SADS Problem-6

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Perspiration from a sample of 20 healthy females was analyzed. Three components, X_1 = Sweet rate, X_2= Sodium content and X_3= Potassium content, were measured and the results, which we call the sweat data are given in the below table.

Sweat Data			
Individual	X_1 (Sweat rate)	X_2 (Sodium)	X_3 (Potassium)
1	3.7	48.5	9.3
2	5.7	65.1	8.0
3	3.8	47.2	10.9
4	3.2	53.2	12.0
5	3.1	55.5	9.7
6	4.6	36.1	7.9
7	2.4	24.8	14.0
8	7.2	33.1	7.6
9	6.7	47.4	8.5
10	5.4	54.1	11.3
11	3.9	36.9	12.7
12	4.5	58.8	12.3
13	3.5	27.8	9.8
14	4.5	40.2	8.4
15	1.5	13.5	10.1
16	8.5	56.4	7.1
17	4.5	71.6	8.2
18	6.5	52.8	10.9
19	4.1	44.1	11.2
20	5.5	40.9	9.4

Population mean vector for Sweat rate, Sodium content and Potassium content is given as $\mu_0^{'}=[4,50,10]$. Test the hypothesis $H_0:\mu^{'}=\mu_0^{'}$ against $H_1:\mu^{'}\neq\mu_0^{'}$ at given level of significance $\alpha=0.05$ $[F_{(3,17)}(0.05)=3.197]$.

H_0:μ'=μ_0 Against H_1: μ'≠μ_0

##Import the data from the excel problem_6 setwd(C:\Users\Admin\OneDrive\Desktop\santosh)

```
setwd("C:\\Users\\Admin\\OneDrive\\Desktop\\santosh")
getwd()
```

```
## [1] "C:/Users/Admin/OneDrive/Desktop/santosh"
```

```
data=read.csv("problem_6.csv")
data
```

```
##    X1..Sweat.rate. X2..Sodium. X3..Potassium.
## 1              3.7        48.5            9.3
## 2              5.7        65.1            8.0
## 3              3.8        47.2           10.9
## 4              3.2        53.2           12.0
## 5              3.1        55.5            9.7
## 6              4.6        36.1            7.9
## 7              2.4        24.8           14.0
## 8              7.2        33.1            7.6
## 9              6.7        47.4            8.5
## 10             5.4        54.1           11.3
## 11             3.9        36.9           12.7
## 12             4.5        58.8           12.3
## 13             3.5        27.8            9.8
## 14             4.5        40.2            8.4
## 15             1.5        13.5           10.1
## 16             8.5        56.4            7.1
## 17             4.5        71.6            8.2
## 18             6.5        52.8           10.9
## 19             4.1        44.1           11.2
## 20             5.5        40.9            9.4
```

##given that the population mean and covariance matrix inverse of covariance matrix

```
Mu=c(4,50,10)
Mu
```

```
## [1]  4 50 10
```

```
x=colMeans(data)
x
```

```
## X1..Sweat.rate.     X2..Sodium.  X3..Potassium.
##           4.640          45.400           9.965
```

```
s=cov(data)
s
```

```
##                 X1..Sweat.rate. X2..Sodium. X3..Potassium.
## X1..Sweat.rate.        2.879368     10.0100      -1.809053
## X2..Sodium.           10.010000    199.7884      -5.640000
## X3..Potassium.        -1.809053     -5.6400       3.627658
```

```
inv=solve(s)
inv
```

```
##                 X1..Sweat.rate.  X2..Sodium. X3..Potassium.
## X1..Sweat.rate.      0.58615531 -0.022085719    0.257968742
## X2..Sodium.         -0.02208572  0.006067227   -0.001580929
## X3..Potassium.       0.25796874 -0.001580929    0.401846765
```

To finding the transpose matrix

```
y=t(x-Mu)
y
```

```
##      X1..Sweat.rate. X2..Sodium. X3..Potassium.
## [1,]            0.64        -4.6         -0.035
```

```
z=(x-Mu)
z
```

```
## X1..Sweat.rate.     X2..Sodium.  X3..Potassium.
##           0.640          -4.600          -0.035
```

To find the T square matrix

The sample mean x^- to the test value μ_0

$T^2=n(x^-—\mu_0)^2/s^2=n(x—\mu_0)'(s^2)^{-1}(x^-\mu_0)$

for natural generalizationof the square distance in multivariate analog

$T^2=n(x—\mu_0)'(s/n)^{-1}(x^-\mu_0)=n(x—\mu_0)'(s)^{-1}(x^-\mu_0)$

```
T2=20*y%*%inv%*%z
T2
```

```
##          [,1]
## [1,] 9.738773
```

Comparision of data with f distribution

```
tcal=T2*(20-3)/((20-1)*3)
tcal
```

```
##          [,1]
## [1,] 2.904546
```

Result:-tcal<Ftab there is evidence to fail the null hypothesis. i.e. reject the null hypothesis