CS210
Lab 3

Welcome to Lab 3 of CS210. This entire lab is designed to practice time complexity, divide and conquer.

Objectives

The **objectives of this Lab** are:

- To discuss various ways to compute time complexity.
- To gain insight on divide and conquer approach

Useful Topics:

For this lab, you may find it useful to review some of the following concepts:

- Big Oh notations
- Divide and conquer

Task 1 3 marks

- Compute the time complexity of the following:
  Let $f : N \to N$ be a function defined by
  $f(1) = a$
  $f(n) = f(\lfloor n/2 \rfloor) + f(\lceil n/2 \rceil) + bn$ for $n \geq 2$,
  with $a \in N$ and $b \in N \setminus \{0\}$.
- Compute the time complexity of the following:
  $L_0 = 1$
  $L_n \leq L_{n-1} + n$, for $n > 0$.
- Compute the time complexity of the following:
  $T(0) = 1$
  $T(n) = 2T(n/4) + T(n/2) + n$

Task 2 7 marks

Write a $O(n \log n)$ algorithm for the following problem:
Let $S = \{p_1, p_2, \cdots, p_n\}$ be n points in $\mathbb{R}^2$. List out $k \geq 1$(user input) closest pair vertices in S in ascending order.