Performance measures for classification systems with rejection

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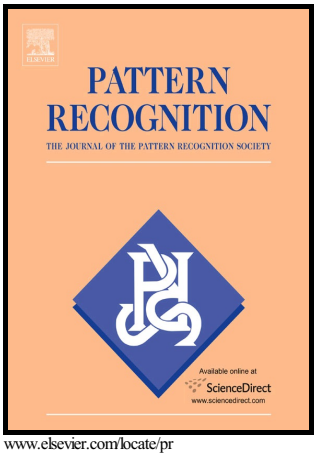

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Abstract

Classifiers with rejection are essential in real-world applications where misclassifications and their effects are critical. However, if no problem specific cost function is defined, there are no established measures to assess the performance of such classifiers. We introduce a set of desired properties for performance measures for classifiers with rejection, based on which we propose a set of three performance measures for the evaluation of the performance of classifiers with rejection. The *nonrejected* accuracy measures the ability of the classifier to accurately classify nonrejected samples; the *classification quality* measures the correct decision making of the classifier with rejector; and the *rejection quality* measures the ability to concentrate all misclassified samples onto the set of rejected samples. We derive the concept of *relative optimality* that allows us to connect the measures to a family of cost functions that take into account the trade-off between rejection and misclassification. We illustrate the use of the proposed performance measures on classifiers with rejection applied to synthetic and real-world data.

Keywords: classification with rejection, performance measures