STAT350 Tutorial 7

20/10/2020

This weeks tutorial is going to be relatively short as we've already covered most topics necessary for assignment 4.

Power of a Staistical Test

The power of a test is defined to be

$$Power = 1 - \beta = 1 - P(\text{Type II Error}),$$

where type II error occurs when the null hypothesis is not rejected given the alternative is true. Or, The probability that rejecting the null hypothesis is the correct choice.

What this comes down to is comparing two distributions: the distribution under the null hypothesis to the true distribution of the quantity of interest. Looking at the figure below we see that the power of a test depends on the overlap of these two distributions. When performing a hypothesis test we set a level α with respect to the distribution under the null hypothesis, then compute the corresponding critical value – this is the point where we consider the overlap.
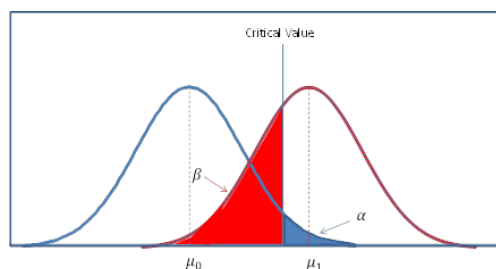

Figure 1: Power of a test as comparing the overlap between two distributions. (Taken from https://www.real-statistics.com/sampling-distributions/statistical-power-sample/)

Given the critical value, there are two main things that affect the power of the hypothesis test: the true value of the quantity of interest and the sample size. As to the former, the farther away the true value from the hypothesized value, resulting in a lower probability of type II error and our test having higher power. Sample size affects the power of the test through it's effect on the variance of the sampling distribution for the quantity of interest. Increasing the sample size results in increased power of the hypothesis test.