P_{12} + P_{13} = \sum_n P_{1n}$
3								
4								
...								
					P_{21}	P_{22}	P_{23}	$P_2 = P_k = P_{21} + P_{22} + P_{23} = \sum_n P_{2n}$
					P_{11}	P_{12}	P_{13}	
					"	"	"	
					P_j	P_j	P_j	

$$F(S, R) = N \cdot \sum_j \frac{(P_{1j} - P_1 P_j)^2}{P_1 \cdot \sigma_j^2} + N \cdot \sum_j \frac{(P_{2j} - P_2 P_j)^2}{P_2 \cdot \sigma_j^2}$$

$$F(S, R) = N \cdot \sum_j \frac{P_{1j}^2 - 2P_{1j} \cdot P_1 \cdot P_j + (P_1 \cdot P_j)^2}{P_1 \cdot 1} + N \cdot \sum_j \frac{P_{2j}^2 - 2P_{2j} \cdot P_2 \cdot P_j + (P_2 \cdot P_j)^2}{P_2 \cdot 1} =$$

$$= N \cdot \sum_j \left(\frac{P_{1j}^2}{P_1} - 2P_{1j} \cdot P_j + P_1 \cdot P_j^2 \right) + N \cdot \sum_j \left(\frac{P_{2j}^2}{P_2} - 2P_{2j} \cdot P_j + P_2 \cdot P_j^2 \right)$$

IG — information gain.

$$IG = I_{\text{parent}} - P_{\text{left}} \cdot I(e) - P_{\text{right}} \cdot I(r) =$$

X	Y	$I_{\text{parent}} = 1 - \sum_{i=1}^n (p_i)^2 = 1 - \left(\frac{2}{5}\right)^2 + \left(\frac{3}{5}\right)^2 = 1 - \frac{4}{25} + \frac{9}{25} = \frac{2}{5} \left(1 - \frac{2}{5}\right) + \frac{3}{5} \left(1 - \frac{3}{5}\right) = 0,24 + 0,36$	
10	1		
20	1	$G(Q) = 1 - \sum_{i=1}^n (p_i)^2 = 1 - \left(\frac{2}{3}\right)^2 + \left(\frac{1}{3}\right)^2 = 1 - \frac{4}{9} + \frac{1}{9} = \frac{4}{9}$	
30	0		
40	0	$G(Q) = 1 - \sum_{i=1}^n (p_i)^2 = 0$	
50	0		

$$\text{Gini impurity} = \frac{3}{5} \cdot \frac{4}{9} + \frac{2}{5} \cdot 0 = \frac{4}{15} = 0,26$$