

Conditional validity of inductive conformal predictors

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Abstract Conformal predictors are set predictors that are automatically valid in the sense of having coverage probability equal to or exceeding a given confidence level. Inductive conformal predictors are a computationally efficient version of conformal predictors satisfying the same property of validity. However, inductive conformal predictors have only been known to control unconditional coverage probability. This paper explores various versions of conditional validity and various ways to achieve them using inductive conformal predictors and their modifications. In particular, it discusses a convenient expression of one of the modifications in terms of ROC curves.

Keywords Inductive conformal predictors · Conditional validity · Batch mode of learning · ROC curves · Boosting · MART · Spam detection

1 Introduction

This paper continues study of the method of conformal prediction, introduced in Vovk et al. (1999) and Saunders et al. (1999) and further developed in Vovk et al. (2005). An advantage of the method is that its predictions (which are set rather than point predictions) automatically satisfy a finite-sample property of validity. Its disadvantage is its relative computational inefficiency in many situations. A modification of conformal predictors, called inductive conformal predictors was proposed in Papadopoulos et al. (2002a, 2002b) with the purpose of improving on the computational efficiency of conformal predictors. For further information on conformal predictors and inductive conformal predictors see, e.g., Balasubramanian et al. (2013) and Papadopoulos et al. (2013).

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