ISCO Spring School:
"Cutting plane methods for integer and combinatorial optimization"
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Pierre Bonami[*] *Gérard Cornuéjols*[†] *Andrea Lodi*[‡]

We will focus on methods which present both a theoretical and computational interest. The first half-day will be devoted to recalling some of the best known and most efficient families of cutting planes, their separation and their use. The rest of the course will be divided into three advanced subtopics for which ongoing research is very active: elementary closures, cuts for Mixed Integer NonLinear Programming (MINLP) and cuts from Multiple Rows. We give below a more detailed program.

Introduction to cutting planes for MIP (Monday morning) We will present several families of cutting planes. In particular: Gomory Fractional and Mixed Integer cuts, Mixed-Integer Rounding (MIR) cuts, Intersection cuts, Disjunctive cuts, Lift-and-Project cuts, and Projected Cvátal-Gomory cuts.

Elementary Closures (Monday afternoon) After having defined the concept of elementary closures, we will show some equivalences between families of cuts. We will then discuss the problem of separating over closures. Finally, we will discuss the use of normalizations in the separation of disjunctive cuts.

Cuts for MINLP (Tuesday Morning) In this part we will first discuss the use of Disjunctive Programming to build strong relaxations for non-convex problems (mainly quadratically constrained but also separable). We will then focus on convex MINLPs (those whose continuous relaxation is a convex program) and several cutting plane methods which have been proposed for them: Outer Approximation cuts, Conic MIR cuts, Disjunctive Cuts.

An introduction to cuts from Multiple Rows (Tuesday Afternoon) In the last three years, a very active area of research has been generalizations of Gomory cuts using more than one row of the simplex tableau. We will give us an introduction to this new and very active area of research.

Prerequisites Attendees with a good knowledge of the basics of Linear Programming (Simplex Method, Duality, Farkas Lemma,...), Mixed Integer Programming (branch-and-bound) and polyhedra (Facets, Extreme points, Minkosky theorem,...) would benefit the most from the course.

[*]Laboratoire d'Informatique Fondamentale, CNRS/Aix Marseille Université, Marseille, France
[†]Tepper School of Business, CMU, USA
[‡]Dipartimento di Elettronica, Informatica e Sistemistica, Università di Bologna