APPLIED STATISTICS EXAM **18/01/2023**

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EXERCISE 1

A)

We want to compare two independent gaussian populations: red and white wine.

To verify if the mean between these two sets is different, we perform a statistical test with level of confidence 95%:

H0: delta1=0, delta2=0, delta3 = 0 H1: at least one of the delta is different from zero

The result of the test is false and we reject H0: there is statistical evidence that e mean of the three variables differ for red and white wines.

B)

The mathematical expression for the rejected region is an ellipse with the centre in delta, the radius equal to the square root of the pivotal quantity and the shape given by covariate spooled matrix divided by n.

The centre of rejected region is delta = (0,0,0), while the value of the statistical test is 40.90507.

C)

The p-value is 1.945724e-06, which is lower than 0.05.

D)

We need to verify two assumptions: gaussianity and the fact that the two samples must have the same covariance.

For the first assumption, we check it with a Shapiro.test: 0.48 (white) and 0.1856(red), so they are both gaussian.

For the second assumption, we compare visually the two covariance matrix and they are quite similar. We can also perform a bartlett.test.

E)

	inf	mid	sup
alcohol	-0.511525332	0.1687878788	0.849101089
density	-0.002769577	-0.0008324675	0.001104642
acidity	-2.945373159	-2.0677056277	-1.190038096

Looking at the three Bonferroni intervals we can notice that both alcohol and density have a similar mean for both types of wine, while acidity is much higher in the red wine.