Classification

$Y \in \{-1, 1\}$, $X \in \mathbb{R}^p$, $\{x_i, y_i\}_{i=1}^n$ iid

def Bayes rule (decision function) R^* is Bayes risk

$$g^*(x) = \begin{cases} 1 & , \; \eta(x) > 0 \\ -1 & , \; \cdots \end{cases}$$

thm 1. $\mathbb{P}\{g^*(X) \neq Y\} \leq \mathbb{P}\{g(x) \neq Y\} \quad \forall g : \mathbb{R}^p \to \{-1, 1\}$

2. $R^* = \mathbb{P}\{g^*(X) \neq Y\} = \frac{1}{2} - \frac{1}{4} \int |f_+(x) - f_-(x)| \, dx$

w/ $f_k(x) = f_{X|Y=k}(x)$.

pf pg 12-15 of "Probabilistic Theory of Pattern Recognition"