

# Exercise: ROC Curve

## Warm-up exercise

You won a lottery prize, you just don't yet know which. The probability that you'll get \$5 is 0.8 and the probability that you'll get \$10 is 0.2. What is the expected value of the prize?

## Now for the exercise:

Sara is a veterinarian who treats hamsters for Chomsky disease. About one half of hamsters she sees have this disease (luckily, the disease is not serious; it only makes hamsters run backwards on the running wheel).

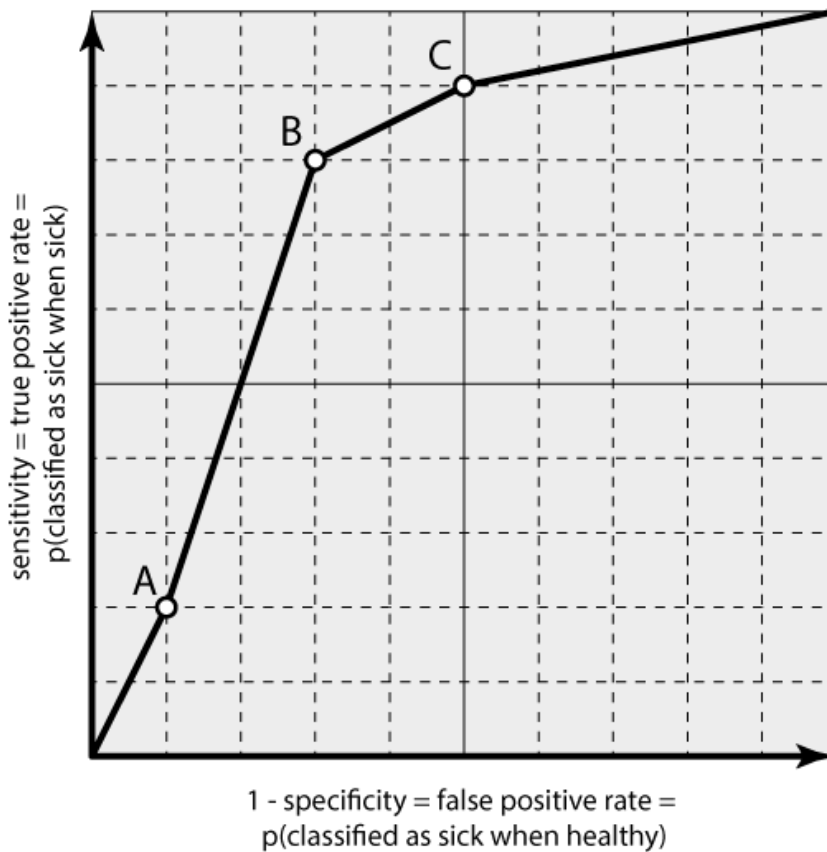


She can make two kinds of mistakes:

- If she fails to detect the disease when it is present, the associated cost (lawsuits etc.) is \$1000.
- If she treats a hamster that is actually healthy, the cost (lawsuits etc.) is \$600.

(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 ROC curve?
- 2 What is the true positive rate at each point?
- 3 What are then the probabilities of making the first or the second type of mistake at each point?
- 4 What is the expected cost of mistakes for each point on the ROC curve?
- 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. What is the probability that she'll pick the **wrong** one?