

Information Theory

Spring semester, 2025

Assignment 5

Assigned: Friday, April 25, 2025

Due: Thursday, May 8, 2025

M. Skoglund

Problem 5.1: Cover & Thomas 8.3 (p. 257). In part (c), change “optional” to “mandatory,” but assume that $a = 1/m$ for $m = 2, 3, \dots$

Problem 5.2: Cover & Thomas 9.1 (p. 290).

Problem 5.3: Cover & Thomas 9.2 (p. 290).

Problem 5.4: Cover & Thomas 9.9 (p. 293).

Problem 5.5: Consider a set of K independent Gaussian channels that can be used in parallel. The noise variance on each sub-channel is $\sigma_k^2 = k^2$, and the total input power is constrained according to

$$\sum_{k=1}^K P_k/k \leq 5,$$

where P_k is the input power of sub-channel k . Find the total capacity, and the optimal power assignment, for the cases $K = 2$, $K = 4$ and $K = \infty$.