**APPLIED STATISTICS EXAM**

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**STUDENT:** FILIPPO CIPRIANI

**PERSONA CODE:** 10956877

**EXERCISE NUMBER N**

First of all we check that the datas belong to a [N]variate normal distribution, to do so we perform a Shapiro test on the whole data obtaining a p-value of [P-value], so we decide to accept the null hypothesis that datas come from a [N]variate normal distribution.

We proceed to perform the test calculating the T2 statistic and the quantile of the Fisher distribution with alpha = [ALPHA] multiplied by (n-1)p/(n-p), which was equal to [CFR.FISHER], it was way lower than the T2: [T2], and the pvalue is very very close to [P-VALUE]:

we cannot accept the hypothesis that [H0 mu = Muo vs H1].

[PLOT WITH CONFIDENCE REGION/MU0]

Here we can see the plot of the data, in particular we have a [COLOR] point at [MU0] and another (with the ellipse) at the sample mean of [SAMPLE MEAN]. We can see the confidence ellipse of level [1-ALPHA]% for the mean in red.

Its radius is [RADIUS], the two semi-axes have length of [SEMI\_AXES]. The two directions are respectively [EIGENVECTS] and [EIGENVECT2]. The point [MU0] is clearly outside/inside the confidence ellipse for the mean. This leads us to conclude again that….

The confidence region is defined as:

Change p =2, F(1-alpha,p,n-p)

E = { m in R^2 | n ( x\_ - m ) ‘ S^(-1) (x\_ - m ) < F (0.95, 2, 98) \* (n-1) \* p / (n – p )}

Where x\_ is the sample mean, S the sample covariance matrix, F is the quantile of the Fisher with confidence of 0.95 and the degrees of freedom p = [P] and n – p = [n-p] (n = [N] number of observations, p = [P] number of variables).

Keeping the [1-ALPHA]% of global confidence we proceed to compute the simultaneous T2 intervals for the two means:

# EXAMPLE:

50 is not even in any of the confidence intervals for the means of the two values, since the have lower bounds respectively of 77.37913 and 90.31843. This is an additional confirmation that the true mean is not (50,50).

**POINT A)**

**POINT B)**

**POINT C)**

**POINT D)**