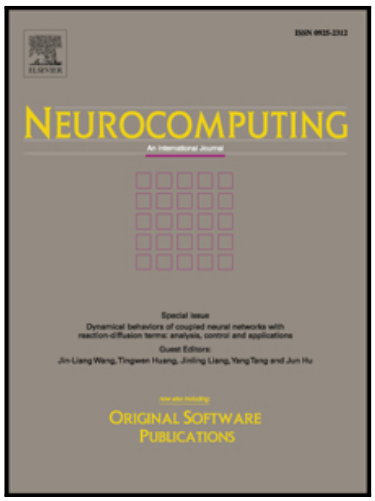

Multi-modal Dimensionality Reduction using Effective Distance

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Multi-modal Dimensionality Reduction using Effective Distance

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Abstract: By providing complementary information, multi-modal data is usually helpful for obtaining good performance in the identification or classification tasks. As an important way to deal with high-dimensional features in multi-modal data, multi-modal dimensionality reduction has caused extensive concern in the machine learning domain. Most of the existing dimensionality reduction methods adopt a similarity matrix to capture the structure of data, and then this matrix is computed by using conventional distances (e.g. Euclidean distance) in most cases. However, Euclidean distance can only model the static structure of data, and the intrinsic dynamic structure information is usually ignored. For overcoming this problem, we develop two novel dimensionality reduction methods based on effective distance for multi-modal data, by using a probabilistically motivated effective distance rather than conventional Euclidean distance. Specifically, we first develop two approaches to compute the effective distance. Then, we propose two novel effective distance-based dimensionality reduction methods, including Effective Distance-based Locality Preserving Projections (EDLPP) and Effective Distance-based Sparsity Preserving Projections (EDSPP). Experiments on varied data sets from UCI machine learning repository and the Alzheimer's disease Neuroimaging Initiative (ADNI) database demonstrate that the effective distance-based dimensionality reduction methods are superior to other state-of-art methods which employ only Euclidean distance.

Keywords: Multi-modal; dimensionality reduction; dynamic structure; effective distance.