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应用

基于聚类核函数的最小二乘支持向量机高光谱图像半监督分类

高恒振, 万建伟, 许可, 钱林杰

国防科技大学电子科学与工程学院

摘要：

针对大规模的高光谱数据分类，为了利用未标签样本所含信息，来提升分类器性能，提出了一种半监督分类算法。该算法根据聚类假设，即属于同一类地物的样本点在聚类中被分为同一类的可能性较大的原则来改进核函数，采用基于光谱角度量的K均值聚类算法对样本集进行聚类，根据多次聚类的结果，构造包袋核函数，然后利用加法和乘法运算将包袋核函数和RBF核函数组合成新的核函数，从而把未标签样本信息融入分类器。而且采用最小二乘支持向量机，将标准支持向量机的二次规划问题转换为求解线性方程组的问题。高光谱实测数据实验表明了本文方法的优越性。

关键词： 半监督； 最小二乘； 聚类； 核函数；支持向量机

Semisupervised Classification of Hyperspectral Image Based on Clustering Kernel and LS-SVM

GAO Heng-Zhen, WAN Jian-Wei, XU Ke, QIAN Lin-Jie

School of Electronic Science and Engineering, National University of Defense Technology, Changsha

Abstract:

When classifying large scale hyperspectral image data, there are a lot of unlabeled samples. In order to enhance the classifier’s performance by using the information contained in the unlabeled data, this paper presents a semisupervised classification method. The proposed algorithm modifies the kernel function based on the clustering assumption. It assumes that the samples belonged to the same class will be assigned to the same cluster in the clustering at high probability. The algorithm clusters the unlabeled samples using K-means clustering algorithm. The K-means method uses spectral angle to measure the differences between the samples. The bagged kernel is constructed based on the multi clustering results of data set. Then the bagged kernel is combined with the RBF kernel using sum or product operation. So the information in the unlabeled samples is merged into the classification procedure. The proposed algorithm adopts the least squares SVM (LS-SVM). Instead of solving the quadratic problem of SVM, the LS-SVM changes it to linear equations. The proposed method is validated by the hyperspectral data. In the experiments the proposed method shows some superiority.

Keywords: semisupervised least squares clustering kernel function support vector machine

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通讯作者:

作者简介:

作者Email: gaohengzhen@gmail.com

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