

# VORträge zum Operations Research

Kolloquium des Instituts für Operations Research

*Zeit:* Donnerstag, 25. Februar 2016, 17:30 Uhr

*Ort:* Raum 111, Gebäude 20.13

*Es spricht:* Sönke Behrends, Universität Göttingen

*Zum Thema:* **The Generation of Nonlinear Cutting Planes for Mixed-Integer Optimization of Polynomials**

*Abstract:* We investigate the algorithmic generation of valid - but not necessarily linear or quadratic - inequalities for mixed-integer problems with polynomial objective and constraints. Special cases we consider are inequalities related to semi-norms, ellipsoids and affine subspaces. Our approach is as follows: We model the problem of finding a valid nonlinear inequality as a continuous polynomial problem. This auxiliary problem is made tractable by approximating it with sum-of-squares (sos) programming. For these sos programs, we give necessary and sufficient conditions for convergence of their optimal solutions towards the optimal solution of the auxiliary problem. Also, in the cases we consider, a feasible solution to the sos program is feasible for the auxiliary problem. Finally, using integrality and ideas from (elementary) number theory, we may turn the thus generated feasible solutions to the auxiliary problem into nonlinear cutting planes, i.e., we cut off feasible solutions of the continuous relaxation.

Apart from conceptual insights, the inequalities entail properties that are desirable in applications: For instance, in case of the seminorms, given a feasible solution, there are conditions that ensure that the method turns (possibly) unbounded integer variables into bounded ones, making them accessible to branch and bound. Also, the problem to find a tight linear inequality - tight at some known feasible solution - can be approached with this method.

This is joint work with Prof. Anita Schöbel.

**Die Vorträge zum Operations Research wenden sich an alle Interessierten!**

Ab 17:00 Uhr ist am Institut für Operations Research (Gebäude 20.13, Raum 104) Gelegenheit zu einem Gespräch mit dem Referenten bei einer Tasse Kaffee gegeben.

Bei Rückfragen wenden Sie sich bitte an:

Prof. Dr. Oliver Stein, Institut für Operations Research.