

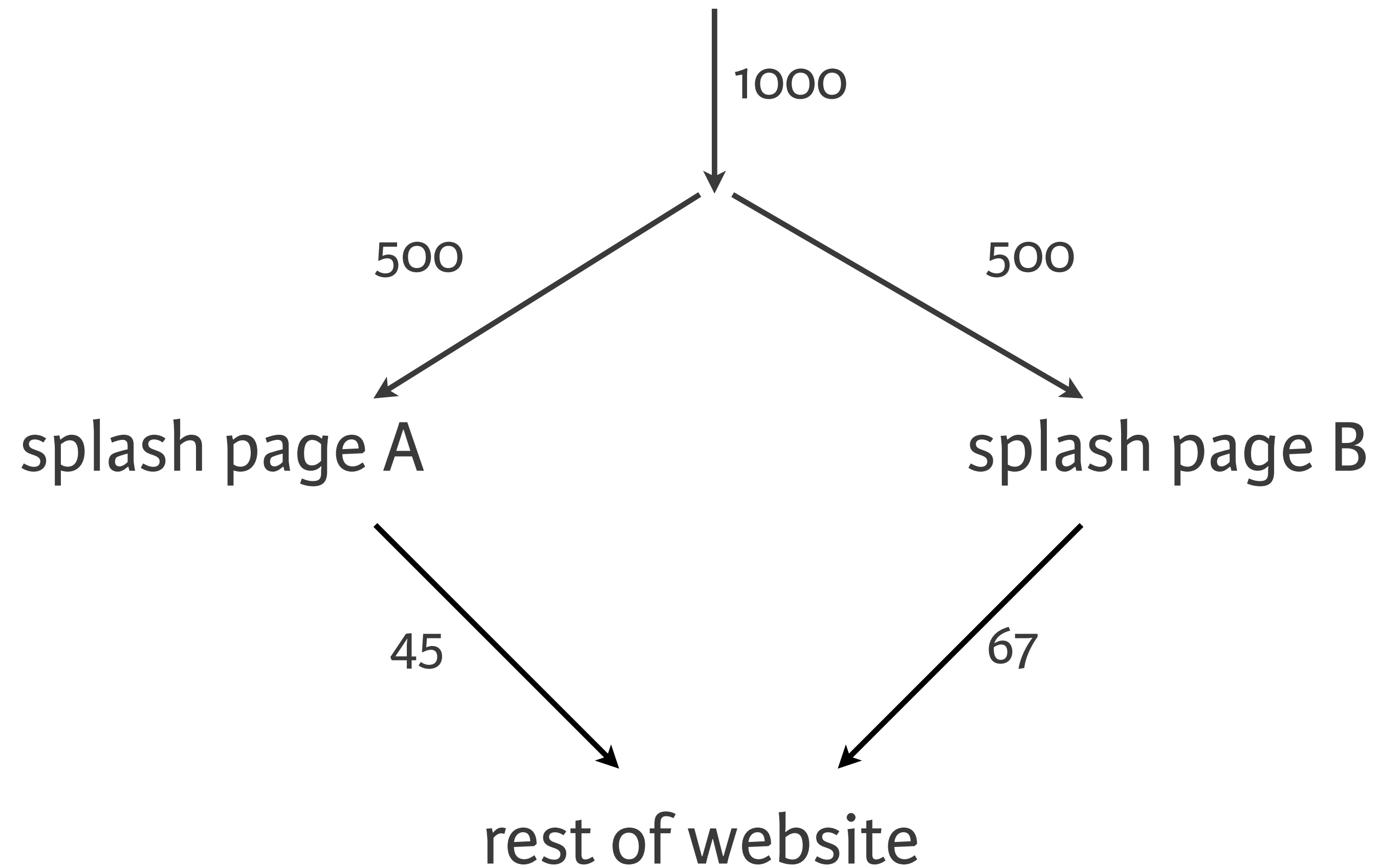


STATISTICAL THINKING IN PYTHON II

A/B testing



Is your redesign effective?



Null hypothesis

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



Permutation test of clicks through

```
In [1]: import numpy as np

In [2]: # clickthrough_A, clickthrough_B: arr. of 1s and 0s

In [3]: 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
...:

In [4]: diff_frac_obs = diff_frac(clickthrough_A,
...:                               clickthrough_B)
```



Permutation test of clicks through

```
In [1]: perm_replicates = np.empty(10000)
```

```
In [2]: for i in range(10000):  
...:     perm_replicates[i] = permutation_replicate(  
...:         clickthrough_A, clickthrough_B, diff_frac)  
...:
```

```
In [3]: p_value = np.sum(perm_replicates >= diff_frac_obs) / 10000
```

```
In [4]: p_value
```

```
Out[4]: 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



STATISTICAL THINKING IN PYTHON II

Let's practice!

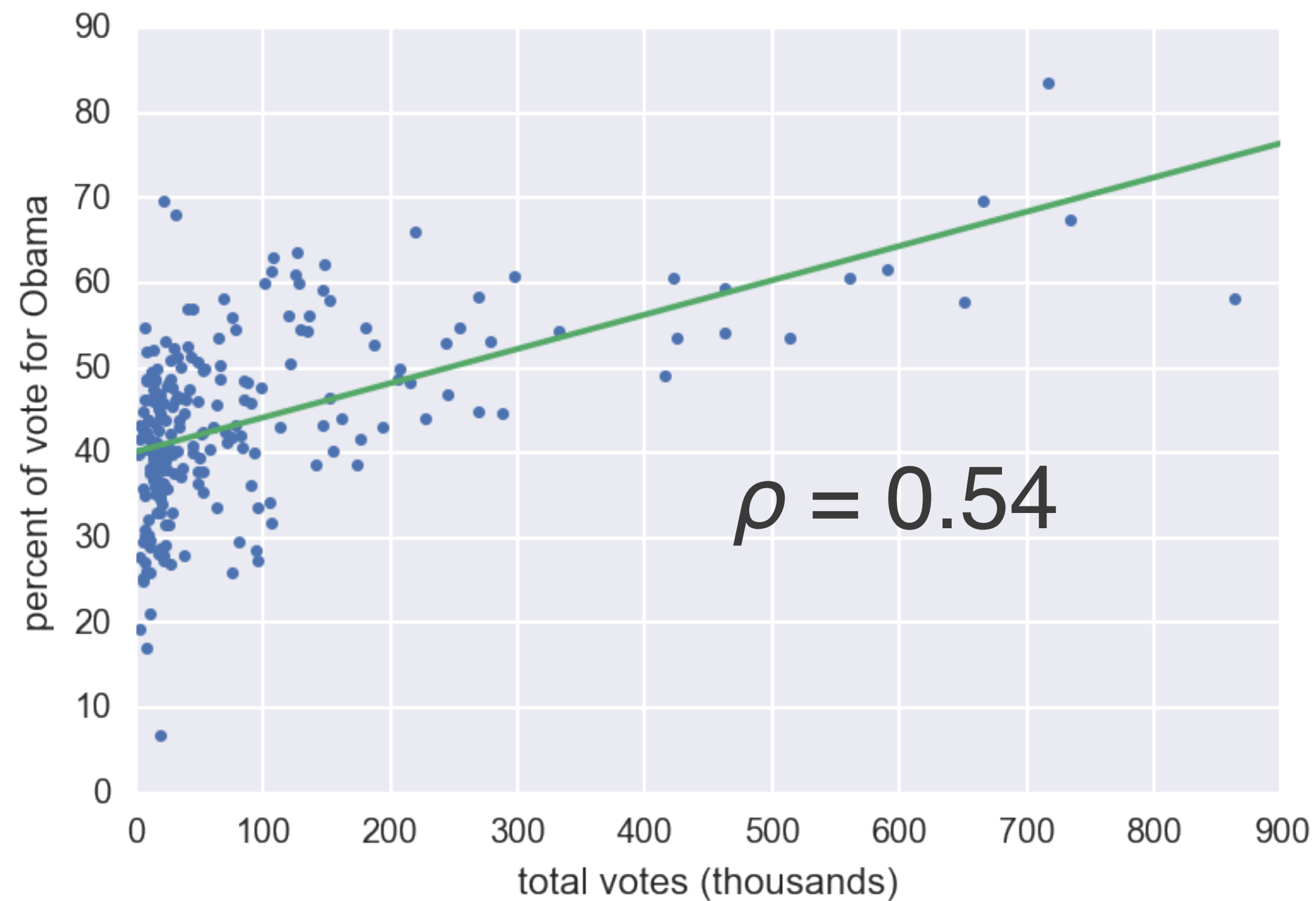


STATISTICAL THINKING IN PYTHON II

Test of correlation



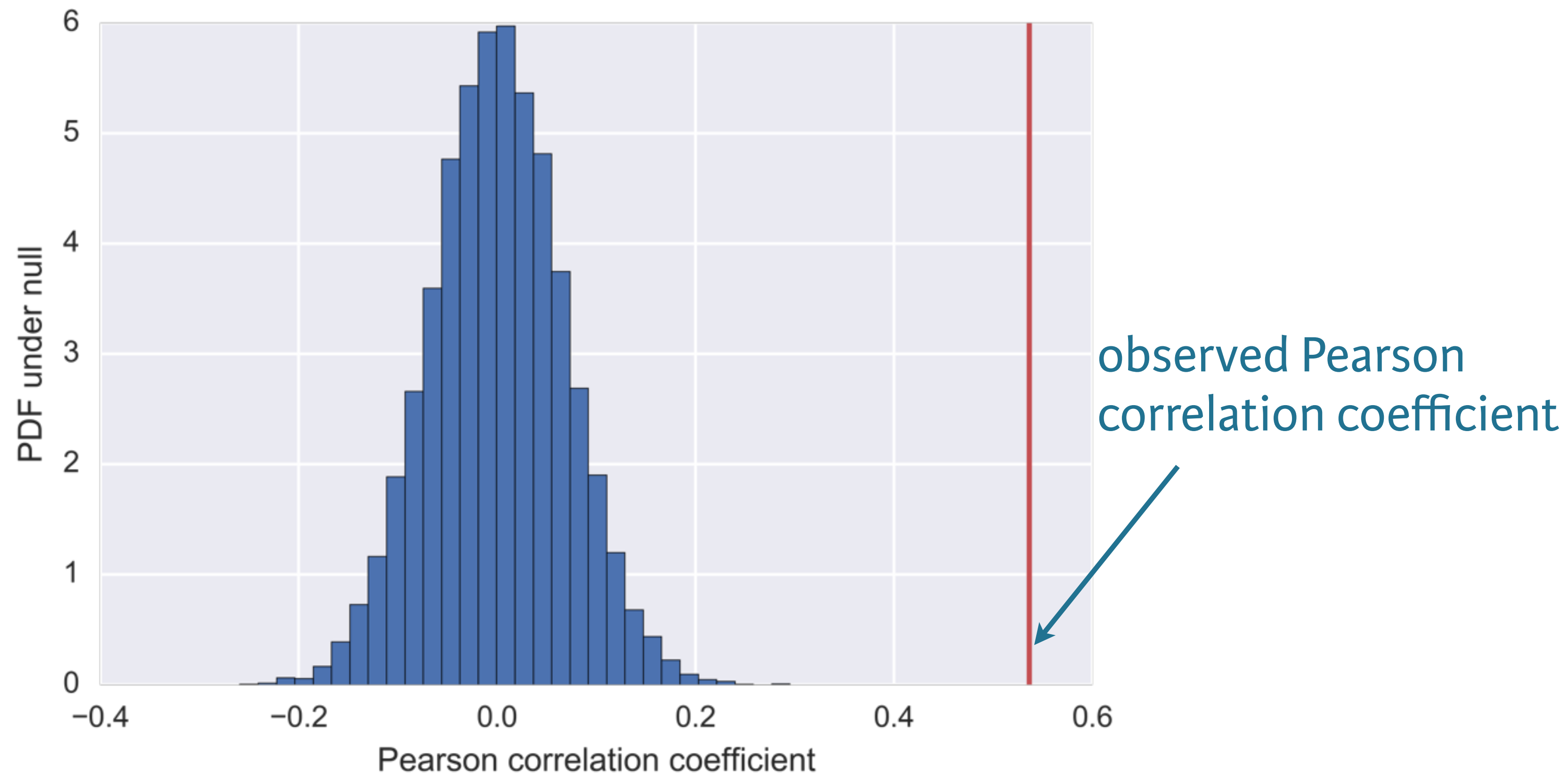
2008 US swing state election results



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



p -value is very very small



STATISTICAL THINKING IN PYTHON II

Let's practice!