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Evaluating the diagnostic powers of variables and their linear combinations when the gold standard is continuous

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(Submitted on 9 May 2011)

The receiver operating characteristic (ROC) curve is a very useful tool for analyzing the diagnostic/classification power of instruments/classification schemes as long as a binary-scale gold standard is available. When the gold standard is continuous and there is no confirmative threshold, ROC curve becomes less useful. Hence, there are several extensions proposed for evaluating the diagnostic potential of variables of interest. However, due to the computational difficulties of these nonparametric based extensions, they are not easy to be used for finding the optimal combination of variables to improve the individual diagnostic power. Therefore, we propose a new measure, which extends the AUC index for identifying variables with good potential to be used in a diagnostic scheme. In addition, we propose a threshold gradient descent based algorithm for finding the best linear combination of variables that maximizes this new measure, which is applicable even when the number of variables is huge. The estimate of the proposed index and its asymptotic property are studied. The performance of the proposed method is illustrated using both synthesized and real data sets.

Subjects: **Methodology (stat.ME)**; Applications (stat.AP); Machine Learning (stat.ML)

Cite as: **arXiv:1105.1575** [stat.ME]

              (or **arXiv:1105.1575v1** [stat.ME] for this version)

Submission history

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[v1] Mon, 9 May 2011 03:54:34 GMT (38kb)

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