CS381 PSO 8: Subset-Sum and Graphs

TAs: Justin Zhang, Aditya Gandhi
Segyul Park, Sage Stefonic

Mid-semester Feedback Form: https://tinyurl.com/msh7yvxu

Problem Subset Sum Practice.

Exercise 11.3. Consider the following variation of subset sum which allows for an additive error of 1. We'll call it *subset-sum*± 1. The input consists of n numbers $x_1, \ldots, x_n \in \mathbb{N}$ and a target $T \in \mathbb{N}$, like subset sum. The goal is to decide if there is a subset of $x_1, \ldots, x_n$ that sums to either $T-1$, T, or $T+1$. For this problem, either (a) design and analyze a polynomial time algorithm (the faster the better), or (b) prove that a polynomial time algorithm would imply a polynomial time algorithm for SAT.

The following are two (potentially hard) graph problems.

Exercise 12.6. Let $G = (V, E)$ be a directed graph with real-valued edge lengths $\ell : E \to \mathbb{R}$, and let $s, t \in V$. Consider the problem of computing the length of the shortest path from s to t. For this problem, either (a) design and analyze a polynomial time algorithm (the faster the better), or (b) prove that a polynomial time algorithm would imply a polynomial time algorithm for SAT.

Exercise 12.13. Let $G = (V, E)$ be a DAG, and $s, t \in V$. Consider the problem of computing the *number* of paths from s to t in G.[6] For this problem, either (a) design and analyze a polynomial time algorithm (the faster the better), or (b) prove that a polynomial time algorithm would imply a polynomial time algorithm for SAT.