



Im Rahmen des Kolloquiums des  
**Graduiertenkollegs Algorithmic Optimization**  
findet am

**Montag, dem 29. Mai 2017**

**16:00 Uhr c.t.**

**Hörsaal 9**

folgender Vortrag statt:

## **Performance estimation of first-order methods for composite convex optimization\***

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\*joint work with Adrien B. Taylor and Julien M. Hendrickx,

Composite convex optimization consists in the minimization of a convex objective function equal to the sum of several convex functions with different properties, for example a smooth term and a nonsmooth term. We consider a large class of first-order methods designed to solve such composite problems, which rely on specific oracles for each term. We show that the worst-case performance of each of those methods can be computed exactly by solving a semidefinite optimization problem, which also produces an explicit problem instance for which this worst-case is attained.

The performance estimation methodology was born in the original work of Drori and Teboulle in 2014, which introduced a semidefinite relaxation to study the behaviour of first-order optimization algorithms for smooth unconstrained convex optimization. In this talk, we present a framework that produces exact convergence bounds for fixed-step linear first-order methods applied to general composite convex optimization. These methods include classical and accelerated gradient methods (including constrained and proximal variants), conditional gradient and subgradient methods, and also allow inexact gradient computations.

In particular, our approach allows us to derive exact convergence rates for the proximal gradient method in function value, gradient residual norm and distance to the solution, backed by independently-checkable analytical proofs. We also use numerical computations to obtain worst-case rates for several well-known methods including accelerated gradient and the conditional gradient method, improving on the best published rates. We conclude with a quick overview of a MATLAB toolbox implementing our framework, called PESTO (Performance Estimation Toolbox), available from <https://github.com/AdrienTaylor/Performance-Estimation-Toolbox>

### **Gastgeber:**

Prof. Dr. Mirjam Dür

Kolloquiums Kaffee ab 15:45 Uhr im Raum E 10