Stochastic incremental mirror descent algorithms with Nesterov smoothing

- Sandy Bitterlich (Chemnitz University of Technology)
- **Sorin-Mihai Grad** (UMA, ENSTA Paris)

Keywords: mirror descent method, Nesterov smoothing, convex optimization.

Abstract: We propose in [1] a stochastic incremental mirror descent method constructed by means of the Nesterov smoothing (see [3]) for minimizing a sum of finitely many proper, convex and lower semicontinuous functions over a nonempty closed convex set in a Euclidean space. The algorithm can be adapted in order to minimize (in the same setting) a sum of finitely many proper, convex and lower semicontinuous functions composed with linear operators. Another modification of the scheme leads to a stochastic incremental mirror descent Bregman-proximal scheme with Nesterov smoothing for minimizing the sum of finitely many proper, convex and lower semicontinuous functions with a prox-friendly proper, convex and lower semicontinuous function in the same framework. Different to the previous contributions from the literature on mirror descent methods for minimizing sums of functions (e.g. [2]), we do not require these to be (Lipschitz) continuous or differentiable. Applications in Logistics, Tomography and Machine Learning modelled as optimization problems illustrate the theoretical achievements.

References:

[1] S. Bitterlich, S.-M. Grad. Stochastic incremental mirror descent algorithms with Nesterov smoothing. hal-03428808, 2021.

[2] R.I. Boţ, A. Böhm. An incremental mirror descent subgradient algorithm with random sweeping and proximal step. *Optimization*, 68:1–18, 2018.

[3] Y. Nesterov. Smooth minimization of non-smooth functions. *Mathematical Programming*, 103:127–152, 2005.