

Multi-Manifold Semi-Supervised Classification Based on the Distinction Between Interior Points of Manifolds and Other Points

Zohre Karimi¹ Saeed Shiry Ghidary² Mohammad Rahmati¹
Rohollah Ramezani³

¹Department of Computer Engineering and Information Technology, Amirkabir University of Technology, Tehran, Iran

²Department of Mathematics and Computer Science, Amirkabir University of Technology, Tehran, Iran

³Department of Mathematics and Computer Science, Damghan University, Damghan, Iran

ABSTRACT

Manifold-based semi-supervised classification has attracted increasing interest in recent years. Existing methods exploit the Euclidean distance for approximating the distances between data points on manifolds and applying the smoothness assumption. This approximation is not correct for the point cloud sampled from intersecting manifolds and makes errors in the label propagation. In this paper, a novel algorithm for semi-supervised classification on intersecting manifolds is proposed that is based on the distinction between interior and non-interior points of manifolds; the proposed method utilizes the most confidence connections in the graph of representing manifolds by modifying the weight of edges of the graph of representing manifolds for propagating the labels. Compared to some recent multi-manifold semi-supervised classifiers, the proposed method has not these restrictive assumptions: knowing the intrinsic dimensions of manifolds, a large number of unlabeled points to estimate the underlying manifolds and similar properties for neighbors of all data points. Some experiments have been conducted in order to show that it verifies the improvement of the classification accuracy on a number of artificial and real benchmark data sets in comparison with other methods.

Keywords: Semi-Supervised Classification, Intersecting Manifolds, Laplacian, Smoothness Assumption.