

论文与技术报告

区分性投影结合最小L1球覆盖的可拒识双层分类器

胡正平 贾千文 许成谦

燕山大学信息科学与工程学院 秦皇岛

摘要:

经典分类模型总是假定测试样本属于训练类之一,然而在网络安全、身份识别、医学诊断等非合作模式识别中往往存在许多非训练类例外模式,这时由于分类器缺乏拒识能力,只能给出错误判决。为此,本文构造了一种基于区分性投影结合最小L1球覆盖的可拒识双层近邻分类器。该方法针对一类分类器忽略类别间区分性描述的不足,定义一种能够表征各训练类模式细节信息的差分矢量,形成新的差分特征。在差分特征空间进行L1范数最大化主成分分析(L1-norm maximization principal component analysis, PCA-L1)构建新的区分性投影方法即差分矢量PCA-L1特征提取。然后,在投影空间对各类别分别建立最小L1球覆盖决策边界,这样对于输入的测试模式,便可做出拒识或者接受处理的判决。最后,针对接受的输入模式,再通过最近邻测试得到识别结果。在UCI数据库、MNIST手写体数据库和CMU AMP人脸表情数据库上的实验结果表明本文方法对训练类测试样本具有较高正确识别率的同时,同时能够对非训练类测试样本进行有效地拒识,在实际模式识别领域具有一定的应用价值。

关键词: 可拒识分类; 最小L1球覆盖; 区分性投影; 差分矢量PCA-L1特征

A Two-Layer Classifier with Rejection Feature based on Discrimination Projection and Minimum L1-ball Covering Model

HU Zheng-Ping, JIA Qian-Wen, XU Cheng-Qian

Institute of Information Science and Technology, Yanshan University, Qinhuangdao

Abstract:

Classical classifier assumed that the test samples must be the same class as the training, samples, while in some applications such as network security biological ID recognition and medical diagnoses maybe make error judgment because the classical classifier couldn't make rejecting judgment for the existing uncooperative exceptional input pattern. A two-layer classifier with rejection feature based on discrimination projection and minimum L1-ball covering model which is a method for pattern feature projection and rejection classification is proposed in this paper to solve this problem. Aiming at the problem that one-class classification ignores discrimination between a given set of classes, the differential vector is defined to represent the detail information of each class, which constitutes a new differential feature space. Combined with PCA-L1, a new discrimination projection called differential vector PCA-L1 is obtained. Then, minimum L1-ball covering model as the decision boundary around each class is presented on the feature space. Thus the input pattern of no-object classes could be rejected by the first decision boundary description. Finally, if a pattern is accepted by the above step, the recognition result is obtained by the nearest neighbor method. Experiments on the UCI database, the MNIST database of handwritten digitals and the CMU AMP face expression database show that the method proposed in this paper could achieve good recognition and rejection performance, and it could be applicable in many real pattern recognition fields.

Keywords: Rejection classification Minimum L1-ball covering Discrimination projection; Differential vector PCA-L1 feature

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通讯作者:

作者简介:

作者Email: hzp@ysu.edu.cn

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