

SESSION 6: READ, USE AND EVALUATE HOW RELEVANT IS A DIAGNOSTIC BINARY TEST

Exercise 1.

Considering the data in the table below reply to the following questions.

1.a Draw the population distribution.

1.b Determine choice of the threshold in a way that sensitivity is the highest possible provided that specificity is 1.

1.c Determine the value specificity for the threshold located in 411 pg/ml

1.d Draw the ROC curve (few points, up to Sensitivity =1)

1.e Calculate the value of precision for when the threshold is chosen at 487.27 pg/ml and at 568.94 pg/ml if prevalence is 1%. Repeat with prevalence 30% and comment.

Concentration pg/ml control	Frequency (%)	Concentration pg/ml cancer	Frequency (%)
0 - 102.56	0.0236	451.32 - 502.78	0.0002
102.56 - 215.47	1.186	502.78 - 568.12	0.0574
215.47 - 256.26	3.315	568.12 - 596.35	5.477
256.26 - 352.12	16.542	596.35 - 652.03	17.192
352.12 - 411.29	25.324	652.03 - 687.12	38.102
411.29 - 487.27	23.213	687.12 - 702.65	23.253
487.27 - 512.51	19.261	702.65 - 751.23	14.618
512.51 - 568.94	9.548	751.23 - 817.06	1.292
568.94 - 654.22	1.568	817.06 - 845.36	0.0045
654.22 - 788.33	0.01488	845.36 - 900.00	0.0001

Exercise 2.

The table below reports the concentration in serum of a biomarker which can diagnose to a certain extent whether a patient is affected by a disease.

2.a Draw the population distribution.

2.b Determine the choice of the threshold in a way that sensitivity is the highest possible provided that specificity is 1. Calculate the corresponding sensitivity.

2.c Determine the value of specificity for the threshold located in 1800 pg/ml.

2.d Draw the ROC curve (up to Sensitivity =1). You can make use of the two points already considered.

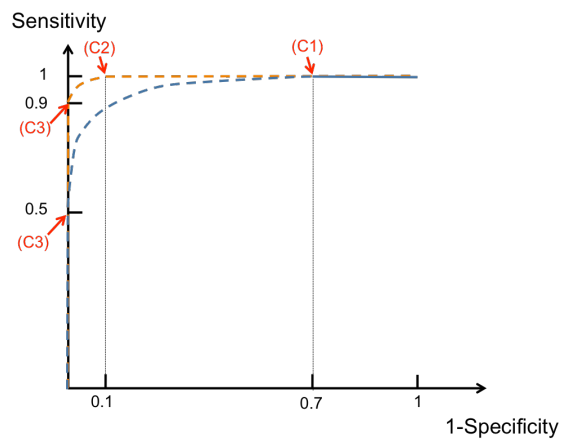
2.e Draw the ideal ROC curve.

Concentration pg/ml control	Frequency (%)	Concentration pg/ml cancer	Frequency (%)
0 - 380	0.007	0 - 1022	0.01
380 - 661	0.06	1022 - 1637	1.3
661 - 1017	5.5	1637 - 1860	3.4
1017 - 1171	17.3	1860 - 2382	16.8
1171 - 1474	38.2	2382 - 2705	25.5
1474 - 1665	23.253	2705 - 3119	23
1665 - 1750	14.3	3119 - 3256	19.3
1750 - 2015	1.3	3256 - 3564	9.5
2015 - 2373	0.01	3564 - 4028	1
2373 - 2528	0.07	4028 - 4759	0.19

Exercise 3.

The figure below represents two ROC curves that are traced for the same biomarker. The curves refer to two different stages of a disease, an early stage and a late stage, respectively.

Three concentrations of the biomarker are indicated on the plots C1, C2, C3.



3.a Indicate which ROC curve represents most likely an “early test” and which one a “late test” (briefly motivate).

3.b Draw the population distributions as you can infer from the ROC curves, indicating C1, C2 and C3 on the axis (no need to indicate values, just their respective positions).