

1 Objectives

At the end of this exercise session you should be able to:

- Compute the capacity of a channel

2 Exercises

Channel coding

Exercise 1. [9.7] Compute the mutual information between X and Y for the binary symmetric channel with $p = 0.15$ when the input distribution is $P(\mathcal{X})$ is uniform.

Exercise 2. [9.8] Compute the mutual information between X and Y for the Z-channel with $p = 0.15$ when the input distribution $P(\mathcal{X})$ is uniform.

Exercise 3. [9.12] What is the capacity of the binary symmetric channel for general p ?

Exercise 4. [9.17] What is the capacity of the five-input, ten-output channel whose transition probability matrix is

$$\begin{bmatrix} 0.25 & 0 & 0 & 0 & 0.25 \\ 0.25 & 0 & 0 & 0 & 0.25 \\ 0.25 & 0.25 & 0 & 0 & 0 \\ 0.25 & 0.25 & 0 & 0 & 0 \\ 0 & 0.25 & 0.25 & 0 & 0 \\ 0 & 0.25 & 0.25 & 0 & 0 \\ 0 & 0 & 0.25 & 0.25 & 0 \\ 0 & 0 & 0.25 & 0.25 & 0 \\ 0 & 0 & 0 & 0.25 & 0.25 \\ 0 & 0 & 0 & 0.25 & 0.25 \end{bmatrix} ?$$