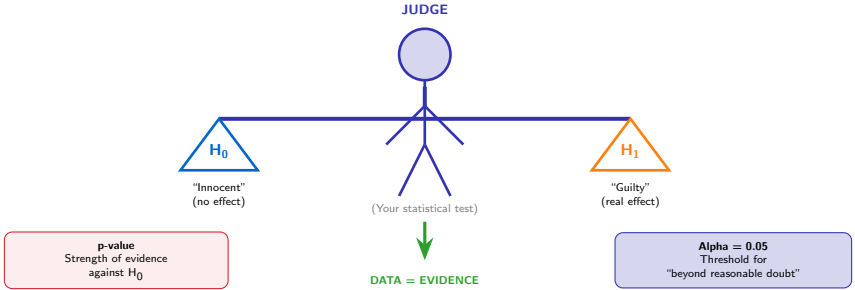
Hypothesis Testing in 5 Slides

Everything You Need to Know

Statistical Data Analysis Course

March 14, 2026

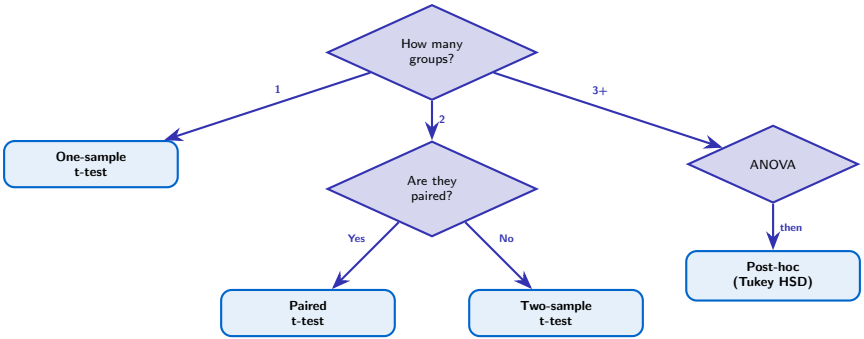
What Is Hypothesis Testing?



- H_0 is **assumed true** until the data says otherwise (innocent until proven guilty)
- A **small p-value** (below 0.05) means the evidence is strong enough to reject H_0
- We never "prove" H_1 – we only reject or fail to reject H_0

Hypothesis testing = putting your claim on trial with data as evidence

Pick Your Test in 10 Seconds



Data not normal? Use non-parametric alternatives: Mann-Whitney (2 groups), Kruskal-Wallis (3+ groups)

Start with "how many groups?" – the rest follows

Read Your Results Like a Pro

Always report these **three** things:

1

p-value

Is it below 0.05?

Yes → "Statistically significant"

No → Cannot reject H_0

But always check the next two!

2

Effect Size

Cohen's d:

0.2	Small
0.5	Medium
0.8	Large

How big is the difference, really?

3

Confidence Interval

Does it include 0?

No → Effect is real

Yes → Uncertain

Shows the plausible range of the effect

A tiny p-value with a tiny effect size = statistically real but practically useless

The 4 Deadly Sins

× p-hacking

Running many tests until one gives $p < 0.05$, then reporting only that one.

Like flipping coins until you get 10 heads in a row, then calling it "significant."

× Too Small a Sample

Underpowered studies miss real effects (high Type II error rate).

Do a **power analysis** before collecting data to find the right sample size.

× Ignoring Effect Size

Celebrating "significant!" when the actual difference is negligible.

With n=10,000, even a difference of 0.001 can be "significant."

× Multiple Testing

20 tests at α=0.05 gives a 64% chance of at least one false positive.

Apply **Bonferroni** or **FDR** correction when running multiple comparisons.

Avoid these four mistakes and you'll be ahead of most published research