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On the T-test

S.Y. Novak

(Submitted on 28 Dec 2020)

<https://export.arxiv.org/abs/2012.14530>

The T-test is probably the most popular statistical test; it is routinely recommended by the textbooks. The applicability of the test relies upon the validity of normal or Student's approximation to the distribution of Student's statistic  $t_n$ . However, the latter assumption is not valid as often as assumed. We show that normal or Student's approximation to  $\sqrt{L(t_n)}$  does not hold uniformly even in the class  $P_n$  of samples from zero-mean unit-variance bounded distributions. We present lower bounds to the corresponding error. The fact that a non-parametric test is not applicable uniformly to samples from the class  $P_n$  seems to be established for the first time. It means the T-test can be misleading, and should not be recommended in its present form. We suggest a generalisation of the test that allows for variability of possible limiting/approximating distributions to  $\sqrt{L(t_n)}$ .