A USER'S GUIDE TO RIEMANNIAN NEWTON-TYPE METHODS ON MANIFOLDS

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Several nonlinearly constrained optimization problems in the sciences and engineering can be formulated on a search space with a particular smooth geometric structure. Endowing such a manifold with special Riemannian metrics provides an intrinsic framework to develop numerical algorithms whose iterates automatically satisfy the constraints. In this talk, we will focus on Newton-type algorithms for optimization on some manifolds that appear in the applications, in particular matrix optimization problems. Special attention will be paid to the practical implementation of the discussed algorithms as to their differential geometric foundations. We will illustrate a variety of concrete algorithms through numerical tests running on specific simple examples inspired from real-world applications.

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