Gradient flows in Riemannian manifolds space discretization by geodesic finite elements

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Many variational problems have in their natural form a target manifold. We study geodesic finite element discretizations of functions into a Riemannian manifold M. These reduce to standard Lagrangian finite elements if $M = \mathbb{R}^n$, and are intrinsic in the sense that the manifold is neither embedded nor approximated, and the theory is invariant under diffeomorphisms. We apply this space discretization to gradient flows after first discretizing time by an implicit Euler scheme.