

EE5585: Homework 4

All problems carry equal points. Due date: May 9 (before class starts)

- (1) Suppose Z_1 and Z_2 are iid Bernoulli(p) random variable, i.e. $\Pr(Z_1 = 1) = p = \Pr(Z_2 = 1)$. Say $X_1 = Z_1 + Z_2$ and $X_2 = Z_1 Z_2$ are two random sources that are seen by Alice and Bob respectively. What is the achievable rate limits of the distributed data compression for X_1 and X_2 sequences in this case?
- (2) Following table shows height-weight data of 12 monkeys:

Height	Weight
18	29.5
28	39.2
36	54.5
25	36.0
17	25.0
31	43.8
21	30.4
35	56.1
24	36.0
22	29.9
18	26.9
32	48.2

Find out the Karhunen-Loeve transform matrix to compress this data. Perform PCA.

- (3) Assume the range of Height in the data of problem 2 is $[18, 36]$ and for weight $[25, 57]$. Design a 2-bit vector quantizer for this data. What would be the 1-bit scalar quantizer for each column? Find out error for the given data for both the quantizers (scalar and vector).