

CS7641 ML Practice Quiz

Module SL 7: Computational Learning Theory

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Question 1

Which of the following statements correctly reflect the concepts discussed in Computational Learning Theory?

- A. In computational learning theory, algorithms are primarily analyzed in terms of their accuracy, disregarding time and space resources.
- B. Inductive learning is defined as learning from examples, focusing on the probability of success and the complexity of the hypothesis class.
- C. The complexity of the hypothesis class has no impact on the risk of overfitting in machine learning algorithms.
- D. In machine learning, training examples are only presented in a batch format, where a fixed training set is provided.
- E. Different methods of selecting training examples, such as the learner asking questions or the teacher providing pairs, are crucial in understanding machine learning.

Question 2

Regarding the resources and efficiency of learning algorithms, which of the following are true?

- A. Time efficiency of algorithms is irrelevant in computational learning theory.
- B. Space efficiency, especially in algorithms with exponential space complexities, is a major consideration in machine learning.
- C. Data, in terms of availability and quality of training samples, is not considered a significant resource in machine learning algorithms.
- D. Managing time, space, and data efficiently is crucial for the effectiveness of a learning algorithm.
- E. Algorithms requiring large amounts of space are preferred due to their comprehensive data handling capacity.

Question 3

Concerning the concept of teaching and learning in machine learning, which statements are correct?

- A. The teacher's role in selecting training examples is insignificant in the learning process.
- B. The learner's task of finding the best hypothesis is equally challenging, whether the teacher selects the questions or the learner asks them.
- C. A helpful teacher can significantly reduce the number of questions required for the learner to identify the right hypothesis.
- D. The learner's ability to ask questions that split the hypothesis set in half is not crucial for efficient learning.
- E. Teaching via 20 questions demonstrates that with a helpful teacher, the correct answer can be obtained in one question.

Question 4

What are the key aspects and implications of resource management in learning algorithms?

- A. The efficiency of algorithms in terms of time and space has a minor impact on their practical application.
- B. The goal is to select algorithms that run in the shortest amount of time and require the least amount of space.
- C. Managing data as a resource involves considering the quantity of data but not its quality.
- D. A learning algorithm's ability to learn well with a small amount of samples indicates ineffective generalization.
- E. Time, space, and data are the three main resources that need to be managed in a learning algorithm.

Question 5

Regarding the theoretical aspects and implications of computational learning theory, which of the following statements are accurate?

- A. Computational learning theory does not involve mathematical reasoning and careful definitions.
- B. Upper-bound analysis in computational learning theory is concerned with fundamentally hard problems that cannot be improved.
- C. Lower-bound analysis focuses on improving algorithms and their performance.
- D. Practical algorithms are not relevant in illuminating the fundamental learning questions in computational learning theory.
- E. The theory draws parallels between analyzing algorithms in computing and understanding learning algorithms' functionality.

Answer Key

1. B, E
2. B, D
3. C, E
4. B, E
5. E