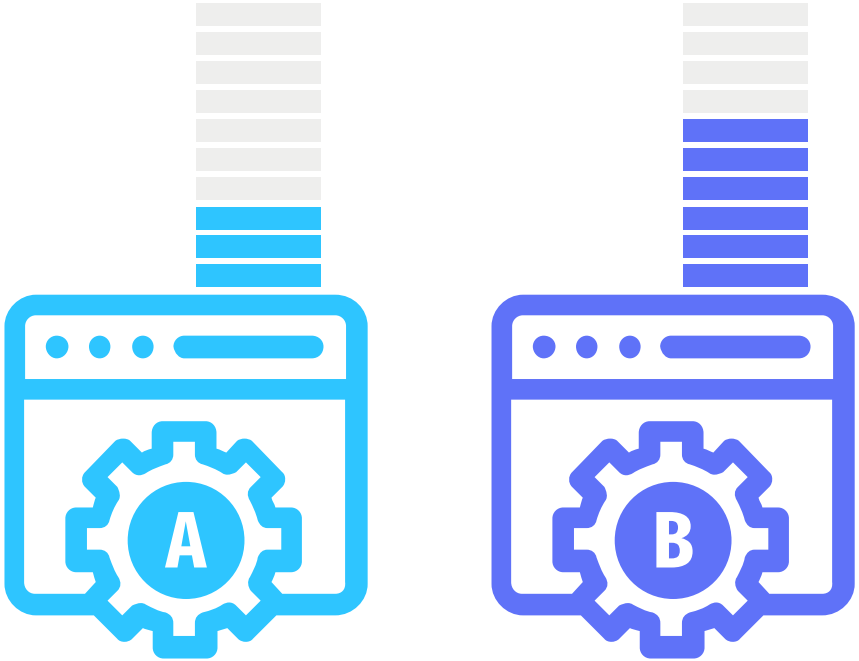


An Analyzing A/B Test Results with Python

Turgay TURKER

2022

INTRODUCTION

Problem

An advertising company has developed a new ad to have users engage with their questionnaire.

The company has shown the new ad to some users and a dummy ad to others and wants their data analyst team to interpret the results.

Does the new ad generate more responses to their questionnaire? Is it statistically significant? Is the company justified in using the new ad?

INTRODUCTION

A/B Testing

A/B testing is common in the business world and is a way to compare two versions of something to figure out which performs better.

Figuring out which ad users prefer is a real-life business problem that would be expected to know how to solve as a business data analyst.

INTRODUCTION

Data

Dataset is found on kaggle from an advertising company:

https://www.kaggle.com/osuolaleemmanuel/ad-ab-testing

	auction_id	experiment	date	hour	device_make	platform_os	browser	yes	no
0	0008ef63-77a7-448b-bd1e-075f42c55e39	exposed	2020-07-10	8	Generic Smartphone	6	Chrome Mobile	0	0
1	000eabc5-17ce-4137-8efe-44734d914446	exposed	2020-07-07	10	Generic Smartphone	6	Chrome Mobile	0	0
2	0016d14a-ae18-4a02-a204-6ba53b52f2ed	exposed	2020-07-05	2	E5823	6	Chrome Mobile WebView	0	1
3	00187412-2932-4542-a8ef-3633901c98d9	control	2020-07-03	15	Samsung SM-A705FN	6	Facebook	0	0
4	001a7785-d3fe-4e11-a344-c8735acacc2c	control	2020-07-03	15	Generic Smartphone	6	Chrome Mobile	0	0
...	...	...	...	...	...	...	...	...	...
8072	ffea24ec-cec1-43fb-b1d1-8f93828c2be2	exposed	2020-07-05	7	Generic Smartphone	6	Chrome Mobile	0	0
8073	ffea3210-2c3e-426f-a77d-0aa72e73b20f	control	2020-07-03	15	Generic Smartphone	6	Chrome Mobile	0	0
8074	ffeaa0f1-1d72-4ba9-afb4-314b3b00a7c7	control	2020-07-04	9	Generic Smartphone	6	Chrome Mobile	0	0
8075	ffeeed62-3f7c-4a6e-8ba7-95d303d40969	exposed	2020-07-05	15	Samsung SM-A515F	6	Samsung Internet	0	0
8076	fffbb9ff-568a-41a5-a0c3-6866592f80d8	control	2020-07-10	14	Samsung SM-G960F	6	Facebook	0	0

8077 rows × 9 columns

INTRODUCTION

Columns Description

auction_id: the unique id of the online user who has been presented the BIO. In standard terminologies this is called an impression id. The user may see the BIO questionnaire but choose not to respond. In that case both the yes and no columns are zero.
experiment: which group the user belongs to - control or exposed.
control: users who have been shown a dummy ad
exposed: users who have been shown a creative, an online interactive ad, with the SmartAd brand.
date: the date in YYYY-MM-DD format
hour: the hour of the day in HH format.
device_make: the name of the type of device the user has e.g. Samsung
platform_os: the id of the OS the user has.
browser: the name of the browser the user uses to see the BIO questionnaire.
yes: 1 if the user chooses the “Yes” radio button for the BIO questionnaire.
no: 1 if the user chooses the “No” radio button for the BIO questionnaire.

INTRODUCTION

Experiment Approach

Null Hypothesis H_o: $p = p_o$ "There is no significant difference between the ad success rate of both groups*»

Alternative Hypothesis H_a: $p \neq p_o$ "There is significant difference between the ad success rate of both groups*»

Confidence Level: 95% (α=0.05)

**we will perform a two-tailed test*

STEPS

A/B Testing overview

Step 1

•Choosing an appropriate statistical test

Step 2

•Calculating the test statistics

Step 3

•Calculating the p-value of the test statistics

Step 4

•Reject or fail to reject the statistical hypothesis (statistical significance)

Step 5

- Calculate the margin of error and confidence interval

STEPS

Choosing an appropriate statistical test

2 different test types were used:

- Binomial Test
- 2 Sample Z Test

STEPS

Before test... Data Preprocessing

- Checked for null values.
- Removed non-answer observations (both 'yes' and 'no' columns are equal to 0). This may remove a significant percentage of the observations, but non-answers are not useful for the analysis.

STEPS

Before test... Data Preprocessing

- Checked for null values.

```
AdSmart.isnull().sum()
```

```
auction_id     0
experiment     0
date           0
hour           0
device_make    0
platform_os    0
browser        0
yes            0
no             0
dtype: int64
```

*there is no null values

STEPS

Before test... Data Preprocessing

- Removed non-answer observations (both 'yes' and 'no' columns are equal to 0).
- 6834 observations were dropped.

```
AdSmart_NoAns = AdSmart[(AdSmart['yes'] == 0) & (AdSmart['no'] == 0)]
AdSmart_NoAns
```

	auction_id	experiment	date	hour	device_make	platform_os	browser	yes	no
0	0008ef63-77a7-448b-bd1e-075f42c55e39	exposed	2020-07-10	8	Generic Smartphone	6	Chrome Mobile	0	0
1	000eabc5-17ce-4137-8efe-44734d914446	exposed	2020-07-07	10	Generic Smartphone	6	Chrome Mobile	0	0
3	00187412-2932-4542-a8ef-3633901c98d9	control	2020-07-03	15	Samsung SM-A705FN	6	Facebook	0	0
4	001a7785-d3fe-4e11-a344-c8735acacc2c	control	2020-07-03	15	Generic Smartphone	6	Chrome Mobile	0	0
5	0027ce48-d3c6-4935-bb12-dfb5d5627857	control	2020-07-03	15	Samsung SM-G960F	6	Facebook	0	0
...	...	...	...	...	...	...	...	...	...
8072	ffea24ec-cec1-43fb-b1d1-8f93828c2be2	exposed	2020-07-05	7	Generic Smartphone	6	Chrome Mobile	0	0
8073	ffea3210-2c3e-426f-a77d-0aa72e73b20f	control	2020-07-03	15	Generic Smartphone	6	Chrome Mobile	0	0
8074	ffeaa0f1-1d72-4ba9-afb4-314b3b00a7c7	control	2020-07-04	9	Generic Smartphone	6	Chrome Mobile	0	0
8075	ffeeed62-3f7c-4a6e-8ba7-95d303d40969	exposed	2020-07-05	15	Samsung SM-A515F	6	Samsung Internet	0	0
8076	fffbb9ff-568a-41a5-a0c3-6866592f80d8	control	2020-07-10	14	Samsung SM-G960F	6	Facebook	0	0

6834 rows × 9 columns

STEPS

Exploratory Data Analysis

```
AdSmart_AfterNoAns['experiment'].value_counts()
```

```
exposed    657
control    586
Name: experiment, dtype: int64
```

experiment	yes	no
control	264	322
exposed	308	349

STEPS

Exploratory Data Analysis

Ad Success Control group 45.05%

Ad Success Exposed group 46.88%

Ad success is higher on the exposed group by 4%

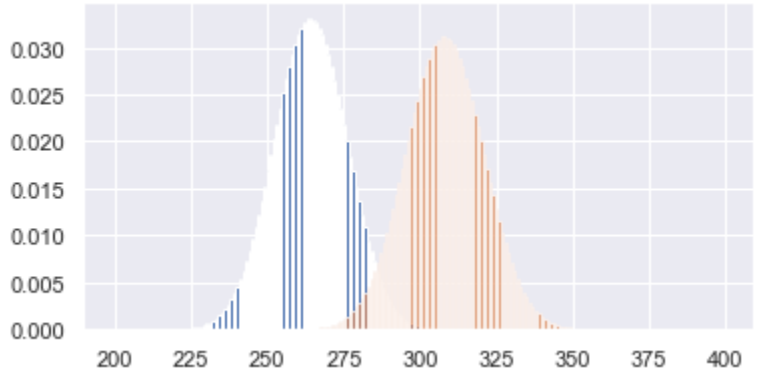
```
rate_con, rate_exp = Con_Yes/Num_con, Exp_Yes/Num_exp
print(rate_con)
print(rate_exp)
```

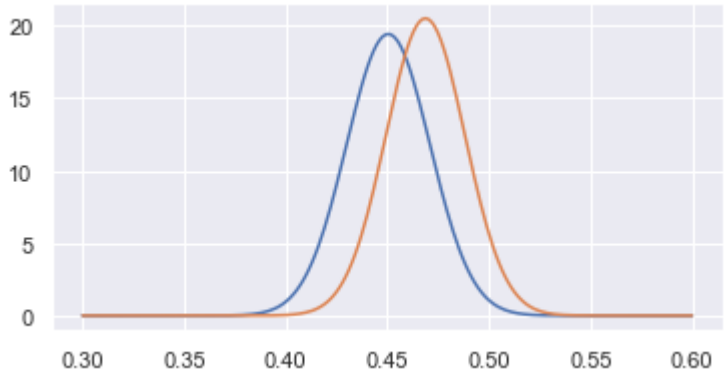
```
0.45051194539249145
0.4687975646879756
```

STEPS

Statistical Significance

Test	Z score	P value	Conclusion
Binomial	0.6459	0.2592	p>0.05 can not reject the null hypothesis

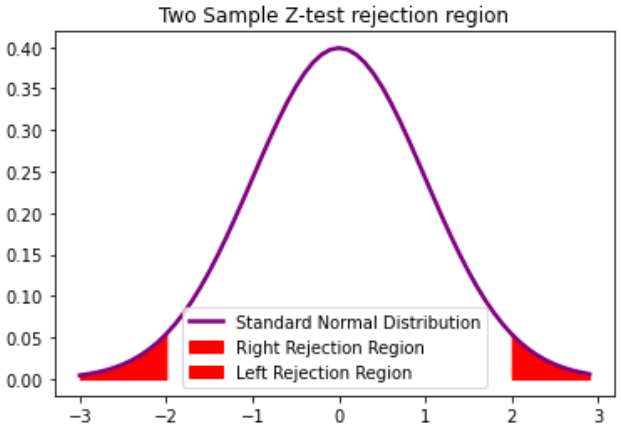




STEPS

Statistical Significance

Test	Test Stat.	Z Critical	P Value	Confidence Interval
2 Sample Z	-0.6457	1.9599	1.4815	[-0.07380 0.03722]



Conclusion

|Test_stat| < Z_crit
(|-0.6457| < 1.9599)

can not reject the null hypothesis

CONCLUSIONS

- According to both tests, the null hypothesis can not be rejected, and conclude that there is no statistically significant difference between the AdA and AdB.

- These findings indicate that the new ad will yield no extra benefit.

- I would like to point out that there were many unanswered observations. This may be a lack of observations as we have removed them from the dataset.

THANKS!

Do you have any questions?

turgayturker55@gmail.com

CREDITS: This presentation template was created by **Slidesgo**