

AbstractID: 7339 Title: Statistical Power of ROC and FROC Experiments in Studies Involving Lesion Localization

Statistical power determines the probability of detecting real differences between imaging modalities and the cost in terms of readers and cases of conducting the study. As such it is an important consideration in an observer performance study. It is likely that the neglect of location information in nodule detection studies, as analyzed by the Receiver Operating Characteristic (ROC) method, can compromise power. The Free-response Receiver Operating Characteristic (FROC) method considers the location information but its usage has been discouraged, since the FROC analysis model neglects correlations between events on the same image. However, testing of the statistical powers of the two methods has not yet been conducted. This study compared the statistical power of ROC and AFROC methodologies using simulations. A new model (XFROC, for Extended FROC) was developed for the decision variable sampling, which included intra-image correlations. The model was used to simulate data for ROC and AFROC analysis. Six readers and 200 cases, half of which contained one signal, were simulated for each trial. Two hundred trials were run equally split between the Null Hypothesis (NH) and the Alternative Hypothesis (AH). In each case the quasi-continuous ratings were analyzed by the DBM method. The net separation of the NH and AH distributions was calculated. It was found that in virtually every case the AFROC method yielded higher power. We conclude that the FROC method can yield higher power than ROC and greater use of this methodology is warranted.