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Semi-supervised Learning for Aggregated Multilayer Graphs Using Diffuse Interface Methods and Fast Matrix Vector Products

We generalize a graph-based multiclass semi-supervised classification technique based on diffuse interface methods to multilayer graphs. Besides the treatment of various applications with an inherent multilayer structure, we present a very flexible approach that interprets high-dimensional data in a low-dimensional multilayer graph representation. Highly efficient numerical methods involving the spectral decomposition of the corresponding differential graph operators as well as fast matrix-vector products based on the nonequi-spaced fast Fourier transform (NFFT) enable the rapid treatment of large and high-dimensional data sets. In fact, the computational complexity depends linearly on the network size in each iteration step in all stages of our algorithm.

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