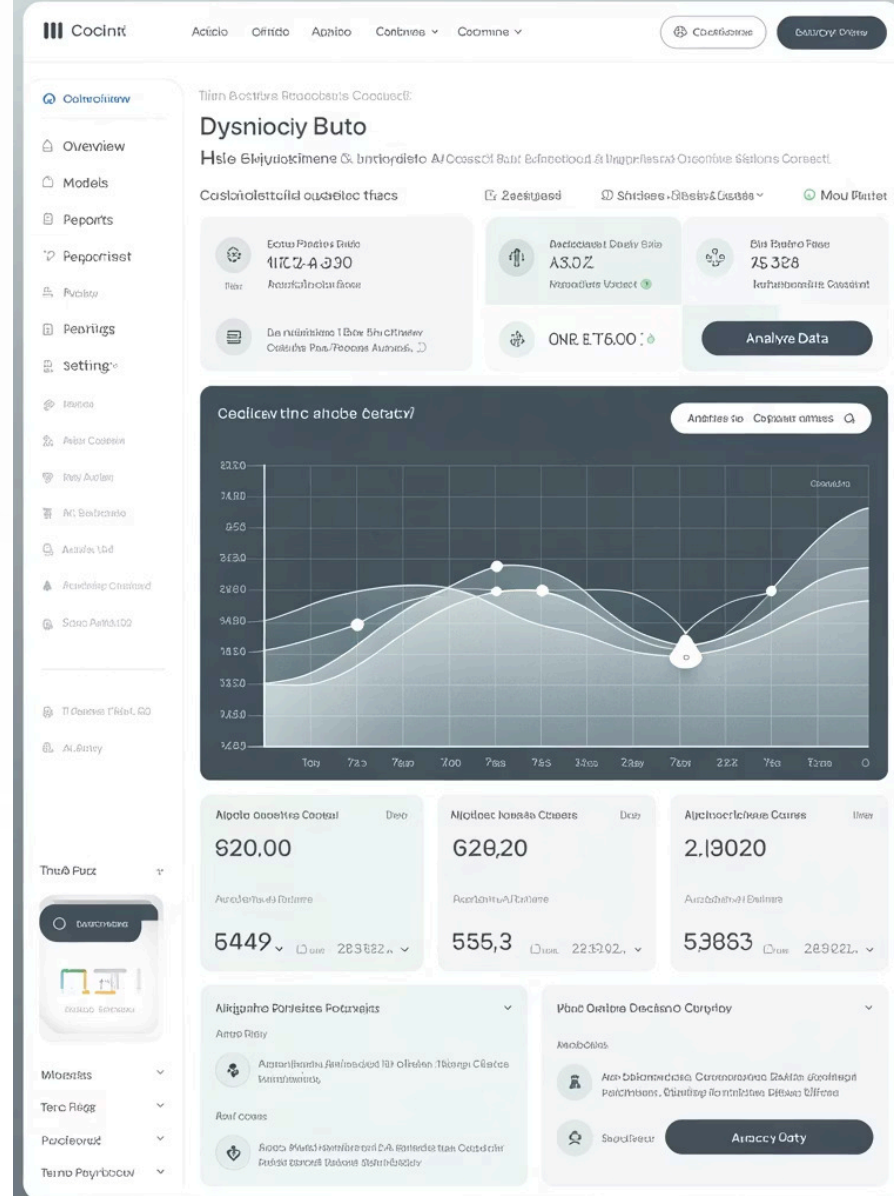


Inferential Statistics & Hypothesis Testing

Welcome to Week 2! Today we'll explore how businesses draw conclusions from sample data through inferential statistics.



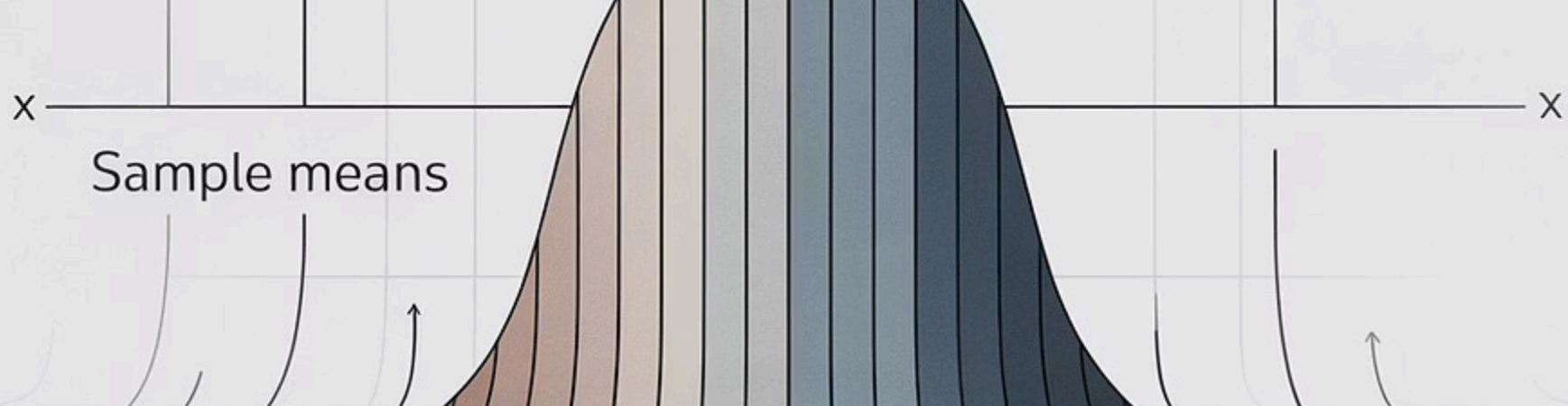
From Description to Inference

Descriptive Statistics

- Summarizes existing data
- Measures central tendency
- Calculates spread and distribution

Inferential Statistics

- Makes predictions beyond sample
- Tests theories about populations
- Quantifies uncertainty in findings



Sampling Distributions & Central Limit Theorem

Population Data

The complete set of observations that we wish to study.

Random Sampling

Drawing representative subsets from the population.

Central Limit Theorem

Sample means approach normal distribution as sample size increases.

Formulating Hypotheses

Null Hypothesis (H_0)

States no effect or difference exists.

Example: "The new marketing strategy has no effect on sales."



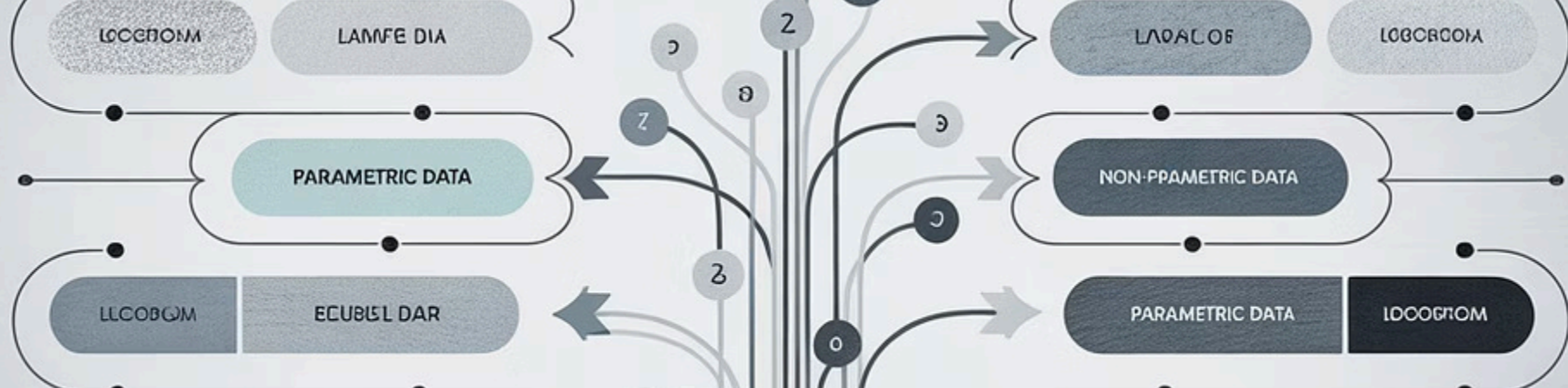
Alternative Hypothesis (H_1)

States an effect or difference exists.

Example: "The new marketing strategy increases sales."

Statistical Error Types

Error Type	Definition	Business Consequence
Type I Error	Rejecting a true null hypothesis (false positive)	Implementing ineffective strategies, wasting resources
Type II Error	Failing to reject a false null hypothesis (false negative)	Missing opportunities, failing to implement effective changes



Choosing the Right Statistical Test

?

Define Question

Are you comparing groups? Looking for relationships? Testing proportions?



Assess Data Type

Categorical, ordinal, or continuous variables? Independent or paired samples?



Select Test

T-test, ANOVA, chi-square, regression, or non-parametric alternatives.

Interpreting Results in Business Context

Statistical Significance

- P-value < 0.05 indicates significance
- Confidence intervals provide result ranges
- Effect size measures practical importance

Business Implications

- Statistical vs. practical significance
- Cost-benefit analysis of findings
- Using results for strategic decisions

Practice Task: Marketing Campaign Analysis

1 Define Hypotheses

H_0 : New campaign conversion rate = old campaign rate

H_1 : New campaign conversion rate > old campaign rate

2 Collect & Analyze Data

Gather conversion metrics from both campaigns.

Run appropriate statistical test (t-test or z-test).

3 Interpret Results

Determine if difference is statistically significant.

Calculate ROI and practical business impact.