

# Projections on the intersection of convex sets

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## Abstract

We address the problem of projecting a point onto the intersection of given closed, convex subsets of the Euclidean space. We assume that the projector onto each individual convex set is simple, while the joint projector is not.

The majority of existing algorithms are sequential, and the convergence to the projection is linear. We propose a new algorithm based on the reformulation of the original optimization problem as a system of nonsmooth equations. By using a fast nonsmooth Newton iterative technique based on Clarke's generalized gradients, we obtain an algorithm with the quadratic rate of convergence. Furthermore, our method is highly parallelizable, in the sense that the computations of the projections to different convex sets are done simultaneously. In such a way, the overall method is attractive for some distributed computing platforms, like e.g. sensor networks.

Numerical examples demonstrate the effectiveness of our approach compared to the traditional ones.

## Keywords

Projections, Convex set, Semismooth function, Nonsmooth Newton method.