Preview

Greedy Algorithm
And
Edmonds Matroid Intersection Algorithm

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Greedy Strategy

example from (Oxley 2006, p. 63)
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Weight Function

\[ w : E \rightarrow \mathbb{R} \]

\[ \forall X \subseteq E \quad w(X) = \sum_{e \in X} w(e) \]
Introduction Greedy Strategy

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Example

Find the cheapest railroad network which connect all cities.
Greedy Strategy

Example from (Oxley 2006, p. 63)

Example

Find the cheapest railroad network which connect all cities.

Task

Find a minimum weight spanning Tree.
Greedy Strategy

example from (Oxley 2006, p. 63)

Kruskal’s Algorithm

- start with empty set
- while you can add an edge:
  - add the cheapest edge such that no cycle appear
**Greedy Strategy**

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**Kruskal’s Algorithm**

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No unique solution, depends on implementation!
choose minimum or maximum and add or delete

generalize to arbitrary independent systems (many combinatorial optimization problems)

find optimal solution iff it is a matroid
Greedy Algorithm

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- Generalize to arbitrary independent systems (many combinatorial optimization problems)
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- generalize to arbitrary independent systems (many combinatorial optimization problems)
- find optimal solution iff it is a matroid
What If Not A Matroid?

- every independence system is a finite intersection of matroids
- Edmond’s algorithm find an optimal solution for an intersection of two matroids
Edmond’s Matroid Intersection Algorithm

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Oxley 2006