

CECS 528, Algorithm Writing Assignment, Due 8:00 am, May 8th, 2024, Dr. Ebert

Directions

Find a source for studying one of the following algorithms (“first come first serve” meaning that at most one student can choose any particular algorithm).

1. Divide-and-conquer algorithm for finding the convex hull of a set of points in \mathcal{R}^n
2. An $O(n^2 \log n)$ algorithm for finding the largest submatrix of 1’s in an $n \times n$ 0-1 matrix
3. Algorithm for deciding if a set of Horn formulas is satisfiable
4. Dynamic-programming algorithm for solving **Bitonic Traveling Salesperson** (BTSP)
5. Dynamic-programming algorithm for optimally triangulating a polygon
6. Finding shortest paths in a graph that has one or more negatively-weighted edges (Bellman-Ford algorithm)
7. Rabin-Karp string matching algorithm
8. Approximation algorithm for Set Covering (See Section 5.4 of text)
9. Given a set of line segments in the plane, determining whether or not any two of them intersect

Find *at least* one source whose study will allow you to learn enough about the algorithm to complete the following sections of a paper that you are to complete using word-processing software of your choice (note: for drawings and diagrams, you may insert your own hand drawings).

Introduction Clearly define the problem that is to be solved as well any necessary supporting definitions. Provide a small but nontrivial problem instance along with its solution. (10 pts)

Algorithm Ideas Based on your understanding of the algorithm, illuminate the key ideas that lie behind the algorithm. Provide examples as needed to illustrate these ideas. (10 pts)

Formal Algorithm Provide a complete description of the algorithm. Provide pseudocode along with one or more paragraphs that walk the reader through each part of the code. Note: you do not need to pseudocode for any subroutines that perform common operations, such as sorting, finding the distance between two points in a graph, finding the gcd of two numbers, etc.. Only novel subroutines that are unique to the algorithm should be fully described. (10 pts)

Examples. Provide enough examples of applying the algorithm to a given problem instance so that different examples highlight different identifiable cases that occur in the pseudocode. (10 pts)

Correctness Identify one or more questionable steps of the algorithm (in terms of the algorithm always returning the correct result), and provide supporting arguments for defending the correctness of those steps. (10 pts)

Running Time Provide a proof of the worst-case running time of the algorithm. (10 pts)

Exercises Provide three exercises which, if completed, have the best chance of helping the reader better grasp the algorithm. (10 pts)

References List all references used. (5 pts)

Plagiarism

Plagiarism is unacceptable. You must take pains to create your own unique sentences and examples and not to copy those of others. Evidence of plagiarism is grounds for receiving an F grade for the entire course.

Approval Process

Please email me your top three choices for which algorithm you want to study, and I will get back to you with the approved algorithm. Remember, it is a first-come first-serve process.