

1. What does Information Theory primarily study?

- a) The transmission of data through networks
- b) The uncertainty and information content in signals
- c) The encryption of sensitive information
- d) The compression of large datasets

Answer: b) The uncertainty and information content in signals

Explanation: Information Theory deals with quantifying the uncertainty in signals and understanding the information content they carry.

2. What is entropy in Information Theory?

- a) The measure of randomness and uncertainty in a source
- b) The rate of data transmission
- c) The degree of compression achieved
- d) The encryption key used

Answer: a) The measure of randomness and uncertainty in a source

Explanation: Entropy quantifies the uncertainty or randomness of a source, indicating how much information is present in the source.

3. Which source exhibits higher entropy?

- a) A source with predictable outcomes
- b) A source with unpredictable outcomes
- c) A source with fewer symbols
- d) A source with more symbols

Answer: b) A source with unpredictable outcomes

Explanation: Higher entropy implies greater unpredictability, meaning a source with unpredictable outcomes has higher entropy.

4. What is the entropy of a binary memoryless source?

- a) 0
- b) 1
- c)  $\log(2)$
- d) 2

Answer: c)  $\log(2)$

Explanation: The entropy of a binary memoryless source is calculated using the formula -  $p\log(p) - (1-p)\log(1-p)$ , where  $p$  is the probability of occurrence of one symbol.

5. How is entropy extended to a discrete memoryless source?

- a) By summing up the probabilities of all symbols
- b) By averaging the entropy of each symbol
- c) By applying a compression algorithm
- d) By converting symbols into binary format

Answer: b) By averaging the entropy of each symbol

Explanation: For a discrete memoryless source, entropy is extended by averaging the entropy of each symbol over all possible symbols.

6. What is self-information?

- a) The information content of a message relative to the entire message space
- b) The information content of a message relative to itself
- c) The redundancy in a message
- d) The encryption key used for the message

Answer: b) The information content of a message relative to itself

Explanation: Self-information measures the amount of information contained in a message relative to the message itself.

7. What does mutual information quantify?

- a) The information shared between two messages
- b) The difference between self-information and mutual information
- c) The entropy of a message
- d) The compression ratio

Answer: a) The information shared between two messages

Explanation: Mutual information quantifies the amount of information that two random variables share.

8. How is mutual information calculated?

- a) By subtracting self-information from entropy
- b) By adding self-information and entropy
- c) By subtracting entropy from self-information
- d) By subtracting the joint entropy from the sum of individual entropies

Answer: d) By subtracting the joint entropy from the sum of individual entropies

Explanation: Mutual information is calculated by subtracting the joint entropy of two random variables from the sum of their individual entropies.

9. What does the average information content of symbols represent?

- a) The total information content of all symbols
- b) The information content per symbol on average
- c) The maximum entropy of the source
- d) The minimum entropy of the source

Answer: b) The information content per symbol on average

Explanation: The average information content of symbols represents the average amount of information carried by each symbol in the source.

10. What property does mutual information satisfy?

- a) Symmetry
- b) Asymmetry
- c) Linearity
- d) Non-linearity

Answer: a) Symmetry

Explanation: Mutual information is symmetric, meaning the mutual information between two variables X and Y is the same as the mutual information between Y and X.