



universität  
wien

**Fakultät für Mathematik**  
Oskar-Morgenstern-Platz 1  
A-1090 Vienna  
Austria

<https://owos.univie.ac.at>

## ONE WORLD OPTIMIZATION SEMINAR

April 11<sup>th</sup> 2022 @ 15:30 CEST (Central European Summer Time)

**MATHIAS STAUDIGL**

(Maastricht University)

### Generalized Self-Concordant Analysis of Frank-Wolfe Algorithms

**Abstract.** Projection-free optimization via different variants of the Frank-Wolfe method has become one of the cornerstones of large scale optimization for machine learning and computational statistics. Numerous applications within these fields involve the minimization of functions with self-concordance like properties. Such generalized self-concordant functions do not necessarily feature a Lipschitz continuous gradient, nor are they strongly convex, making them a challenging class of functions for first-order methods. Indeed, in a number of applications, such as inverse covariance estimation or distance-weighted discrimination problems in binary classification, the loss is given by a generalized self-concordant function having potentially unbounded curvature. For such problems projection-free minimization methods have no theoretical convergence guarantee. This paper closes this apparent gap in the literature by developing provably convergent Frank-Wolfe algorithms with standard  $O(1/k)$  convergence rate guarantees. Based on these new insights, we show how these sublinearly convergent methods can be accelerated to yield linearly convergent projection-free methods, by either relying on the availability of a local linear minimization oracle, or a suitable modification of the away-step Frank-Wolfe method.

Joint work with Pavel Dvurechensky, Kamil Safin and Shimrit Shtern.

*The link of the zoom-room of the meeting and the corresponding password will be announced the day before the talk on the mailing list of the seminar, to which one can subscribe on <https://owos.univie.ac.at>.*