

The rate-distortion theorem does not include the source coding theorem as a special case:

- In Example 8.20,

$$R_I(D) = \begin{cases} h_b(\gamma) - h_b(D) & \text{if } 0 \leq D < \min(\gamma, 1 - \gamma) \\ 0 & \text{if } D \geq \min(\gamma, 1 - \gamma) \end{cases}$$

for $0 \leq \gamma \leq 1$, where $\gamma = \Pr\{X = 1\}$.

- Therefore, $R_I(0) = h_b(\gamma) = H(X)$.
- By the rate-distortion theorem, if $R > H(X)$, the average Hamming distortion, i.e., the error probability per symbol, can be made arbitrarily small.
- However, by the source coding theorem, if $R > H(X)$, the message error probability can be made arbitrarily small, which is much stronger.