Lecture 3.3

vrijdag 8 september 2023 15:21

For this course, we do not need to know how to solve a linear program; we only need to known what they are, that they can be solved efficiently, and how they can be used to construct approximation algorithms.

A linear program asks to optimize an objective function consisting of variables, such that a set of inequalities (constraints) with respect to these variables is satisfied. Both the objective function and the constraints must be linear: that is, a linear combination of variables.

The feasible region consists of all points in the solution space which satisfy all the constrains.

Linear programs may have several different ‘kinds’ of solutions. They may have:
- A unique solution *(i.e. 1 solution)*
- No solution *(if the constraints cannot be satisfied simultaneously)*
- An unbounded solution *(if the feasible region, in the direction of the optimum, is infinitely large)*
- A bounded, non-unique solution *(which may happen if a constraint-boundary lies along the optimum)*

Linear programming asks to optimize $\vec{c} \cdot \vec{x}$ subject to $A \cdot \vec{x} \leq \vec{b}$.

Linear-programming problems can be solved in polynomial time (when input size is measured in bits).