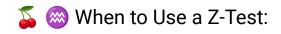# Data Science Notes by Sarowar Ahmed

📊 **Chapter: inferential statistics**

📊 **Topic: Z-Test**

📣 What is a Z-Test?

▪ A z-test is a type of hypothesis testing used to determine whether there is a significant difference between the mean (average) of a sample and the mean of a population. This test is especially useful when the population variance is known and the sample size is large (generally over 30).

🍒 ♒ When to Use a Z-Test:

▪ Comparing a sample mean to a population mean

Testing differences between two sample means (with known population variances)

➕ Formula:

The formula for a one-sample z-test is:

$z = (\bar{x} - \mu)/(\sigma/\sqrt{n})$

Where:

▪ $\bar{x}$ = sample mean
▪ μ = population mean
▪ σ = population standard deviation
▪ n = sample size

📗 Example:

▪ A university claims that its students average 75 on a national knowledge test. A local journalist, skeptical of this claim, surveys 50 students who recently took the test, finding an average score of 72. The standard deviation of scores nationwide is known to be 10.

Using the z-test formula:

$z = (72 - 75)/(10/\sqrt{50}) = -3/1.41 = -2.13$

A z-value of -2.13 indicates that the sample mean is 2.13 standard deviations below the claimed population mean. This can then be compared to a critical value (from a z-table) to determine significance, often at the 5% level (z = ±1.96).

💡 Why is this useful?

▪ Understanding z-tests helps businesses, policymakers, and researchers make informed decisions by confirming hypotheses with actual data. Whether it's assessing customer satisfaction, effectiveness of a medical treatment, or performance of educational initiatives, z-tests provide a clear path to statistically significant conclusions.

📈 Z-tests bridge the gap between theory and real-world applications, ensuring decisions are backed by solid statistical evidence!

Got any questions on the Z-Test? Feel free to ask me via Linkedin! Let's keep learning together.

My LinkedIn   Date: 08/05/2024

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