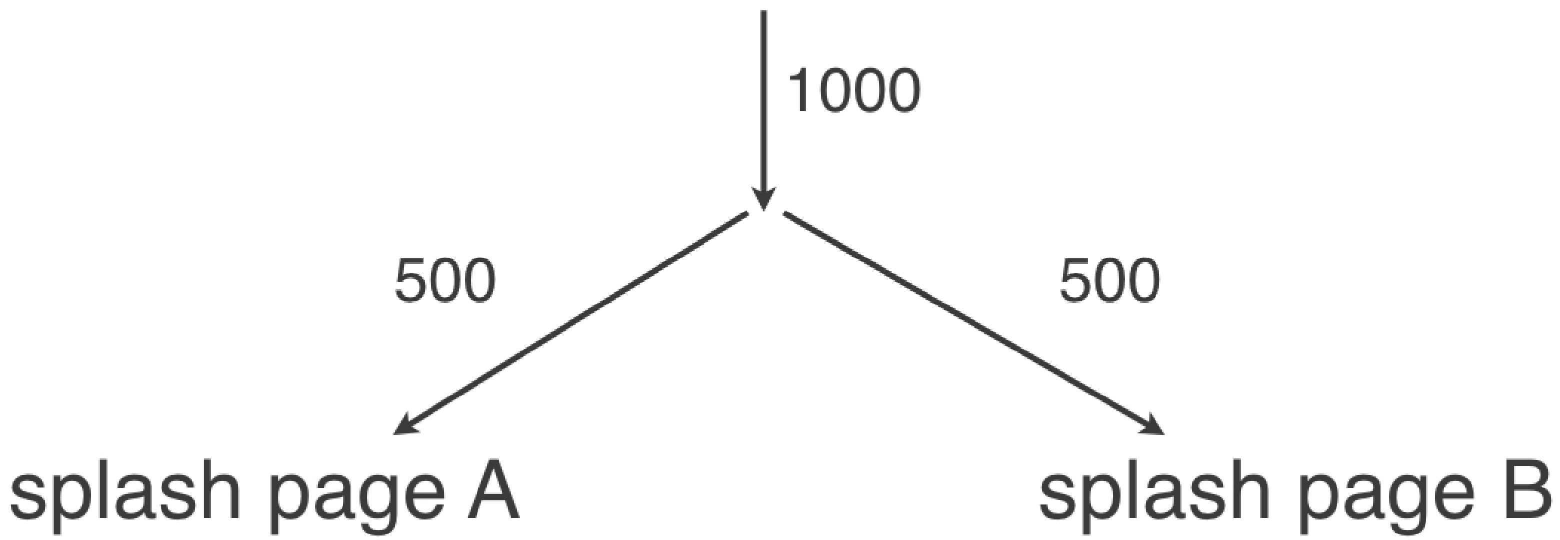
A/B testing

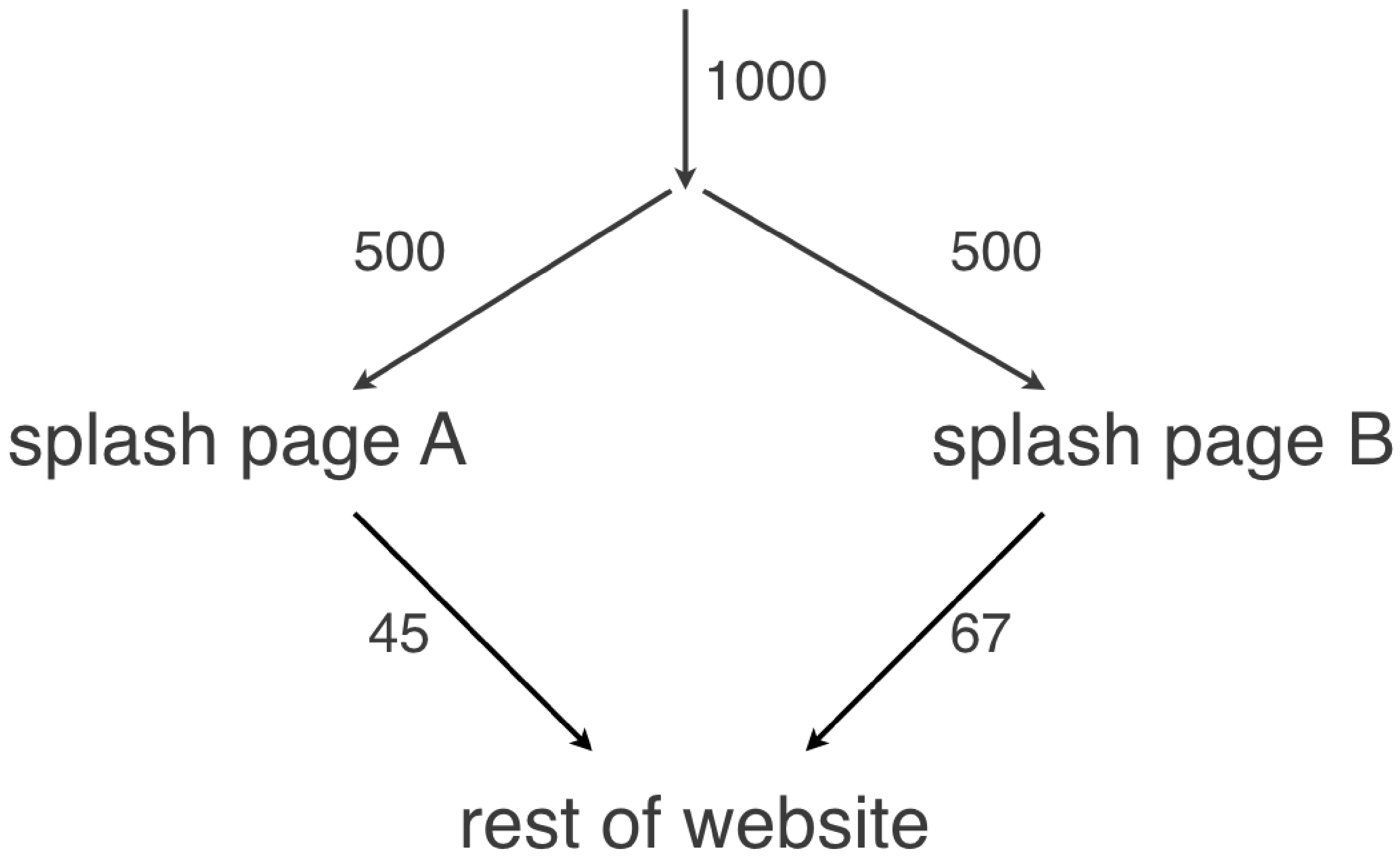
STATISTICAL THINKING IN PYTHON (PART 2)

Justin Bois
Lecturer at the California Institute of Technology

Is your redesign effective?



Is your redesign effective?



Null hypothesis

- The click-through rate is not affected by the redesign

Permutation test of clicks through

```
import numpy as np
# clickthrough_A, clickthrough_B: arr. of 1s and 0s
def diff_frac(data_A, data_B):
        frac_A = np.sum(data_A) / len(data_A)
        frac_B = np.sum(data_B) / len(data_B)
        return frac_B - frac_A
diff_frac_obs = diff_frac(clickthrough_A,
                          clickthrough_B)
```

Permutation test of clicks through

```
perm_replicates = np.empty(10000)
for i in range(10000):
     perm_replicates[i] = permutation_replicate(
                   clickthrough_A, clickthrough_B, diff_frac)
p_value = np.sum(perm_replicates >= diff_frac_obs) / 10000
p_value
```

```
0.016
```

A/B test

- Used by organizations to see if a strategy change gives a better result

Null hypothesis of an A/B test

- The test statistic is impervious to the change

Let's practice!

STATISTICAL THINKING IN PYTHON (PART 2)

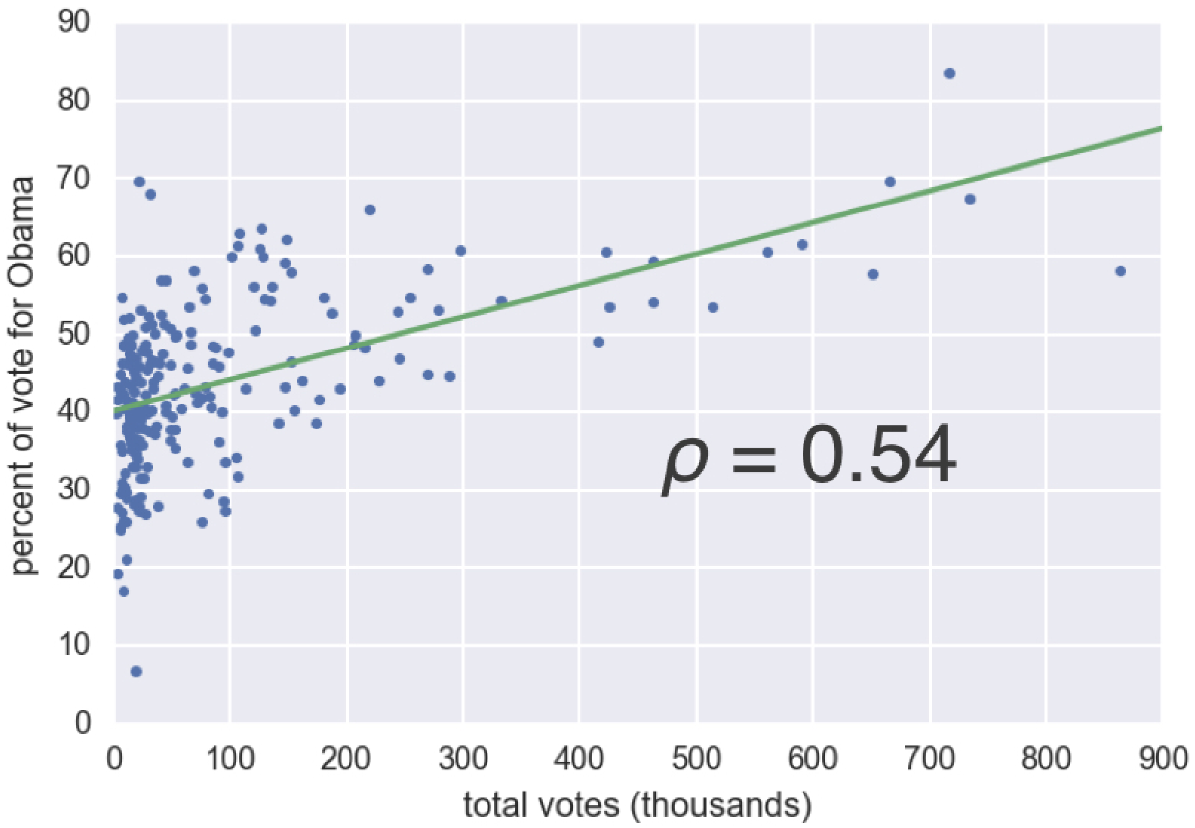
Test of correlation

STATISTICAL THINKING IN PYTHON (PART 2)

Justin Bois

Lecturer at the California Institute of Technology

2008 US swing state election results

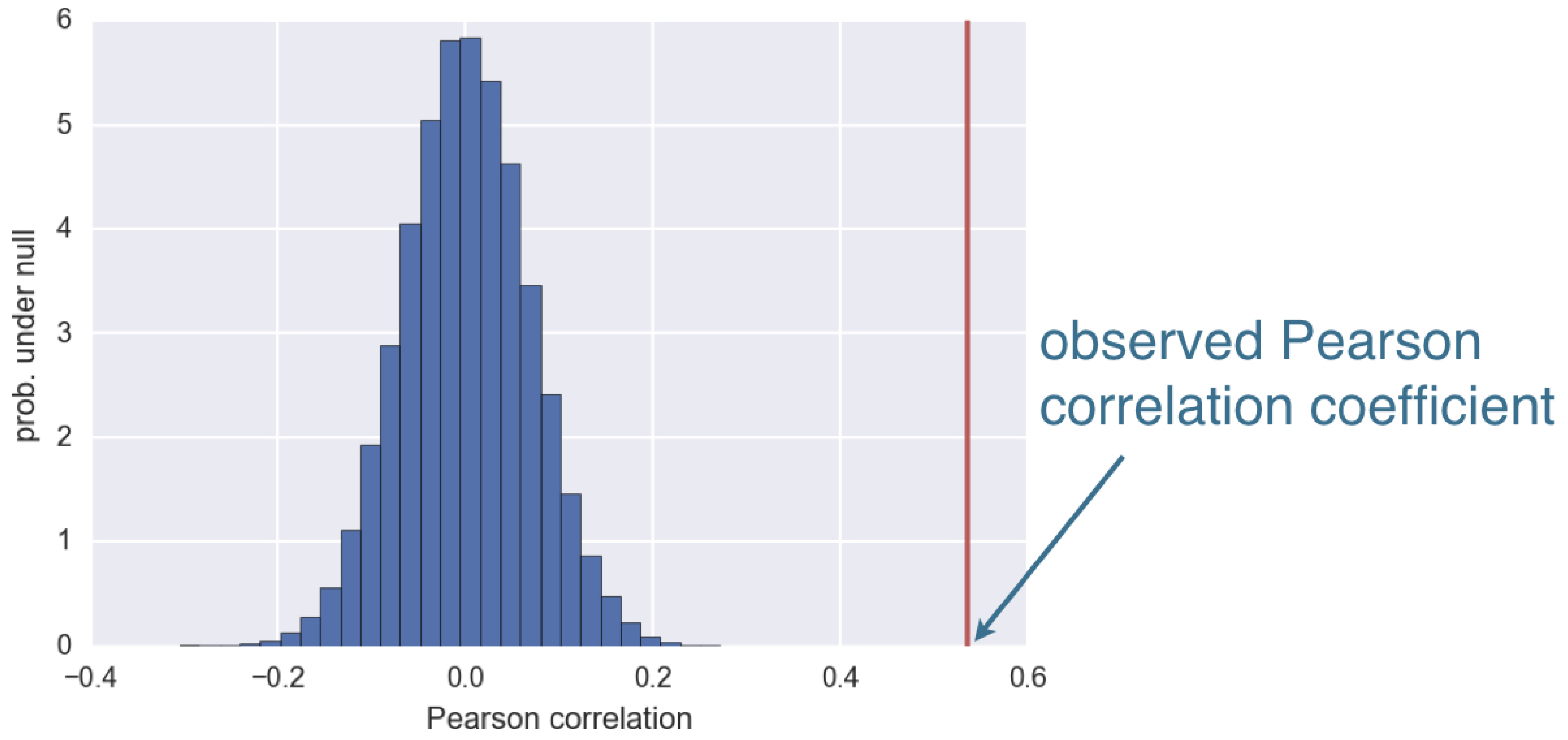


[1] Data retrieved from Data.gov (https://www.data.gov/)

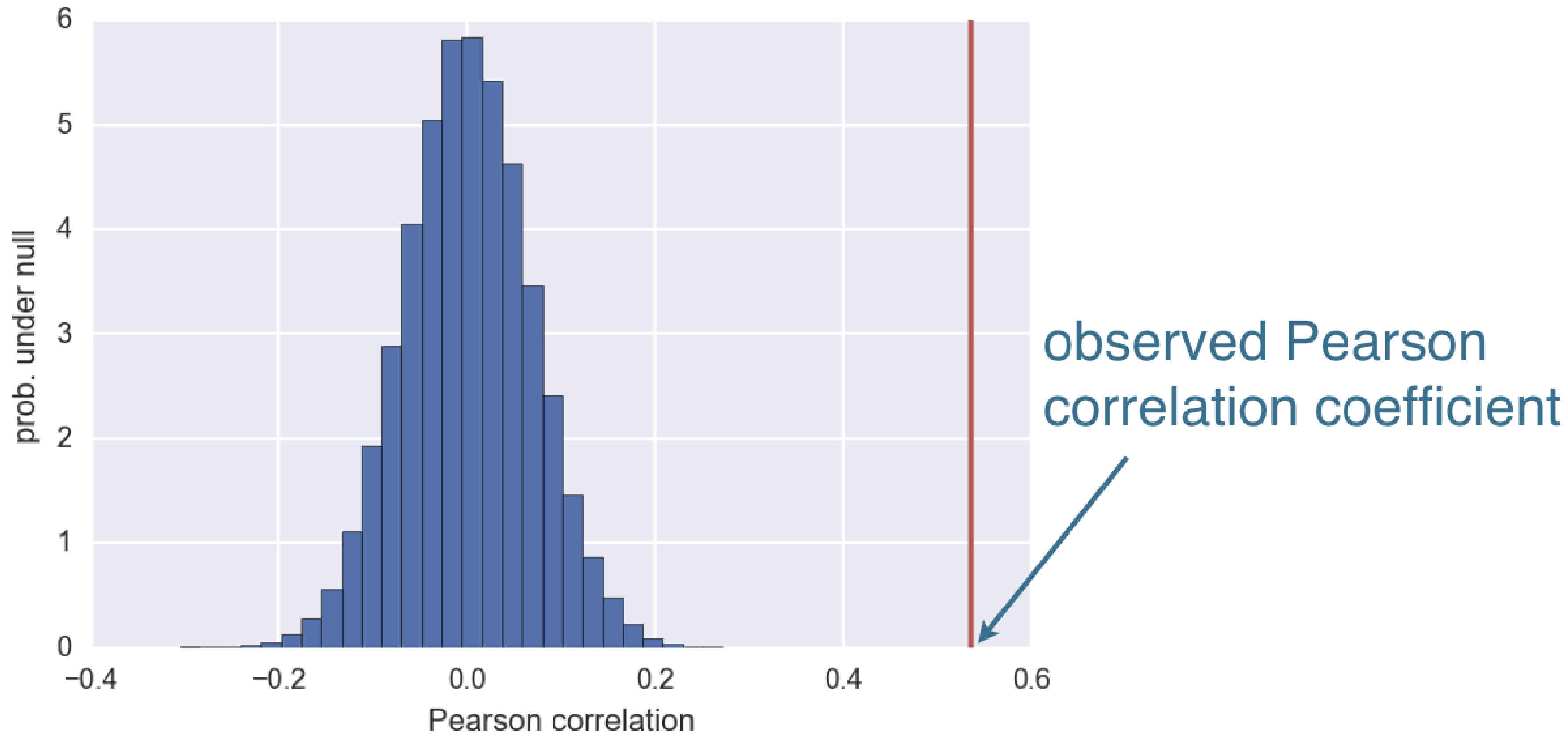
Hypothesis test of correlation

- Posit null hypothesis: the two variables are completely uncorrelated
- Simulate data assuming null hypothesis is true
- Use Pearson correlation, ρ, as test statistic
- Compute p-value as fraction of replicates that have ρ at least as large as observed.

More populous counties voted for Obama



More populous counties voted for Obama



p-value is very very small

Let's practice!

STATISTICAL THINKING IN PYTHON (PART 2)