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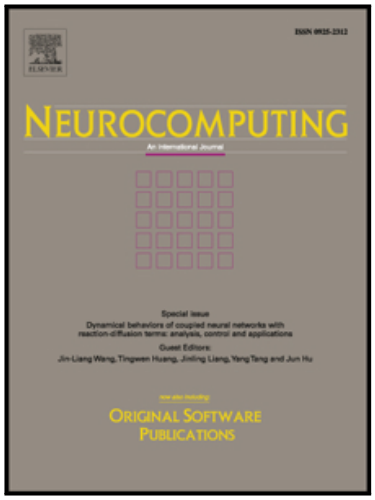

An improved locality preserving projection with ℓ_1-norm minimization for dimensionality reduction

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An improved locality preserving projection with ℓ_1-norm minimization for dimensionality reduction

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Abstract

Locality preserving projection (LPP) is a classical tool for dimensionality reduction and feature extraction. It usually makes use of the ℓ_2-norm criterion for optimization, and is thus sensitive to outliers. In order to achieve robustness, LPP-L1 is proposed by employing the ℓ_1-norm as distance criterion. However, the edge weights of LPP-L1 measure only the dissimilarity of pairs of vertices and ignore the preservation of the similarity. In this paper, we develop a novel algorithm, termed as ILPP-L1, in which the ℓ_1-norm is utilized to obtain robustness and the similarities of pairs of vertices are effectively preserved, simultaneously. ILPP-L1 is robust to outliers because of the use of the ℓ_1-norm. The ℓ_1-norm minimization problem is directly solved, which ensures the preservation of the similarity of pairs of vertices. The solution is justified to converge to local minimum. In addition, ILPP-L1 avoids small sample size problem. Experiment results on benchmark databases confirm the effectiveness of the proposed method.

Keywords: Locality preserving projection (LPP), ℓ_1-norm minimization, dimensionality reduction, robust

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