

# Construction, Visualization and Application of Neutral Zone Classifiers

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**Abstract:** When the potential for making accurate classifications with a statistical classifier is limited, a neutral zone classifier can be constructed by adding a no-decision option as a classification outcome. We show how a neutral zone classifier can be constructed from a receiving operating characteristic (ROC) curve. We extend the ROC curve graphic to highlight important performance characteristics of a neutral zone classifier. Additional utility of neutral zone classifiers is illustrated by showing how they can be incorporated into the first stage of a two-stage classification process. At the first stage, a classification is attempted from easily collected or inexpensive features. If the classification falls into the neutral zone, additional relatively more expensive features can be obtained and used to make a definitive classification at the second stage. The methods discussed in the paper are illustrated with an application pertaining to prostate cancer.