

Geometric approaches to optimization

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Timetable: 20 hrs. First lecture on April 30, 2014, 16:00 (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30.

Course requirements: Linear algebra. Some knowledge in linear programming and graph theory will be useful, but not strictly necessary.

Examination and grading: Written exam.

SSD:MAT/09.

Aim: In this course we will provide an answer to the following question: what is the best choice of variables to express a given optimization problem? We will focus on reducing the size of optimization problems through reformulations in different spaces. After recalling basics of linear optimization and polyhedra, we will see some cases where it is possible to drastically reduce the number of constraints of linear optimization problems by a reformulation, and prove that this is not always possible. Finally, we will consider more general conic optimization problems.

Course contents:

1. Linear optimization and polyhedra.
2. Reformulations of linear optimization problems: examples, techniques, and size lower bounds.
3. Optimization over other cones (positive semidefinite matrices and completely positive matrices).