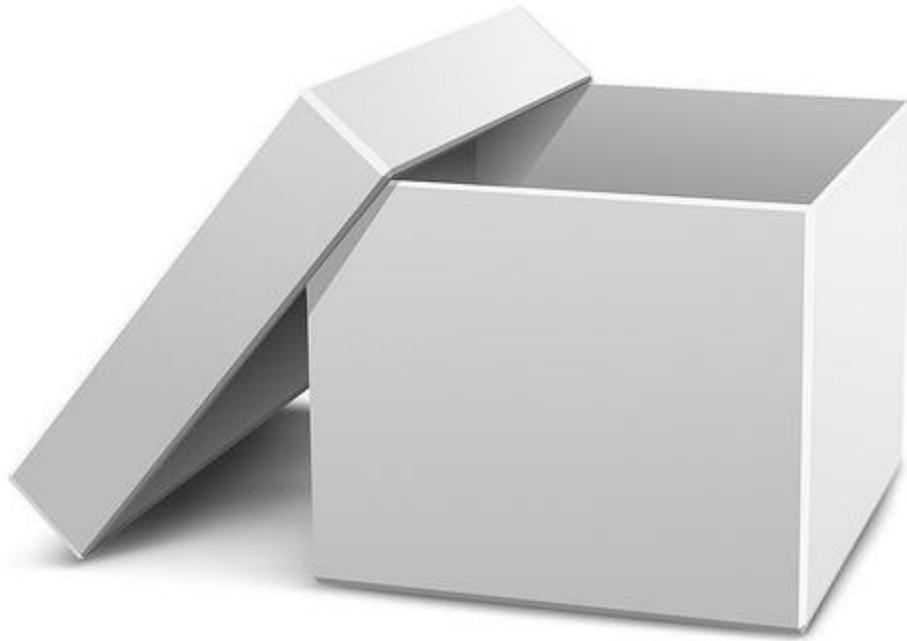




# Hypothesis Testing & Statistical Comparisons

Jeff Sauro, PhD



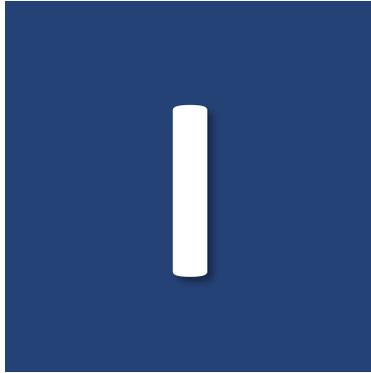
|  |  |
|--|--|
|  |  |
|  |  |

# HYPOTHESIS TESTING OVERVIEW

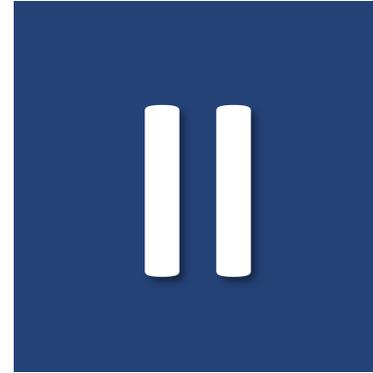


# Hypothesis Testing: What can go wrong?

---

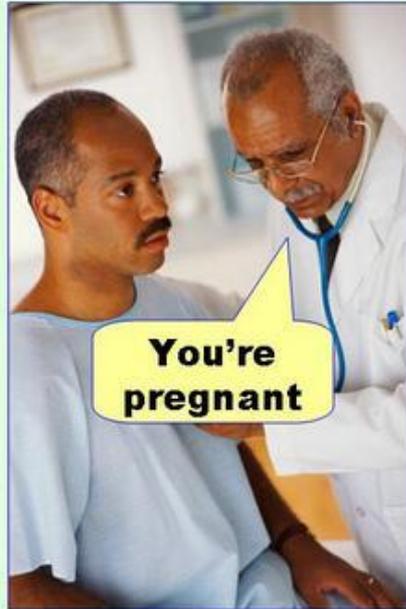


Saying there is a difference  
when one does not exist

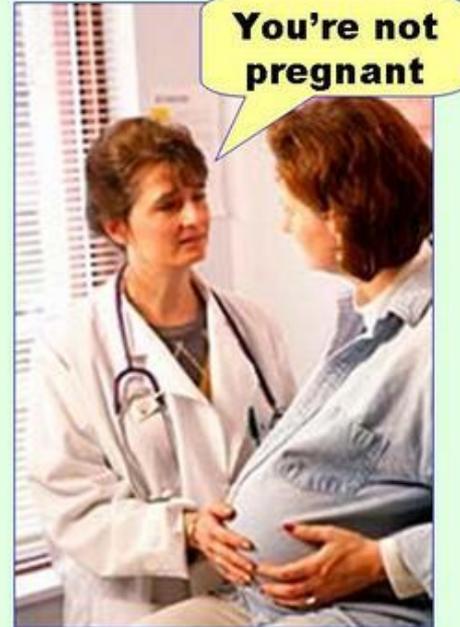


Saying there is **not** a difference  
when one **does** exist

**Type I error**  
(false positive)

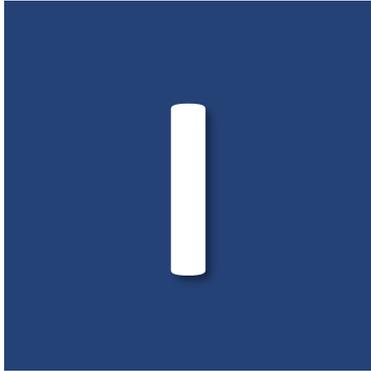


**Type II error**  
(false negative)



# Type 1 Error

---



Convicting an innocent person

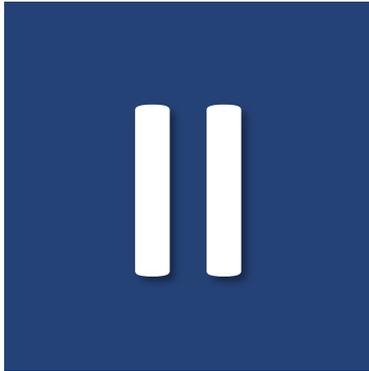
A false positive

Incorrectly reject the Null

**Saying a design IS better, when there really is no difference**

# Type II Error

---



Letting the bad guy go free

A false negative

Incorrectly failing to reject the Null

**Saying there is no difference between designs, when one really is better**

# Test your error knowledge

---

You get a p-value of .01 and conclude the designs are different.

What error can you make?

---

You get a p-value of .044 and conclude the designs are NOT different.

What error can you make?

---

You get a p-value of .049 and conclude the designs are still NOT different.

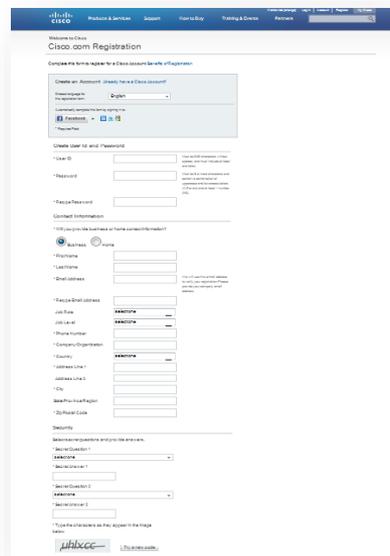
What error can you make?

# COMPARING TWO COMPLETION RATES



# Do more users register on the new form?

## OLD DESIGN

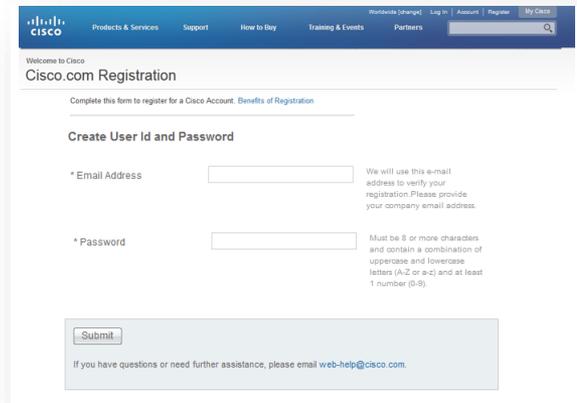


8 Successful

12 Attempted

**67%**  
Completion Rate

## NEW DESIGN



11 Successful

11 Attempted

**100%**  
Completion Rate

# Which design generates more purchases?

## A/B Test

**YOU'VE GOT CODE TO WRITE**  
LET US MANAGE THE REST

NEAR 100% UPTIME

SEE HOW IT WORKS

MANAGED CLOUD | STREAM RICH MEDIA | SAAS HOSTING | WHY OPEN IS BETTER

Don't waste your energy just keeping the lights on. Get a Managed Cloud account, so you can focus on what you're good at. Let our trained cloud experts handle everything else.

SHOW UP NOW

This banner features a man in a dark hoodie and glasses working on a laptop. The background is dark with a grid of light squares. A circular callout points to a 'SEE HOW IT WORKS' button. Below the main text is a navigation bar with four menu items. At the bottom, there is a short paragraph and a green 'SHOW UP NOW' button.

13 Clicks | 3,125,760 Views

.0004%

**SATISFY YOUR USERS**  
WITH HIGHLY AVAILABLE AND  
DEPENDABLE SAAS HOSTING

MAINTAIN UPTIME

SEE HOW IT WORKS

MANAGED CLOUD | STREAM RICH MEDIA | SAAS HOSTING | WHY OPEN IS BETTER

With SaaS, you can grow your infrastructure as your needs grow. And pay only for what you use. Plus, we can manage it for you, so you don't have to add staff.

LEARN MORE

This banner features a woman sitting on the floor, looking at a tablet. The background is dark with a line graph showing an upward trend. A circular callout points to a 'SEE HOW IT WORKS' button. Below the main text is a navigation bar with four menu items. At the bottom, there is a short paragraph and a green 'LEARN MORE' button.

10 Clicks | 1,041,515 Views

.001%

# Hypothesis testing errors

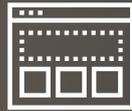
|               |                                 | REALITY   |   |
|---------------|---------------------------------|---|---|
|               |                                 | Is a Difference<br><i>Guilty</i>  | No Difference<br><i>Innocent</i>  |
| YOUR DECISION | Difference!!<br><i>Convict</i>  |    | <p><i>False Positive</i></p>  <p><b>TYPE I Error</b><br/>Alpha = .05</p> |
|               | No Difference!<br><i>Acquit</i> | <p><i>False Negative</i></p>  <p><b>TYPE II ERROR</b><br/>Beta = .20</p> |    |

# About MeasuringU

MeasuringU is a quantitative research firm based in Denver, Colorado focusing on quantifying the user experience.



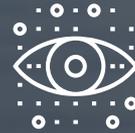
Remote UX Testing  
Platform (Desktop &  
Mobile)



UX Research



Measurement  
& Statistical Analysis



Eye Tracking & Lab  
Based Testing



UX Boot Camp Aug 16th-18th  
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