Data Science Notes by Sarowar Ahmed

📊 **Chapter: inferential statistics**

📊 **Topic: Power Analysis**

📢 What is Power Analysis?

▪ Power analysis is a statistical method used to determine the sample size needed for a study to detect a significant effect if one truly exists. It assesses the probability of correctly rejecting the null hypothesis (i.e., finding a true effect) based on factors like sample size, effect size, and significance level.

➕ Formula:

The formula for power analysis depends on various factors, including effect size, significance level, and desired power (usually set at 0.80 or higher). One commonly used formula for calculating power is based on the non-central t-distribution:

Power=$1-\beta$

▪ Where β represents the probability of a type II error (failing to reject the null hypothesis when it's false).

📗 Example:

▪ Suppose a researcher wants to conduct a study to test the effectiveness of a new drug in reducing blood pressure. Based on previous research, they estimate the effect size to be 0.5, the significance level to be 0.05, and the desired power to be 0.80. Using these values, they can perform a power analysis to determine the required sample size to detect a significant effect with 80% power.

💡 Why is Power Analysis Useful?

▪ Power analysis allows researchers to:

1. Determine sample size: Ensure studies have sufficient statistical power to detect meaningful effects.

2. Plan studies effectively: Allocate resources efficiently and design studies that yield reliable results.

3. Interpret findings: Understand the likelihood of detecting true effects and assess the robustness of study conclusions.

🔍 Key Takeaway:

▪ Understanding power analysis is crucial for ensuring the reliability and validity of research findings, ultimately enhancing the quality of scientific inquiry and decision-making.

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

My LinkedIn   Date: 13/05/2024

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