Hypothesis Testing

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Objectives

— Define null and alternative hypotheses

— Define and calculate the t-statistic, p-value

— Describe how to apply a t-test

Hypothesis Testing

Example: Say we are testing the efficacy of a new blood pressure drug.

— 50 people receive placebo (control group)

— 50 people receive treatment (experimental group)

— These 100 people are a random sample from the population

Hypothesis Testing

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Question: What should be considered a significant (non-random) effect?

t-Test

t-statistics: a measure of the **degree by which our groups differ** (standardized by the variance of measurement)

p-value: a metric that indicates the probability that our measured difference **was due to random change** in the sampling of subjects

A p-value is the probability of getting our sample data, given whatever measurement we actually observed, assuming the null hypothesis is true.

Drug testing

Data: BPs of participants in two groups: x_i
Statistic: mean BP of each group: $\bar{x}_E$ and $\bar{x}_C$

— Null hypothesis, **H0**: $\bar{x}_E - \bar{x}_C = 0$

— Alternative hypothesis, **H1**: $|\bar{x}_E - \bar{x}_C| > 0$

$$p\text{-value} \leftarrow P(\text{data} \quad | \quad \bar{x}_E - \bar{x}_C = 0)$$

Why is this called a t-test**?**

In practice we use t-distribution rather than a **normal distribution**.

Python Time

go to notebook frequentist-hypothesis-test-ttests-pvalues.ipynb