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Pymanopt: a Python toolbox for optimization on manifolds using automatic differentiation.
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Summary: Optimization on manifolds is a class of methods for optimization of an objective function, subject to constraints which are smooth, in the sense that the set of points which satisfy the constraints admits the structure of a differentiable manifold. While many optimization problems are of the described form, technicalities of differential geometry and the laborious calculation of derivatives pose a significant barrier for experimenting with these methods.

We introduce Pymanopt (available at pymanopt.github.io), a toolbox for optimization on manifolds, implemented in Python, that – similarly to the Manopt Matlab toolbox – implements several manifold geometries and optimization algorithms. Moreover, we lower the barriers to users further by using automated differentiation for calculating derivative information, saving users time and saving them from potential calculation and implementation errors.

MSC:
65Y15 Packaged methods for numerical algorithms
65K10 Numerical optimization and variational techniques
68W30 Symbolic computation and algebraic computation
90C26 Nonconvex programming, global optimization
90C30 Nonlinear programming

Keywords:
Riemannian optimization; nonconvex optimization; manifold optimization; projection matrices; symmetric matrices; rotation matrices; positive definite matrices

Software:
RTRMC; Matlab; Pymanopt; GitHub; Manopt; DiffSharp; Python

Full Text: arXiv Link