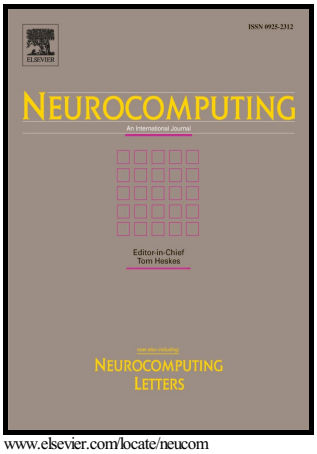

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A Semi-supervised Manifold Alignment Algorithm and an Evaluation Method Based on Local Structure Preservation

Xiaojie Li[1], Jiancheng Lv[2*], Xi Wu[1], and Xin Yu[3]

1.College of Computer Science, Chengdu University of Information Technology
2.College of Computer Science, Sichuan University
3.State Key Laboratory of Computer Architecture, Institute of Computing Technology, CAS, China
[*] *Corresponding author: Jiancheng Lv e-mail: lvjiancheng@scu.edu.cn.*

Abstract

Manifold alignment is the process of aligning the shared intrinsic structure extracted from multiple manifolds. The criteria of manifold alignment are 2-fold. First, the alignment should minimize the distance between manifolds, ensuring high alignment accuracy. Second, the original structure should be preserved. Currently, most alignment algorithms focus on alignment accuracy, whereas structure preservation has received little attention. This paper proposes a new semi-supervised alignment method that combines locally linear reconstructions in each manifold. The shared intrinsic structure is obtained by solving an optimization problem with a closed-form solution, which simultaneously matches the corresponding instances and preserves the local geometry of each manifold. Furthermore, a new method is presented to evaluate the local structure preservation. The structural stability is defined as a metric of the local structure preservation property. It is shown that the proposed method preserves the local geometry of the original dataset well. It is also found that better structural stability gives higher alignment accuracy, but the converse is not true. Experimental results on both synthetic and real datasets demonstrate the effectiveness and efficiency of our method.

Keywords: Manifold alignment, structural stability, local structure