Master's Thesis Defense

The Prize-Collecting Steiner Tree Problem and Related Problems

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- Summary

Overview

What happened in the last six months?

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Overview

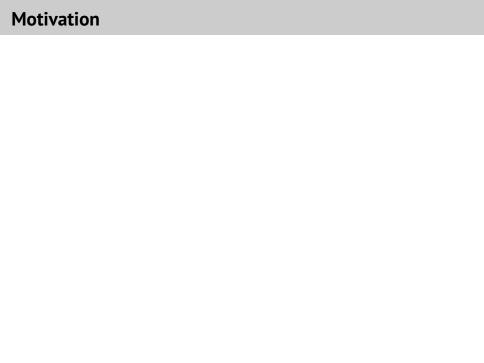
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- I read a stack of research papers about the PCSTP.
 - Problem: articles are often too short and it's difficult to get an overview.
 - Solution: write a survey.
- I looked



Motivation

NP-Hard problems are worth solving.

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Problem Definition

Given an undirected graph

$$G = (V, E, c, p)$$

where $c: E \to \mathbb{R}^+$ defines edge weights, and $p: V \to \mathbb{R}^+$ defines vertex *prizes*, then the solution to the *PCSTP* is a tree

$$T = (V_T, E_T, c, p) \subseteq G$$

which minimizes

$$c(T) = \min_{T} GW(T) = \sum_{(i,j)\in E_T} c_{ij} + \sum_{v\in (V\setminus V_T)} p_v.$$

Applications

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Prize-Collecting Tours

Median Subgraphs

Problem Definition

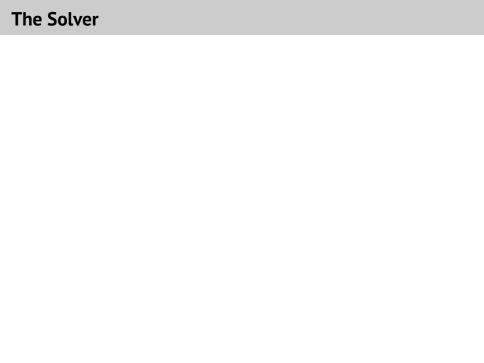
Let G=(V,E,c,d) be an undirected graph. Denote $c:E\to\mathbb{R}^+$ as an *edge cost* function and $d:V\times V\to\mathbb{R}^+$ be an *assignment cost* function where we have

$$d_{ii} = 0.$$

Then the *Median Tree Problem* is defined as finding a *connected* subgraph $T=(V_T,E_T)$ of G where $V_T\subseteq V$ and $E_T\subseteq E$ which minimises the cost function,

$$c(T) = \sum_{ij \in E_T} c_{ij} + \sum_{i \in V} \min_{j \in V_T} d_{ij}.$$







What did I manage to do?

Further Work

Conclusion