Week X

Overview

- Greedy algorithms and greedy properties;
- Local Search.
- Neighbourhood Search.

Greedy Properties

- **Greedy** means "*the best at this moment*".
- **Sub-optimal Structure**: optimal solutions in a smaller version of the problem can be used to create solution for larger problems.
- **Choice Property**: at each stage, the best solution possible should be taken.

Greed, in the lack of better word, is good.

Michael Douglas in "Wall Street" (1987)

Greedy "Recipe"

General approach for greedy methods:

- Sorting options;
- Selecting the current best;
- Update the current state of the problem;
- Repeat until convergence.

Example of Greedy Algorithms

- Dijkstra;
- Prim and Kruskal;
- Ford-Fulkerson;
- Matching (aslo Bipartite).

Definition

*A **neighborhood** of a solution p is a set of solutions that are in some sense close to p. Normally, it can be easily computed from p or share a significant amount of structure with p.*

Limitations of Local Search

- Neighbourhood range;
- Efficient neighbourhood operators;
- Initial solution.

Advantages of Local Search

- Strategy;
- Stop criteria;
- Performance guarantee.

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