

CS3230: Design and Analysis of Algorithms

Semester 2, 2019-20, School of Computing, NUS

Challenge Problem 1

Deadline : Friday, 21st February 2020, 6:00pm

Instructions

- **IMPORTANT:** Write your NAME, Matric No, Tut. Gp in your Answer Sheet.
- Make sure your name and matric number is on each sheet.
- Write legibly. If we cannot read what you write, we cannot give points. In case you CANNOT write legibly, please type out your answers and print out hard copy.
- To submit, staple them together and drop them into the CS3230 dropbox in undergraduate general office before the due date and time.
- When you submit your answer, please try to make it short. The page limit is 3.
- Note: This problem is worth 1 mark.

1 Dominating Point Set

Given a set S of points in d -dimensional space, a point $p = (x_1, x_2, \dots, x_d) \in S$ is said to be a *dominating point* of S if for every other point $q = (y_1, y_2, \dots, y_d) \in S$ there exists at least one index i , $1 \leq i \leq d$, such that $x_i > y_i$. A set is called a *dominating set* of S if it contains all the dominating points of S .

Given a set S of n distinct points in 3-dimensional space (i.e., $d = 3$), design an algorithm to find out the dominating set of S in time $O(n \log n)$. Prove correctness and analyze time complexity of your algorithm.

(**Hint:** First design a divide-and-conquer algorithm for the case when $d = 2$, and then try to extend that algorithm to 3-dimension.)



Every art is beautiful and so is the art of algorithm design ...