

Matlab problem 1

You know (Maxwell's devil told you) that the value of bilirubin in the blood of a healthy person is a Gaussian random variable with mean μ_0 and variance σ_0^2 ; a person with pancreas tumor has the value of bilirubin in the blood which is again Gaussian with mean μ_1 and variance σ_1^2 . You decide that the bilirubin test is positive if the measured bilirubin value is above threshold T .

Write the formulas of your test specificity and sensitivity. Let us say that the incidence of pancreas tumor in the population is p . Write the formulas for the probabilities $P(D_y|T_p)$ that a person really is affected by pancreas tumor given that the test is positive and $P(D_n|T_n)$ that a person really is healthy given that the test is negative.

Write a Matlab script that plots:

1. test sensitivity and specificity as functions of the threshold T
2. $P(D_y|T_p)$ as function of T and p (a surface, you can use mesh or meshc)
3. $P(D_n|T_n)$ as function of T and p (a surface, you can use mesh or meshc)
4. the superimposed contour plots of $P(D_y|T_p)$ and $P(D_n|T_n)$ at probability values 0.5, 0.9, 0.99, 0.999, 0.9999

Use initially

- $\mu_0 = 10, \sigma_0^2 = 4$
- $\mu_1 = 15, \sigma_1^2 = 8$

then, once you can plot the results for this case, change these values and comment the results.