Course: DD2427 - Exercise Set 3

Exercise 1: *Pen and Paper Exercise*

You will write a face detection algorithm for this course. Imagine at the end of the course, before the final examination, I make you the following offer:

> *I have an image. It has a 50% chance of containing a face. You can pass the course with top marks without taking the final exam if the output from your face detector correctly reports whether the image contains a face or not. However, if it makes the wrong prediction you fail the course.*

Let a be the variable denoting if there is a face in the image and b the output of your algorithm. That is

$$a = \begin{cases} 1 & \text{there is a face in the image} \\ 0 & \text{there is not a face in the image} \end{cases}$$

$$b = \begin{cases} 1 & \text{your algorithm reports there's a face in the image} \\ 0 & \text{your algorithm reports there's not a face in the image} \end{cases}$$

Being a relatively cautious person you would probably accept the offer if:

$$p(a = 1 \,|\, b = 0) \le .01 \quad \text{and} \quad p(a = 0 \,|\, b = 1) \le .01$$

Say your face detection algorithm has a false postive rate

$$f = p(b = 1 \,|\, a = 0) = .001$$

What should the minimum value of the true positive rate $t = p(b = 1 \,|\, a = 1)$ be before you accept the offer ?

For the lecture: 29th of March

Please bring your solution to this problem. A hand written solution is fine, but please make sure it's legible!