Models of Higher Brain Functions: Empirically derived receiver operating characteristic(ROC)-curves  
  
The following data were observed in a yes-no experiment about taste detection 1

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| --- | --- | --- | --- |
| **“Yes ”** | **Signal trials** | **“Yes”** | **Noise trials** |
| 78 | 285 | 0 | 300 |
| 149 | 292 | 31 | 282 |
| 163 | 286 | 57 | 285 |
| 239 | 295 | 123 | 293 |
| 288 | 300 | 236 | 295 |

Perform the following analyses on these data

**1.** Plot an empirical ROC curve of the data.

**2.** Derive the area under the ROC curve as a measure of sensitivity. (Hint: the trapz-Function from pylab/numpy, might be of interest in this context.

**3.** ROC curves are often fit by a parametric model. The most common of these is the equal variance gaussian model. This model assumes that the values on the decision axis in noise and signal+noise trials follow a normal distribution with a fixed variance σ. They differ however in their means and that difference can be taken as a measure of sensitivity (d data and derive a measure for d to and plotted as z-scores, the ROC curves of the equal variance gaussian model are straight lines. The python function scipy.stats.norm.ppf transforms fractions to z-scores.)

Warning: Pay attention to and deal with the special case of hits = 1.0 or F A = 0.0

**4.** Add the best fitting equal variance gaussian model ROC curve to your plot.

1 Except for one entry the data are in correspondence with Observer 2 from the experiment by Linker et al. (cf. Green & Swets (1966), p. 99, Fig. 4-7.0).

Fit the equal variance gaussian model to the. (Hint: When hits and false alarms are converted 0