

Misclassification error rate, ROC and AUC of a normally distributed prognostic test

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A test can be a medical test for the presence of a given disease, a test of strength of a material in an industrial setting, or in an educational setting a test to determine the level of understanding of students.

Visualise a test as a machine that takes in certain inputs and outputs results, based on these results certain decisions are made. The nature of a test inputs is usually the characteristics of the test object. In a medical setting, where the test investigates the presence of a disease, the input may be a blood sample from the patient (test object). The strength of a material may be tested by inputting some chemical or physical properties of the material (test object) into a test. Finally, testing the understanding of students may be done by a written exam, where students (test object) give as input into the test their written answers to questions.

In statistics and machine learning the terminology discriminant function is usually used instead of a test. A statistical model is built/trained and the end result is a discriminant function. Usually there is a presence of a training dataset (X_{train}, Y_{train}) and a validation dataset $(X_{validation}, Y_{validation})$.