**E**stimation **A**nd **C**onfidence **I**ntervals

**Scenario**

A manufacturer of print-heads for personal computers is interested in estimating the mean durability of their print-heads in terms of the number of characters printed before failure. To assess this, the manufacturer conducts a study on a small sample of print-heads due to the destructive nature of the testing process.

**Data**

A total of 15 print-heads were randomly selected and tested until failure. The durability of each print-head (in millions of characters) was recorded as follows:

1.13, 1.55, 1.43, 0.92, 1.25, 1.36, 1.32, 0.85, 1.07, 1.48, 1.20, 1.33, 1.18, 1.22, 1.29

**Assignment Tasks**

**a. Build 99% Confidence Interval Using Sample Standard Deviation**

Assuming the sample is representative of the population, construct a 99% confidence interval for the mean number of characters printed before the print-head fails using the sample standard deviation. Explain the steps you take and the rationale behind using the t-distribution for this task.

**b. Build 99% Confidence Interval Using Known Population Standard Deviation**

If it were known that the population standard deviation is 0.2 million characters, construct a 99% confidence interval for the mean number of characters printed before failure.

**Data given data**

Number of samples = n = 15 no.s

Durability of samples (in million of charcters) = [1.13, 1.55, 1.43, 0.92, 1.25, 1.36, 1.32, 0.85, 1.07, 1.48, 1.20, 1.33, 1.18, 1.22, 1.29]

**#In python**

* import **pandas** as **pd**
* import **numpy** as **np**
* from **scipy** import **stats**
* n = 15
* sample = [1.13, 1.55, 1.43, 0.92, 1.25, 1.36, 1.32, 0.85, 1.07, 1.48, 1.20, 1.33, 1.18, 1.22, 1.29]
* sample = np.array(sample)

**#**point estimation or mean estimation

* sample.**mean()**
* **1.2386666666666666**

#sample standard deviation

* sample.**std()**
* **0.18661427836285438**

**#Task 1**- assuming the sample is representing population to find **99% confidence interval.**

n < 30 , we use t-interval.

* stats.t.interval(0.99,14, sample.**mean(),** scale = (sample.**std()/np.sqrt(**15**)**))

#99% confidence interval

* **(1.0952316686385626, 1.3821016646947706)**

99% confidence interval for the mean number of characters

printed before the print-head fails= **(1.0952316686385626, 1.3821016646947706)**

**#Task-2 –** If it were known as population, confidence interval at 99% .

If Standard deviation = 0.2 million characters.

* Stats.norm.interval(0.99,sample.**mean(),** 0.2/**np.sqrt**(15))

#99% confidence interval

* **(1.1056514133957607, 1.3716819199375725**)
* 99% confidence interval for the mean number of characters printed before the print-head fails.When population standard deviation is known = **(1.0952316686385626, 1.3821016646947706)**