论文与报告

基于混沌和免疫应答的增量聚类新算法

李向华, 王钲旋, 吕天阳, 车翔玖

1. 吉林大学计算机科学与技术学院 长春 130012

2. 吉林大学珠海学院计算机科学与技术系 珠海 519041

3. 哈尔滨工程大学计算机科学与技术学院 哈尔滨 150001

摘要

受免疫应答原理的启发, 提出了一种适用于增量数据聚类的人工免疫系统框架, 以及在此框架上的结合混沌的自组织增量聚类新算法, 称为免疫应答算法(Immune response algorithm, IRA). 新算法利用Logistic混沌序列生成初始抗体种群, 利用其多样性识别新增的不属于任何已知簇的数据, 该过程模拟了初次免疫应答. 同时, 初次免疫应答形成的记忆抗体可用于二次免疫应答, 即识别新增的属于已知簇的数据. 为了减少数据冗余, 算法用中心点和代表点表示已知簇并动态更新其识别区域, 这样算法不但能动态、自组织地形成聚类, 而且实现了数据特征的提取. 模拟实验充分显示出该算法无论在聚类质量上还是数据特征的提取上, 都具有一定优势, 且具有参数数量少、速度快、对数据输入次序不敏感的优点, 在实际问题中有一定应用价值.

关键词　　人工免疫系统　增量聚类　免疫应答　混沌　特征提取

分类号

A Novel Incremental Clustering Algorithm Based on Chaos and Immune Response

LI Xiang-Hua, WANG Zheng-Xuan, LV Tian-Yang, CHE Xiang-Jiu

1. College of Computer Science and Technology, Jilin University, Changchun 130012

2. Department of Computer Science and Technology, Zhuhai College, Jilin University, Zhuhai 519041

3. College of Computer Science and Technology, Harbin Engineering University, Harbin 150001

Abstract

Inspired by the immune response principle, an artificial immune system framework for incremental data clustering is proposed. Meanwhile, a novel self organizing incremental clustering algorithm called IRA (Immune response algorithm) is also proposed based on the framework. IRA uses Logistic chaotic sequence to produce the initial antibody population. The diversity of the chaotic sequence is used for recognizing the incremental data which do not belong to any existing clusters. This process simulates the primary immune response. At the same time, the memory antibodies produced by the primary immune response are used for the secondary immune response, that is, they can recognize the incremental data which belong to the existing cluster. In order to reduce the data redundancy, the algorithm uses the center and representative points to represent the existing clusters. The recognizing scopes of them are updated dynamically. Therefore, the algorithm not only can form clusters dynamically and self organization, but also can achieve data feature selection. The experimental results show that the algorithm has advantages on both the clustering quality and the data feature selection. Furthermore, it has some other merits, such as few parameters, fast speed, insensitivity to input and so on. So the algorithm has some value for practical problems.

Key words　　Artificial immune system　incremental clustering　immune response　chaos　feature selection

通讯作者　车翔玖 chexj@jlu.edu.cn

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