

Homework #4: Operating points

Sara is a veterinarian who treats hamsters for Chomsky disease. About 20 % of hamsters she tests have this disease (luckily, it's not serious, it only makes them run backwards on the running wheel).

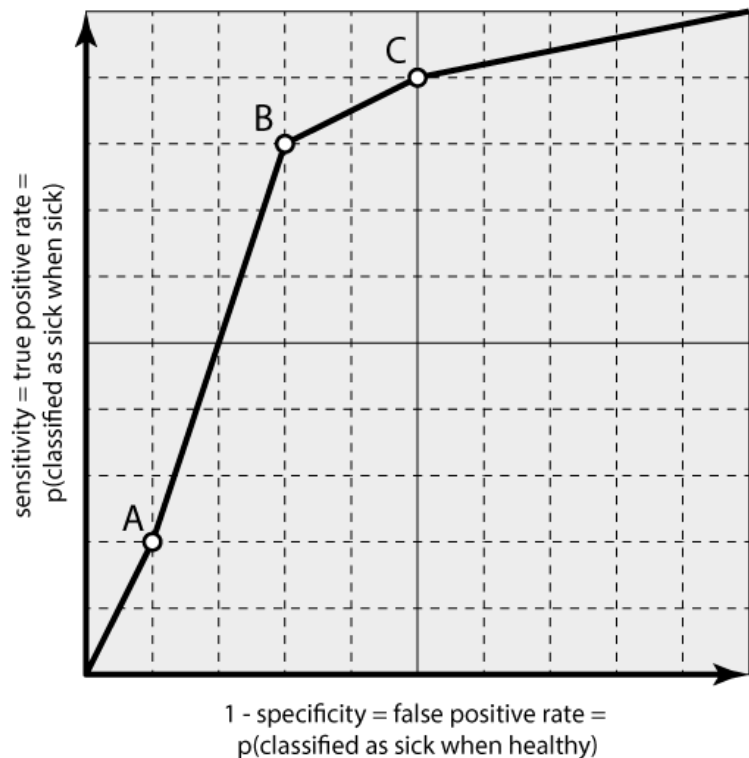
She can make two kinds of mistakes:

- Failing to detect the disease when present costs her 1000 euros (lawsuits etc.).
- Treating a hamster that is actually healthy costs her 600 euros (lawsuits etc.).

Don't worry about her, in both cases she charges enough to survive.

Her choice whether to administer the cure will be based on the classifier that predicts the probability of the disease from the observed symptoms. The classifier she uses is not perfect, as shown in the ROC curve.

- 1 What is the false positive rate at each point marked on the curve?
- 2 What is the true positive rate at each point?
- 3 What are then the probabilities of making one or the other of the above mistakes at each point?
- 4 What is the expected cost of mistakes at each point?
- 5 Sara has accidentally put a sick and a healthy subject (that is, hamster) in the same cage. Now she doesn't know which is which. She is going to diagnose both hamsters and administer the cure to the one which she believes is more likely to be sick. Compute is the probability that she'll pick the **wrong** one.



Submit your homework as PDF (include a title of the homework, your name and email) to bzupan@gmail.com with subject "DM-HW3" (no spaces in the subject title!) by **January 29th**.