Ask a Question

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Unit 11 - Week 9 : Approximate Counting Course outline How does an NPTEL online course work? Week 0:Prerequisite Week 1: Introduction to Randomized Algorithms Week 2: Probability Review Week3: Moments and Deviations Week4: Probabilistic Method Week 5: Markov Chains Week 6 : Markov Chains-II Week 7: Number Theoretic Algorithms Week 8: Graph Theoretic Algorithms Week 9 : Approximate Counting Introduction to approximate counting DNF counting Perfect Matching-I Perfect Matching-II Perfect Matching-III Quiz : Assignment 9 Weekly feedback form for week 9 Week 10: Randomization and Data Structures

Week 11 : Computational

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Complexity

Assignment 9

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

Due on 2020-04-01, 23:59 IST.

 Consider a region of area A inside a unit square. Sample N points uniformly and independently from the unit square. Let Xi be a random variable 1 point such that $X_i = 1$ if the *i*th point sampled is inside the square. Let $X = \sum_i X_i$. What is $\mathbb{E}[X]$?

 \boldsymbol{A}

N + AN/A

No, the answer is incorrect. Score: 0

Accepted Answers: AN

AN

Consider an (ε, δ)-approximation algorithm A. Which of the following statements are true?

A returns the correct answer on every problem instance.

 \mathcal{A} returns the correct answer on every problem instance with probability at least $1-\delta$.

 \mathcal{A} returns the an answer which lies between $(1-\epsilon)X$ and $(1+\epsilon)X$, where X is the correct answer, on every problem instance with probability at least $1-\delta$.

A returns an answer which lies between $(1 - \epsilon)X$ and $(1 + \epsilon)X$, where X is the correct answer, on every problem instance.

No, the answer is incorrect. Score: 0

Accepted Answers:

A returns an answer which lies between $(1-\epsilon)X$ and $(1+\epsilon)X$, where X is the correct answer, on

every problem instance.

3) Let ϕ be a DNF formula on n variables. Consider an algorithm which chooses uniform samples from the set of all Boolean assignments on n variable θ point and uses it to estimate the number of satisfying assignments via the Monte Carlo method. Which of the following statements are true?

The Monte Carlo method fails to give a poly time algorithm on formulas which have a large number of satisfying assignments.

The uniform sampling cannot be done in polynomial time as the set of all Boolean assignments is exponentially large.

The Monte Carlo method gives a correct poly time approximation algorithm to count the number of satisfying assignments.

The Monte Carlo method fails because there are certain inputs on which the subset consisting of the satisfying assignments in too small compared to the sample space.

No, the answer is incorrect.

Score: 0

Accepted Answers:

The Monte Carlo method fails because there are certain inputs on which the subset consisting of the satisfying assignments in too small compared to the sample space.

4) Let G be a bipartite graph with n vertices on either sides. Which of the following statements are true? Assume $P \neq NP$.

There are no polynomial time algorithms to check if G has a perfect matching.

Given a collection of edges M, it can be checked in polynomial time if M is a matching in G.

There are polynomial time algorithms to count the number of perfect matching in G.

There are no polynomial time algorithms to count the number of perfect matchings in G.

No, the answer is incorrect. Score: 0

Accepted Answers:

Given a collection of edges M , it can be checked in polynomial time if M is a matching in G.

There are no polynomial time algorithms to count the number of perfect matchings in G.

5) Let G be a dense bipartite graph with n vertices on either sides. Which of the following statements are true?

G may not have a perfect matching.

For every matching in G with k edges, k < n, there is an augmenting path of length at most 3.

For some matchings in G with k edges, k < n, there are no augmenting paths of less than or equal to 3.

For every matching in G with k edges, k < n, there is an augmenting path of length exactly 3.

No, the answer is incorrect. Score: 0

Accepted Answers:

For every matching in G with k edges, k < n, there is an augmenting path of length at most 3.

6) Consider a Markov chain $\mathcal M$ whose states are elements of a sample space S. Which of the following statements are true?

The uniform distribution is the only steady state distribution of \mathcal{M} .

If the transition probability matrix P is symmetric, then the uniform distribution is the only steady state distribution of \mathcal{M} .

If \mathcal{M} is irreducible and the transition probability matrix P is symmetric, then the uniform distribution is the only steady state distribution of \mathcal{M} .

If \mathcal{M} is irreducible, the transition probability matrix P is symmetric and $P_{ii} > 0$ for every state i in \mathcal{M} , then the uniform distribution is the only steady state

No, the answer is incorrect. Score: 0

distribution of \mathcal{M} .

Accepted Answers:

If M is irreducible, the transition probability matrix P is symmetric and $P_{ii} > 0$ for every state i in M, then the uniform distribution is the only steady state distribution of \mathcal{M} .