

## Bivariate Marker Measurements and ROC Analysis

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### Abstract

This talk considers receiver operating characteristic (ROC) analysis for bivariate marker measurements. The research interest is to extend rules and tools from univariate marker model to bivariate marker model for evaluating predictive accuracy of markers. In the bivariate marker setting, an ROC function together with a weighted ROC function (WROC) and their conjugate counterparts are introduced for examining the performance of bivariate markers. Specific features of ROC and WROC functions and other related statistics are discussed in comparison with those familiar features in univariate marker setting. Nonparametric methods are developed for estimating ROC-related functions and (partial) area under curve. The established rules and tools can be used to i) evaluate gain and loss from decision rules based on a single test measurement or bivariate test measurements, and ii) compare performance from different pairs of bivariate markers. The inferential results developed in this talk extend in a straightforward manner to multivariate marker measurements with a sequence of combined 'and', 'or' classifier.

*Keywords:* Area under curve; Multiple testing; Nonparametric estimation; U-statistic.

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