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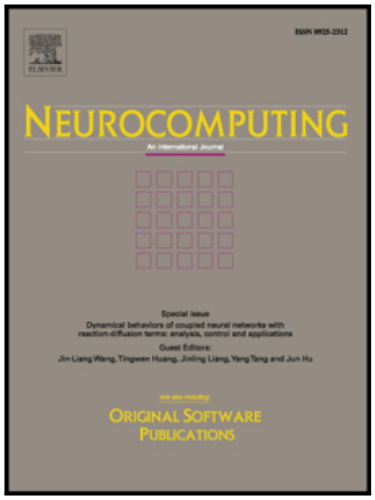

Robust locally linear embedding algorithm for machinery fault diagnosis

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ACCEPTED MANUSCRIPT

Robust locally linear embedding algorithm for machinery fault diagnosis

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Abstract

Locally linear embedding (LLE) is a classical nonlinear dimensionality reduction algorithm, and it has been widely used in machinery fault diagnosis. LLE reduces the dimensions of a data set only by exploring the geometry structure, that is, the geometry structure is one of the key factors for the embedding result. In conventional LLE algorithm, the geometry structure is calculated by ordinary least square (OLS) algorithm, which makes the embedding result be sensitive to noise. In order to resolve the problem, a robust LLE (RLLE) is investigated. In RLLE algorithm, the Least Angle Regression and the Elastic Net (LARS-EN) technologies are employed to compute the local structure. Besides, a novel fault diagnosis method based on RLLE and support vector machine (SVM) are proposed for machinery fault diagnosis. Experiments performed on both synthetic and real data sets demonstrate the advantages of the proposed method in the term of fault diagnosis.

Keywords: Local linear embedding; l_1 regularization; fault diagnosis; Least Angle Regression; Elastic Net.

1. Introduction

With the sensor and the sampling technologies developing, the information obtained from a machinery has become more and more easy. Amounts

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