



Minimax rate for Dimension Estimator

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Abstract. Many manifold learning algorithms require knowing the intrinsic dimension of the manifold. Some estimators have been proposed to estimate the intrinsic dimension. However, there is no detailed analysis on the minimax rate of convergence for this problem. We provide such an analysis here. Under regularity conditions, we bound the minimax rate for any dimension estimator that separates distributions of two dimensions d_1 and d_2 . We show that upper bound for minimax rate is $O(n^{-(d_2/d_1-1-\epsilon)n})$, by calculating minimax rate of the dimension estimator constructed on TSP path of data. Then we also show that lower bound for minimax rate is $\Omega(n^{-(2d_2-2d_1+\epsilon)n})$, by applying Le Cam's lemma with a specific set of d_1 -dimensional probability distribution.

Keywords: dimension estimator; minimax; manifold learning.