Estimation of Standardized Mutual Information

Zhiyi Zhang and Ann M. Stewart

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Abstract

Mutual information is a measure of association between two random elements on a joint alphabet. However mutual information lacks an upper bound and therefore conveys little about how strong the association is. Standardized mutual information on the other hand measures the association on the scale from zero to one. In this paper, four versions of standardized mutual information are shown to each satisfy the properties that it is zero if and only if the two random elements are independent and that it is one if and only if there is a one-to-one correspondence between them. Furthermore, two sets of nonparametric estimators for all four versions of standardized mutual information are discussed. The first set includes four plug-in estimators and the second set includes four estimators based on Turing's perspective. The asymptotic normalities of all discussed estimators are respectively established.

Department of Mathematics, UNC Charlotte, Charlotte, NC 28223