Statistics Assignment 5

1. How are you going to figure out the average height of trees in Karnataka?
Answer:
We don't know that total how many trees are there in Karnataka. So let assume we have Population Size be **N**. Now to find average height of all trees, we have find Population Mean i.e. $\boldsymbol{\mu}$.
Since the population size is too large so we took some sample trees which will be represent the population fairly and known as Sample Size, expressed as **n**. The sample should be such that **n < N**. The sample size should always be less than population size.
Now we find Sample Mean, expressed as $\overline{\mathbf{X}}$ and this sample mean is the average height of the sample.
After this we can perform Hypothesis testing to find whether the sample mean $\overline{\mathbf{X}}$ is equal to population mean $\boldsymbol{\mu}$ or not.

2. What is Hypothesis testing and How does it work?
Answer:
Hypothesis testing is an act of testing a hypothesis or assumptions regarding the given population parameter. We can also say that it quantifies an observation of an experiment under a given assumption.
Working of Hypothesis testing:-

i. Null Hypothesis (H0) – Here we assume that everything is fair/equal/same.
ii. Alternate Hypothesis (H1) – Here we assume everything is unequal/unfair or unequal biased.
iii. Calculate Significance value (α)
iv. Perform Experiments – Like Z test, T test, etc. From this experiment we will get p value.
v. State the Decision – Based on above performed experiment,
If (p-value) $\leq$ (α value) then Reject Null Hypothesis (H0) and Accept Alternate Hypothesis (H1).
If (p-value) $>$ (α value) then Accept Null Hypothesis (H0) and Reject Alternate Hypothesis (H1).

3. Explain the difference between Alpha and Beta errors. Which inaccuracy is the most hazardous?
Answer:
Alpha Error is also known as Type 1 Error. This error occurs whenever there is rejecting of Null Hypothesis (H0), when in reality it is true.

A Type 1 error is a False Positive conclusion. For example, The test result says you have failed the exam, but you actually don't.

Beta Error is also known as Type 2 Error. This error occurs whenever there is retaining (accepting) of Hull Hypothesis (H0), when in reality it is false.
A Type 2 error is a False Negative conclusion. For example, The test result says you don't have failed the exam, but you actually do.

Which one is more hazardous? It depends on the circumstances. In some circumstances, Alpha may be and in some other circumstances, Beta may be.
But may be in general, Alpha errors can be more hazardous than Beta errors. (May be)

4. What is the significance of p-value?
Answer:
P-value used to find the randomness of an observation. For example, consider Touchpad in laptops. It is in shape of square. Maximum number of time a user touches the touchpad only around its centre part as compared to corners and edges region. If the p-value of centre is 0.85, then it means that out of 100 times, 85 times a user touches the touchpad around its centre region only.

P-value is the probability for the Null Hypothesis (H0) to be true.
If (p-value) $\leq$ (α value) then Reject Null Hypothesis (H0) and Accept Alternate Hypothesis (H1).
If (p-value) $>$ (α value) then Accept Null Hypothesis (H0) and Reject Alternate Hypothesis (H1).

5. What is the Probability Distribution Function and How does it work?
Answer:
Probability Distribution Function is also known as Probability Density Function i.e. pdf.
It nothing but Smoothened version of a Histogram.
Pdf gives a curve and represent that at any point (with respect to x- axis) on that curve, what is the percentage of total distribution falls within the area of that point.
Pdf can tell mean, variance, standard deviation, skewness of curve etc.