Anderson Accelerated Douglas-Rachford Splitting

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Abstract

We consider the problem of non-smooth convex optimization with general linear constraints, where the objective function is only accessible through its proximal operator. This problem arises in many different fields such as statistical learning, computational imaging, telecommunications, and optimal control. To solve it, we propose an Anderson accelerated Douglas-Rachford splitting (A2DR) algorithm, which we show either globally converges or provides a certificate of infeasibility/unboundedness under very mild conditions. Applied to a block separable objective, A2DR partially decouples so that its steps may be carried out in parallel, yielding an algorithm that is fast and scalable to multiple processors. We describe an open-source implementation and demonstrate its performance on a wide range of examples.