Proximal algorithms for nonconvex nonsmooth optimization problems with KL functions

Radu Ioan Boţ
University of Vienna

In this talk, we address in the nonconvex setting the minimization of the sum of a nonsmooth with a smooth function. First, we formulate a proximal-gradient algorithm with inertial and memory effects for which we prove that every generated sequence converges to a critical point of the objective, provided that a regularization of the latter is a KL function; in other words, it satisfies the Kurdyka-Łojasiewicz property.

Additionally, we focus on the case when the nonsmooth function is the difference of two convex functions. In this particular setting we propose another algorithm which allows the evaluation of both the concave and the convex part by their proximal points, while the smooth part is evaluated via its gradient. In the spirit of primal-dual splitting algorithms, the concave part might be the composition of a concave function with a linear operator, which are, however, evaluated separately. Convergence of the iterates is shown if the objective is also a KL function.

One of the remarkable properties of KL functions is their ubiquity in applications. To the class of KL functions belong semialgebraic, real subanalytic, uniformly convex and convex functions satisfying a growth condition.