

Definition 7.1 (Discrete Channel I) Let \mathcal{X} and \mathcal{Y} be discrete alphabets, and $p(y|x)$ be a **transition matrix** from \mathcal{X} to \mathcal{Y} . A discrete channel $p(y|x)$ is a single-input single-output system with input random variable X taking values in \mathcal{X} and output random variable Y taking values in \mathcal{Y} such that

$$\Pr\{X = x, Y = y\} = \Pr\{X = x\} p(y|x)$$

for all $(x, y) \in \mathcal{X} \times \mathcal{Y}$.