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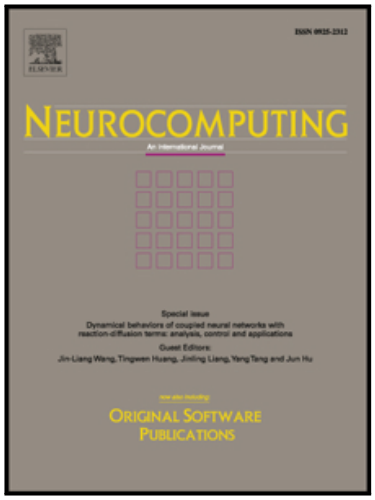

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Abstract

Convolutional neural networks (CNN) have achieved great success in image classification, object detection and semantic segmentation. Generally, CNN is stacked by layers of convolutional filtering, entry-wise nonlinearities, and pooling operators, where convolutional filtering and pooling can be regarded as the operators for feature transformation and dimensionality reduction, respectively. However, CNN was suggested for images and signals, and cannot be used to samples in general vector form. Motivated by the CNN structure, in this paper we propose a deep vanishing component analysis network (DVN) for pattern classification of samples in general vector form. To be specific, vanishing component analysis is utilized for non-linear feature transformation and principal component analysis for dimensionality reduction, while Gentle Adaboost is employed for entry-wise nonlinearities and feature selection. DVN can thus utilize the multi-layer network architecture stacked by VCA, PCA and Gentle Adaboost for pattern classification. Experimental results show that our DVN significantly outperforms the existing surficial learning methods, e.g., SVM, and is comparable or better than several deep learning approaches, e.g., DBN and DBM.

Keywords: Vanishing Component Analysis, Gentle Adaboost, General Vector Form, Deep Structure

1. Introduction

Deep structures are biologically-inspired multi-stage architectures that can automatically learn hierarchies of intrinsical features of data. Compar-