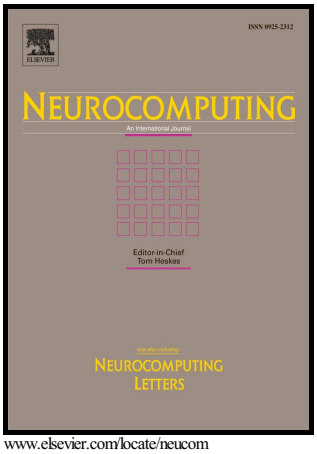

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Hierarchical Learning of Large-Margin Metrics for Large-Scale Image Classification

Hao Lei[a,b], Kuizhi Mei[b,*], Jingmin Xin[b], Peixiang Dong[b], Jianping Fan[c]

[a] *Xi'an Institute of Optics and Precision Mechanics, Chinese Academy of Sciences, Xi'an 710119, China*

[b] *Institute of Artificial Intelligence and Robotics, Xi'an Jiaotong University, Xi'an 710049, China*

[c] *School of Information Science and Technology, Northwest University, Xi'an 710069, China*

Abstract

Large-scale image classification is a challenging task and has recently attracted active research interests. In this paper, a new algorithm is developed to achieve more effective implementation of large-scale image classification by hierarchical learning of large-margin metrics (HLMMs). A hierarchical visual tree is seamlessly integrated with metric learning to learn a set of node-specific/category-specific large-margin metrics. First, a hierarchical visual tree is learned to characterize the inter-category visual correlations effectively and organize large numbers of image categories in a coarse-to-fine fashion. Second, a new algorithm is developed to support hierarchical learning of large-margin metrics by training nearest class mean (NCM) classifiers over our hierarchical visual tree. In addition, we also consider dimensionality reduction as a regularizer for high-dimensional data in our large-margin metric learning. Two top-down approaches are developed for supporting hierarchical learning of large-margin metrics. We focus on learning more discriminative metrics for NCM node classifiers to identify the visually similar sub-nodes (visually similar image categories) under the same parent node over our hierarchical visual tree. A mini-batch stochastic gradient descend method is used to optimize our HLMMs learning algorithm. The experimental results on ImageNet Large Scale Visual Recognition Challenge 2010 dataset (ILSVRC2010) have demonstrated that our HLMMs learning algorithm is very promising for supporting large-scale image classification.

Keywords: Visual tree, Hierarchical learning, Large-margin metric learning, Dimensionality reduction, Large-scale image classification

*Corresponding author. Tel: +86-029-82668672, Fax: +86-029-82668672

Email address: meikuizhi@mail.xjtu.edu.cn (Kuizhi Mei)