

# Exact and heuristic approaches to prize collecting tour construction (working title)

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## Abstract

This is a simple paragraph at the beginning of the document. A brief introduction about the main subject.

## 1 Introduction

### 1.1 Case study: A sightseeing tour planning app

We were presented with the following problem: blabla tourist app.

Given the maximum time to do the tour a start and a destination, we wish to find the best touristic tour that contains the biggest ammount of points of interest suitable to the user.

The the tours and the kinds of points of interest visited may vary according to the user's preferences, the amount of available time and the kind of transportation used. The visited points of interest ought to match the user's preferences.

## 2 Reduction to a graph problem

A street map with all the points of interest (POIs) can be converted to a weighted directed graph. The POIs can then be a subset of the graph's vertices with a specific prize assigned to each of them. This prize would depend on the user's preferences (for example, if a user wishes to prioritise historical landmarks, their respective vertices's prizes may be inflated). The start and finish are also vertices in the graph.

## 3 Formalization of the problem

Inputs:

- A graph  $G = (V, E)$  with non-negative directed edges

- A set of POI vertices  $P$  such that  $P \subseteq V$
- A function  $f$  that maps a POI node  $v \in P$  to a score (such that  $f(v_i) = s_i$ )
- Start  $S$  and finish  $F$  vertices such that  $S, F \in V$
- A budget  $B$

Output:

- A list of vertices (a path) that maximizes the total score (the sum of the scores of the POI vertices in the list) and verify the following conditions:
  1. It begins in  $S$  and finishes in  $F$
  2. The total cost of the path (sum of the edges' weights) is lower than  $B$

## 4 Overview of the problem

TODO