

## Unit 10 - Week 9: Data Compression-1 (Unit 9) and Data Compression-2 (Unit 10)

## Course outline

How does an NPTEL online course work?

Week 1: Information and probabilistic modeling

Week 2: Uncertainty, compression, and entropy

Week 3: Randomness and entropy

Week 4: Information and statistical inference-1

Week 5: Information and statistical inference-2

Week 6: Properties of measures of Information-1

Week 7: Properties of measures of Information-2 and Information Theoretic lower bounds

Week 8: Information theoretic lower bounds and Data Compression-1

Week 9: Data Compression-1 (Unit 9) and Data Compression-2 (Unit 10)

Information Theory Review 8

Kraft's inequality

Shannon code

Huffman code

Minmax Redundancy

Type based universal compression

Quiz : Weekly Assignment 9

Unit 9 and Unit 10 Notes

Solution 9

Week 10: Data Compression-2 (Unit 10) and Data Compression-3 (Unit 11)

Week 11: Channel coding and capacity (Unit 12) and Shannon's channel coding theorem proof (Unit 13)

Week 12: Shannon's channel coding theorem proof (Unit 13) and Gaussian channels (Unit 14)

VIDEO DOWNLOAD

Live Session

## Weekly Assignment 9

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2020-11-18, 23:59 IST.**

These questions are based on the Week-9 video lectures. Please use discussion forum in case you have any doubt.

For Q2-Q4, you can assume that the empty sequence ( $\Phi$ ) is valid codeword.

1) Given a prefix-free code which assigns codeword of length  $\ell_i$  to symbol  $i \in [n]$ , which of these always hold? ('log' stands for log base 2.) 0 points

$$\sum_{i \in [n]} \log \ell_i \geq 0$$

$$\sum_{i \in [n]} \log \ell_i \leq 0$$

$$2^{\ell_i} \leq 1$$

$$\text{For } n \geq 2, 2^{\ell_i} + 2^{\ell_n} \leq 1$$

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$$2^{\ell_i} \leq 1$$

$$\text{For } n \geq 2, 2^{\ell_i} + 2^{\ell_n} \leq 1$$

2) Consider a source  $X$  with pmf

$$P(0) = 1/2, P(1) = P(2) = 1/8, P(3) = P(4) = P(5) = P(6) = 1/16.$$

What is the value of  $\bar{L}(X)$ ?

 3/4

 1/4

 3/2

 2

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$$3/4$$

3) Consider a source  $X$  with pmf

$$P(0) = 1/2, P(1) = P(2) = 1/8, P(3) = P(4) = P(5) = P(6) = 1/16.$$

What is the value of  $\bar{L}^p(X)$ ?

 3/4

 9/4

 3/2

 2

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$$9/4$$

4) Consider a source  $X$  with pmf

$$P(0) = 1/2, P(1) = P(2) = 1/8, P(3) = P(4) = P(5) = P(6) = 1/16.$$

What is the value of  $\bar{L}_{0.25}(X)$ ?

 3/4

 9/4

 2

 1/4

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$$1/4$$

5) Consider a source  $X$  with pmf

$$P(1) = 1/3, P(2) = 1/6, P(3) = 1/6, P(4) = 1/3.$$

Which of the following is/are the Huffman code for this source?

$$1 \rightarrow 001$$

$$2 \rightarrow 0110$$

$$3 \rightarrow 1001$$

$$4 \rightarrow 110$$

$$1 \rightarrow 110$$

$$2 \rightarrow 0110$$

$$3 \rightarrow 1001$$

$$4 \rightarrow 001$$

$$1 \rightarrow 110$$

$$2 \rightarrow 1001$$

$$3 \rightarrow 0110$$

$$4 \rightarrow 001$$

$$1 \rightarrow 101$$

$$2 \rightarrow 0110$$

$$3 \rightarrow 1001$$

$$4 \rightarrow 000$$

No, the answer is incorrect.  
Score: 0

Accepted Answers:

$$1 \rightarrow 001$$

$$2 \rightarrow 0110$$

$$3 \rightarrow 1001$$

$$4 \rightarrow 110$$

$$1 \rightarrow 110$$

$$2 \rightarrow 0110$$

$$3 \rightarrow 1001$$

$$4 \rightarrow 001$$

$$1 \rightarrow 110$$

$$2 \rightarrow 1001$$

$$3 \rightarrow 0110$$

$$4 \rightarrow 001$$

1 point

1 point

1 point

0 points