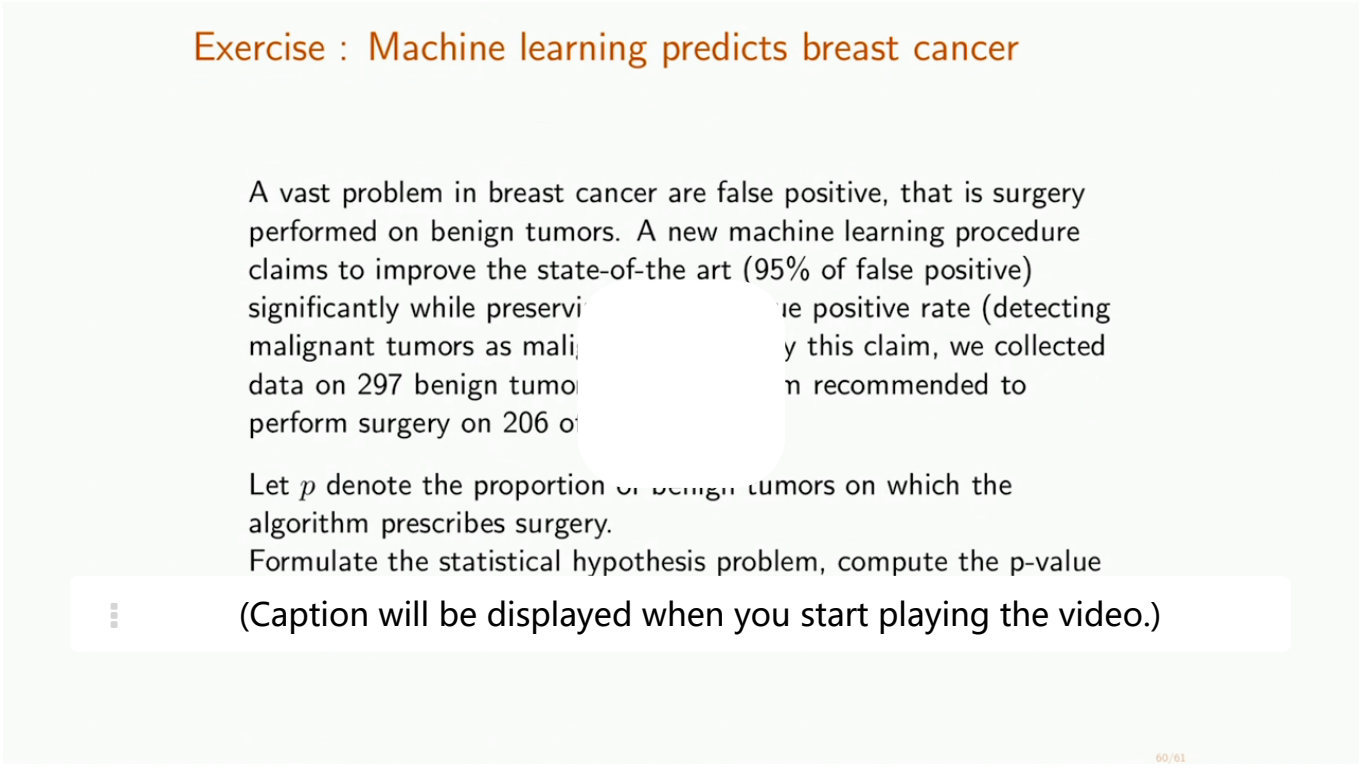
10. Is the False Positives Rate Below 95 Percent?
Worked Example 3: Verifying the Effectiveness of New Machine Learning Algorithm



Start of transcript. Skip to the end.

Here's one that's akin to the YouTube example.

It's extremely confusing in terms of phrasing.

And I just want you to be aware of these things

that we don't really discuss.

It's a tricky way for me to teach you

a little bit about things that are outside

of the scope of this class.

视频
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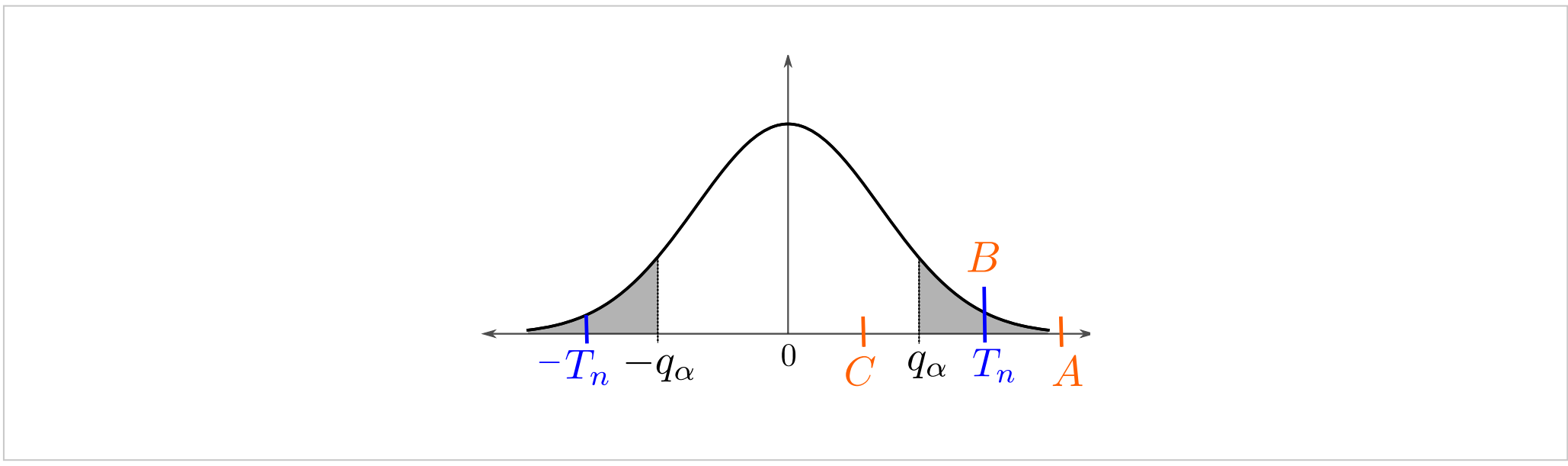
Visualizing the p-value

4/4 points (graded)
Suppose we have a test statistic T_n such that $T_n \sim |Z|$ where $Z \sim N(0,1)$. In particular, for this problem we know the distribution of T_n for any fixed n and not just asymptotically. You design the test

$$\psi_n = \mathbf{1}(T_n > q_{\eta/2})$$

where q_η is the $1-\eta$ quantile of a standard Gaussian (*i.e.*, if $Z \sim N(0,1)$, then $P(Z > q_\eta) = \eta$). If $\psi = 1$, we will reject H_0, and if $\psi = 0$, we will fail to reject H_0.

With this set-up, you observe a data set and compute T_n. Consider the following figure:



On which side, **to the left** or **to the right**, of T_n should the value $q_{\eta/2}$ be such that ψ_n rejects on our data set?

To the left of . ▼ ✔ **Answer:** To the left of T_n.

What is the largest value of $q_{\eta/2}$ such that ψ_n rejects on our data set?

B ▼ ✔ **Answer:** B

What is the smallest value of η so that ψ_n rejects on our data set? (Note that this is the p-value for our data set.)

- $\eta = 2 \times (\text{the area under the curve to the right of A})$
- $\eta = 2 \times (\text{the area under the curve to the right of B})$ ✔
- $\eta = 2 \times (\text{the area under the curve to the right of C})$

Now you observe a new data set and compute a new value of the test statistic, which we denote by T_n'. Suppose that $T_n' < T_n$, *i.e.*, the test statistic has a smaller value than from before.

Will the new p-value be **larger** or **smaller** than the p-value from the previous data set considered in this problem?

- Larger ✔
- Smaller

Solution:

For the first question, if $q_{\eta/2}$ is to the left of T_n (*i.e.*, $q_{\eta/2} < T_n$), then we see that $\psi = \mathbf{1}\left(T_n > q_{\eta/2}\right) = 1$. Hence, we would reject in this situation. For the second question, we know that ψ rejects if $q_{\eta/2}$ is to the left of T_n. Hence, we should make $q_{\eta/2}$ as large as possible so that we still reject. This implies we set $q_{\eta/2} = T_n$, and the correct choice is B. For the third question, note that $\eta/2$ is the area under the curve to the right of $q_{\eta/2}$. Based on the last question, the correct response is "
$\eta = 2^* \left(\text{the area under the curve to the right of B}\right)$". Note that this is the p-value for our data set. For the final question, if $T_n' < T_n$, then we know that the new p-value is the area under the curve to the right of T_n' and to the left of $-T_n'$. Referring to the graphic in this problem, we see that this means the p-value for T_n' will be **larger** than the p-value for T_n.

提交 你已经尝试了2次（总共可以尝试2次）

Answers are displayed within the problem

讨论

显示讨论

主题： Unit 2 Foundation of Inference:Lecture 7: Hypothesis Testing (Continued): Levels and P-values / 10. Is the False Positives Rate Below 95 Percent?

认证证书是什么?