

Information and Communication Theory

Problem Set 2 - Solutions

2022

Department of Electrical and Computer Engineering,
Instituto Superior Técnico, Lisboa, Portugal

1. (a) 2 bits/symbol
(b) 1 bit/symbol
(c) $\approx 763 \text{ MB}$
2. (a) $T > Y > Z > X$
(b) $E(X) = 1, E(Y) \approx 1.58, E(Z) = 1.5, E(T) \approx 2.12$
3. (a) $H(Y) = H(Z) \approx 2.58, H(Y, Z) \approx 5.16$
(b) $H(X) \approx 3.27$
- 4.
5. (a) $H(X) \approx 1.58, H(Y) \approx 1.58, H(X, Y) \approx 2.58, H(X|Y) = 1, H(Y|X) = 1$
(b) i. $H(X) = 1.5, H(Y) = 1, H(X, Y) = 1.5, H(X|Y) = 0.5, H(Y|X) = 0$
ii. $H(X) \approx 0.92, H(Y) = 1.5, H(X, Y) \approx 2.42, H(X|Y) \approx 0.92, H(Y|X) = 1.5$
6. $H(X) = H(Y) \approx 0.92, H(X, Y) \approx 1.58, H(X|Y) = H(Y|X) = \frac{2}{3}, I(X; Y) \approx 0.25$