

GMRA: A tool for Dictionary Learning and Compressed Sensing on manifolds

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Abstract

In many relevant applications high-dimensional data needs to be processed or stored. Both tasks require too much resources when working directly in the full ambient space. However, naturally occurring signals often show some type of lower dimensional structure that can be exploited for a more efficient representation. Common model assumptions are full linearity, sparsity or a manifold structure. In this talk we will mostly focus on the latter - more precisely the data points will be i.i.d. samples from a probability distribution supported on a isometrically embedded smooth Riemannian manifold with some additive noise.

The Geometric Multi-Resolution Analysis (GMRA) provides a multi-scale piecewise linear approximation to such data. We will review its construction and state some recently proven results on approximation quality and robustness. After that, we will explore how the GMRA can be used to efficiently solve tasks in Dictionary Learning and Compressed Sensing on manifolds.