True or False

Instructions :

Be very careful with the multiple choice questions below. Some are "choose all that apply," and many tests your knowledge of when particular statements apply.

As in the rest of this exam, only your last submission will count.

(a)

1/1 point (graded)
The likelihood ratio test is used to obtain a test with non-asymptotic level α.

○ True

◉ False ✔

Solution:

The likelihood ratio test relies on Wilks Theroemis and (under subject to technical conditions), and is used to obtain test with specified asymptotic levels.

| Submit | You have used 1 of 3 attempts |

ⓘ Answers are displayed within the problem

(b)

1/1 point (graded)
The sample mean and the sample variance of i.i.d. random variables are always independent.

○ True

◉ False ✔

Solution:

This is a consequence of Cochran's theorem when the random variables are Gaussian random variables. However Cochran's theorem does not hold for general i.i.d. random variables.

| Submit | You have used 1 of 3 attempts |

ⓘ Answers are displayed within the problem

(c)

1/1 point (graded)

Let U be a standard Gaussian random variable and V be a χ^2 random variable with d degrees of freedom. (No other assumptions are made about U and V.) Then, $\sqrt{d}\frac{U}{\sqrt{V}}$ is a Student t random variable with d degrees of freedom.

- ○ True
- ⦿ False ✔

Solution:

Note that $\sqrt{d}\frac{U}{\sqrt{V}}$ is a Student random variable with d degrees of freedom only if U and V are **==independent==**. If U and V are not independent then $\sqrt{d}\frac{U}{\sqrt{V}}$ does not have the distribution of a Student random variable with d degrees of freedom.

Submit   You have used 1 of 3 attempts

ⓘ Answers are displayed within the problem

(d)

1/1 point (graded)
Student's t test can be run even with a small sample size, as long as the data are i.i.d. Gaussian.

- ⦿ True ✔
- ○ False

Solution:

The Student's test applies for all sample sizes, because the given data is Gaussian, and the Central Limit Theorem is not needed as a source of normality.

Submit   You have used 1 of 3 attempts

ⓘ Answers are displayed within the problem

(e)

1/1 point (graded)
If $X_1, \ldots, X_n$ are i.i.d. random variables on a finite discrete sample space E, a χ^2-test can be run in order to test if the unknown distribution of X_1 is uniform on E.

Note: (added May 4) You may assume n is sufficiently large.

- ⦿ True ✔
- ○ False

Solution:

A ==χ^2 test can be used to check whether a random variable has any distribution over a finite space E.== In particular it can be used to test whether the samples are uniform for E. (As seen in lectures and homework, the χ^2 test can also be adapted to test for continuous distributions or even families of distributions.)

Submit   You have used 1 of 3 attempts