

HKUSTx: ELEC1200.2x A System View of Communications: From Signals to...

- Pre-course Materials
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- **▼** Topic 2: Lossless **Source Coding: Hamming** Codes
- 2.1 Source Coding Week 1 Quiz due Nov 02, 2015 at 15:30 UT 🗗
- 2.2 Sequence of Yes/No Questions Week 1 Quiz due Nov 02. 2015 at 15:30 UT
- 2.3 Entropy of a Bit Week 1 Quiz due Nov 02, 2015 at 15:30 UT

2.4 Entropy of a **Discrete Random** Variable

Week 1 Quiz due Nov 02, 2015 at 15:30 UT @

2.5 Average Code Length

Week 1 Quiz due Nov 02, 2015 at 15:30 UT 🗗

2.6 Huffman Code

Week 1 Quiz due Nov 02, 2015 at 15:30 UT

2.7 Lab 1 - Source Coding

Lab due Nov 02, 2015 at 15:30 UTC

MATLAB download and

2.4 QUIZ QUESTION 1 (1/1 point)

Consider a biased die, where the probabilities of the six outcomes, X, are given by probabilities, p[X], shown below.

Χ p[X]= ==== 1 0.1 2 0.2 3 0.3 4 0.2 5 0.15 6 0.05

What is the entropy of a single toss of this die? Give your answer to two significant digits (e.g. 1.00).

Answer: 2.41 2.41

2.41

EXPLANATION

Compute the entropy according to the formula

$$H = -\sum_{X=1}^6 p[X]log_2(p[X])$$

You have used 1 of 3 submissions

2.4 QUIZ QUESTION 2 (1/1 point)

In comparison with the entropy of a single toss of a fair die (i.e. where all outcomes are equally likely), the entropy of the biased die above is

Greater Smaller tutorials

Equal

EXPLANATION

A discrete random variable where all N possible values are equally likely has the maximum entropy among all discrete random variables with N possible outcomes. This entropy is $H = log_2(N)$. When N=2 , Hpprox 2.585 .

You have used 1 of 2 submissions

2.4 QUIZ QUESTION 3 (1/1 point)

Consider two discrete random variables, X and Y. X can assume integer values from 1 to 4 with the probabilities p(X) shown below.

```
Χ
     p(X)
=
     ====
     0.4
1
2
     0.3
     0.2
3
4
     0.1
```

Y can assume integer values from 5 to 8 with the probabilities p(Y) shown below.

```
Υ
     p(Y)
=
     ====
     0.1
5
6
     0.2
7
     0.3
     0.4
```

The entropy of X is

- greater than the entropy of Y.
- less than the entropy of Y.
- equal to the entropy of Y.

EXPLANATION

The entropy depends only upon the probabilities of the possible outcomes, not upon their values (which do not even need to be numerical). Both X and Y have four possible outcomes with probabilites 0.1, 0.2, 0.3 and 0.4. Thus, they have the same entropy.

You have used 1 of 2 submissions

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