Intertwining wavelets or multiresolution analysis on graphs through random forests.
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Several methods are available to analyze signals on graphs, i.e functions defined on the vertices of a finite connected weighted graph. Fourier analysis requires the computation of the eigenvalues and eigenvectors of the graph Laplacian, it is also a non-local transformation. In this communication we propose a multiresolution scheme which provides well localized basis functions without requiring spectral computations. The approach relies on probabilistic tools: a random spanning forest to downsample the set of vertices, and approximate solutions of Markov intertwining relation to provide a subgraph structure and a filterbank which is a basis of the set of functions. As a by-product, the method provides a graph coarse-graining procedure. We illustrate the method by numerical experiments computed with the Python Package IntertwiningWavelet [4] developed by Dominique Benielli (Labex Archimède, Université Aix-Marseille) to process the method.

References


[2] Avena Luca; Castell Fabienne; Gaudillièere, Alexandre; Mélot Clothilde Intertwining wavelets or multiresolution analysis on graphs through random forests. To appear in Applied Computational Harmonic Analysis.


[4] sources available on the git repository: https://plmlab.math.cnrs.fr/archimede/intertwiningwavelet the Package is available on PyPi https://pypi.org/project/IntertwiningWavelet/