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How to calculate a p-vale from the t-distribution for a two-tailed t-test?

Asked 1 year, 4 months ago Active 1 year, 4 months ago Viewed 124 times

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The resulting t statistic from a t-test follows a t-distribution with parameter $k =$ freedom-degrees. For us to compute the probability of t to occur, we use the cumulative distribution function of the t-distribution (CDF_t).

For a left-sided test, this is equal to finding the probability on the y-axis of the CDF, which intersects with the given t value.

For a right-sided test, this is equal to 1 - the left-sided p-value.

What about the two-sided test? I am not sure how this p-value is computed using the CDF.

So far I have only seen this method: (from https://stackoverflow.com/questions/45045802/how-to-do-a-one-tail-pvalue-calculate-in-python)

$$p = CDF_t(t, df) * 2$$

i.e. the left-sided p-value multiplied by two.. which strikes me as odd, as the p-value ranges from 0 to 1, this equation generates a p-value in the domain [0-2].

hypothesis-testing t-test p-value

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asked Apr 30 '20 at 20:49
hirschme
630 7 19

1 Answer

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For an easy way of understanding, the two sided p value turns out to be equal to double the smallest one-sided p value. Since these sum to 1, the smallest is in the domain [0-0.5], so the two sided is in the domain [0,1].

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edited Apr 30 '20 at 21:36

answered Apr 30 '20 at 21:18
E. Rei
151 9

This is easy and (crucially) correct, but why do you say it's intuitive? Perhaps you can elaborate on that. – Dave Apr 30 '20 at 21:29

I guess intuitive wasn't the right word to use. Kind of meant easy to remember. Edited that out of the answer – E. Rei Apr 30 '20 at 21:36

1 @H.Green that makes sense. But it also means that the equation I wrote in the question is incomplete right? – hirschme Apr 30 '20 at 22:22