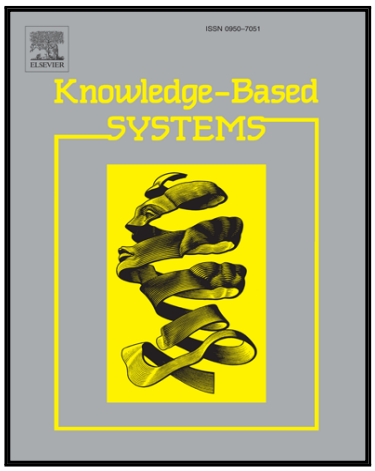

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Distance metric learning for ordinal classification based on triplet constraints

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Abstract

Ordinal classification is a problem setting in-between nominal classification and metric regression, where the goal is to predict classes of an ordinal scale. Usually, there is a clear ordering of the classes, but the absolute distances between them are unknown. Disregarding the ordering information, this kind of problems is commonly treated as multi-class classification problems, however, it often results in a significant loss of performance. Exploring such ordering information can help to improve the effectiveness of classifiers. In this paper, we propose a distance metric learning approach for ordinal classification by incorporating local triplet constraints containing the ordering information into a conventional large-margin distance metric learning approach. Specifically, our approach tries to preserve, for each training example, the ordinal relationship as well as the local geometry structure of its neighbors, which is suitable for use in local distance-based algorithms such as k-nearest-neighbor (k-NN) classification. Different from previous works that usually learn distance metrics by weighing the distances between training examples according to their class label differences, the proposed approach can directly satisfy the ordinal relationships where no assumptions about the distances between classes are made.

Keywords: Ordinal classification, ordinal regression, distance metric learning, nearest neighbor, semidefinite programming.

1. Introduction

Ordinal classification (also called ordinal regression) has recently become an important research topic as a consequence of the growing amount of human preference information in many real-world applications, such as human age estimation [1], face recognition [2], medical research [3], social sciences [4], and

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