

**Definition 11.10** For all  $1 \leq w \leq M$ , let

$$\lambda_w = \Pr\{\hat{W} \neq w | W = w\} = \int_{\{\mathbf{y} \in \mathcal{Y}^n : g(\mathbf{y}) \neq w\}} f_{\mathbf{Y}|\mathbf{X}}(\mathbf{y}|e(w)) d\mathbf{y}$$

be the conditional probability of error given that the message is  $w$ .

**Definition 11.11** The maximal probability of error of an  $(n, M)$  code is defined as

$$\lambda_{max} = \max_w \lambda_w.$$

**Definition 11.12** The average probability of error of an  $(n, M)$  code is defined as

$$P_e = \Pr\{\hat{W} \neq W\}.$$