iPiano: Inertial Proximal Algorithm for Non-convex Optimization

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We study an algorithm for solving a minimization problem composed of a differentiable (possibly non-convex) and a convex (possibly non-differentiable) function. The proposed algorithm - named iPiano - combines forward-backward splitting with an inertial force and hence can be seen as an extension of the celebrated heavy-ball method proposed by Polyak already in 1964. A rigorous analysis of the proposed algorithm based on the Kurdyka-Łojasiewicz inequality yields global convergence for both the function values and the iterates. This makes the algorithm robust for minimizing the considered class of non-convex problems. We demonstrate iPiano on computer vision problems: image denoising with learned priors and diffusion based image compression.