# STATISTICS FOR ENGINEERS

# MAT2001

# LAB TASK – 5

**NAME –** **SPARSH ARYA**

**REGISTRATION NO –** **17BEC0656**

**CLASS NO –** **VL20191000424**

**SLOT –** **L49+L50**

**FACULTY –** **PROFESSOR SUJATHA V.**

***T-test -***

***Single Mean Test -***

*An outbreak of salmonella-related illness was attributed to ice produced at a certain factory. Scientists measured the level of Salmonella in 9 randomly sampled batches ice cream. The levels(in MPN/g) were -*

*(0.593, 0.142, 0.329, 0.691, 0.231, 0.793, 0.519, 0.392, 0.418)*

*Is there evidence that the mean level of Salmonella in ice cream greater than 0.3 MPN/g?*

```
> x=c(0.593,0.142,0.329,0.691,0.231,0.793,0.519,0.392,0.418)
> t.test(x,alternative="greater",mu=0.3)

        One Sample t-test

data:  x
t = 2.2051, df = 8, p-value = 0.02927
alternative hypothesis: true mean is greater than 0.3
95 percent confidence interval:
 0.3245133       Inf
sample estimates:
mean of x
0.4564444
```

*From the output we see that the p-value = 0.029. Hence, there is moderately strong evidence that* ***the mean Salmonella level in the ice cream is not above 0.3MPN/g****.*

***For two samples (independent) -***

*Comparing two independent sample means, taken from two populations with unknown variances. The following data shows the heights of individuals of two different countries with unknown population variances. Is there any significant difference between the average heights of two groups.*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **A** | 175 | 168 | 168 | 190 | 156 | 181 | 182 | 175 | 174 | 179 |
| **B** | 185 | 169 | 173 | 173 | 188 | 186 | 175 | 174 | 179 | 180 |

```
> x=c(175,168,168,190,156,181,182,175,174,179)
> y=c(185,169,173,173,188,186,175,174,179,180)
> t.test(x,y)

        Welch Two Sample t-test

data:  x and y
t = -0.94737, df = 15.981, p-value = 0.3576
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -11.008795   4.208795
sample estimates:
mean of x mean of y
    174.8     178.2
```

*The p-value > 0.05, we conclude that* ***the means of the two groups are significantly similar****.*

***F-test -***

*Five Measurements of the output of two units have given the following results (in kilograms of material per one hour of operation). Assume that both samples have been obtained from normal populations, test at 10% significance level if two populations have the same variance.*

| | | | | | |
|---|---|---|---|---|---|
| **A** | 14.1 | 10.1 | 14.7 | 13.7 | 14.0 |
| **B** | 14.0 | 14.5 | 13.7 | 12.7 | 14.1 |

$H_0: S_1^2 = S_2^2$

$H_1: S_1^2 \neq S_2^2$

```
> x=c(14.1,10.1,14.7,13.7,14.0)
> y=c(14.0,14.5,13.7,12.7,14.1)
> var.test(x,y)

        F test to compare two variances

data:  x and y
F = 7.3304, num df = 4, denom df = 4, p-value = 0.07954
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
  0.7632268 70.4053799
sample estimates:
ratio of variances
          7.330435
```

*Here p value is greater than 0.05, thus there is* ***no evidence to reject the null hypothesis.***

## *$X^2$ Test -*

*The below table mentions the anxiety level of the students according to the family type. Determine if the two variables are dependent on each other.*

| Family Type | Anxiety Levels | | |
|---|---|---|---|
| | **Low** | **Medium** | **High** |
| **Joint** | 35 | 42 | 61 |
| **Nuclear** | 48 | 51 | 68 |

```
> d=matrix(c(35,42,61,48,51,68),ncol=3,byrow=T)
> d
     [,1] [,2] [,3]
[1,]   35   42   61
[2,]   48   51   68
> chisq.test(d)

        Pearson's Chi-squared test

data:  d
X-squared = 0.53441, df = 2, p-value = 0.7655
```

*As p value > 0.05, thus it can be concluded that* ***the variables are dependent on each other.***