MTHE - MATH 474/874 - Information Theory
Fall 2018

Homework # 5
Due Date: Thursday November 29, 2018

Material: Joint source-channel coding, differential entropy and Gaussian channels.

Readings: Section 4.5 and Chap. 5 of the textbook.
The referred problems are from the textbook.

(1) Consider a binary stationary Markov source \( \{X_n\} \) with transition probability

\[
Pr\{X_{n+1} = 1|X_n = 0\} = Pr\{X_{n+1} = 0|X_n = 1\} = \frac{1}{4}.
\]

Suppose we wish to encode the output of this source and transmit the result over a binary symmetric channel (BSC) with crossover probability \( \epsilon \). For what values of \( \epsilon \) can this source be reliably transmitted (with asymptotically vanishing probability of error) over this channel? (Assume that the source and channel signaling rates are equal.) [Hint: \( h_b(0.25) = 0.811 \) and \( h_b(0.029) = 0.189 \).]

(2) Problem 5.1.

(3) Problem 5.2.

(4) Problem 5.6.

(5) Problem 5.8.

(6) Problem 5.17.

(7) Problem 5.19.

Additional Problems for MATH 874 students:

(8) Problem 4.30.

(9) Problem 5.16.

(10) Problem 5.18.