

Comparison of binary diagnostic predictors using entropy

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Abstract

The use of gold standard procedures in screening may be costly, risky or even unethical. It is usually therefore, not admissible for large scale application. In this case, a more acceptable diagnostic predictor is applied to a sample of subjects alongside a gold standard procedure. The performance of the predictor is then evaluated using Receiver Operating Characteristic curve. The area under the curve provide a summative measure of the performance of the predictor. The Receiver Operating Characteristic curve is a trade-off between sensitivity and specificity which in most cases are of different clinical significance. Also, the areas under the curve is criticized for lack of coherent interpretation. In this study, we proposed the use of entropy as a summary index measure of uncertainty to compare diagnostic predictors. Noting that a diseased subject who is truly identified with the disease at a lower cut-off will also be identified at a higher cut-off, we substituted time variable in survival analysis for cut-offs in a binary predictor. We then derived the entropy of the functions of diagnostic predictors. Application of the procedure to real data showed that entropy was a strong measure for quantifying the amount of uncertainty engulfed in a set of cut-offs of binary diagnostic predictor.