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Manifold Sampling for L1 Nonconvex Optimization

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We introduce the *manifold sampling* algorithm for unconstrained minimization of a nonsmooth composite function $h \circ F$. By classifying points in the domain of h into manifolds, the algorithm adapts search directions within a trust-region framework based on knowledge of manifolds intersecting the current trust region.

We motivate this idea through a study of ℓ_1 functions, where the classification into manifolds using zero-order information about the constituent functions F_i is trivial. In this case, we show that both deterministic and stochastic versions of the algorithm generate cluster points that are Clarke stationary.

Since the manifold sampling algorithm only requires approximations of the Jacobian ∇F at the trust-region center, the algorithm can also address situations where F is defined by a simulation for which such derivative information may not be available. We present numerical results for different variants of the algorithm and show that using manifold information from points near the current iterate can improve empirical performance.