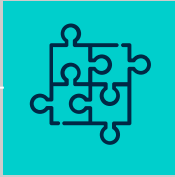# Ad CAMPAIGN PERFORMANCE

IS THERE A SHIFT IN THE BRAND AWARENESS?

David Elvis
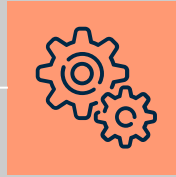SmartAd Company
Junior Data Scientist

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PROBLEM & DATA OVERVIEW

-Objectives
- Hands on Data
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ACTION

-Hands on Methods
-Comparison on the methods
- Overall Upshot
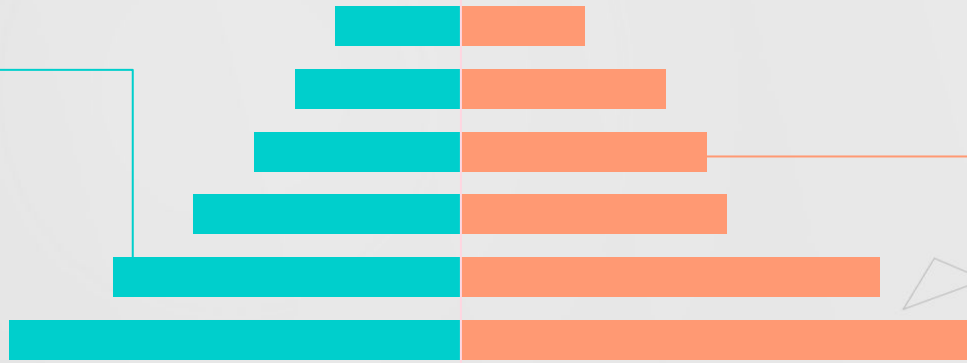
03

TARGET

-Recommendation and outcome
-Limitation of Analysis
-References

OBJECTIVE IN DEPTH

Focus: **Is there a significant lift in Brand Awareness?**

Exposed group- Users shown a
creative Ad with SmartAd brand

Control group- Users
Shown A dummy Ad

DATA METRICS

The BIO data for this project is a "Yes" and "No" response of online users to the following question:

Q: Do you know the brand SmartAd?
- O Yes
- O No

DATA VARIABLES

NUMERIC VARIABLES
- Hour
- Platform_os
- Yes & No

CATEGORICAL VARIABLES
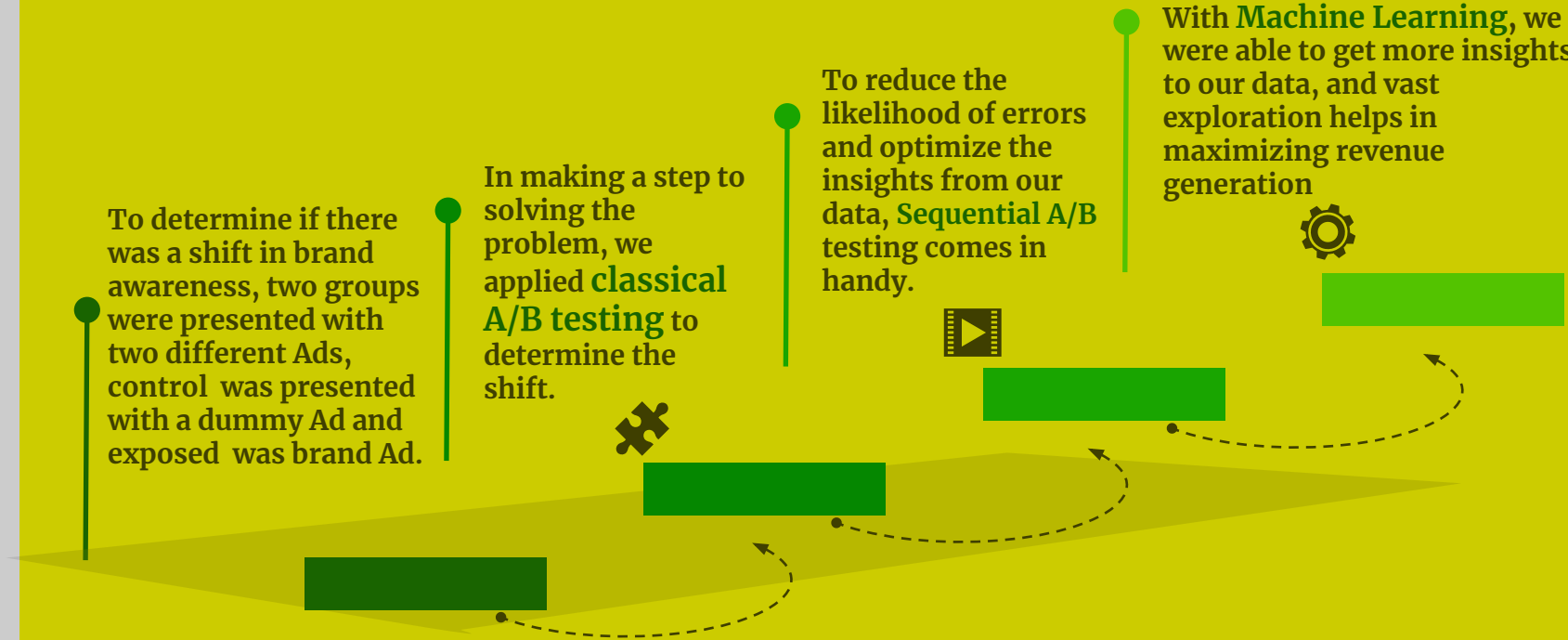- Browser
- Device_make
- Auction Id

DEEP DIVE APPROACH

To determine if there was a shift in brand awareness, two groups were presented with two different Ads, control was presented with a dummy Ad and exposed was brand Ad.

In making a step to solving the problem, we applied classical A/B testing to determine the shift.

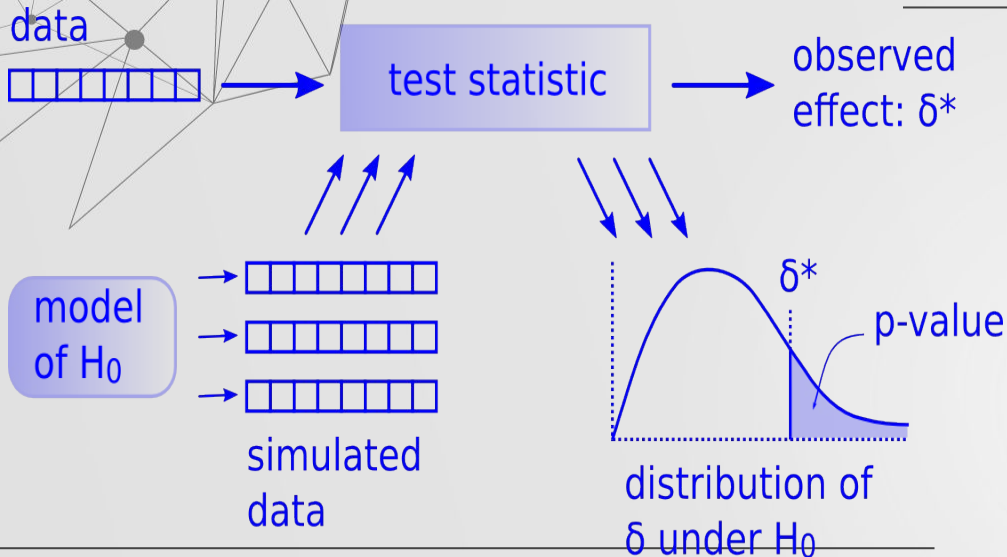**To reduce the likelihood of errors and optimize the insights from our data, Sequential A/B testing comes in handy.**

With Machine Learning, we were able to get more insights to our data, and vast exploration helps in maximizing revenue generation

Workflow

data

test statistic → observed effect: δ*

model of H_0 → simulated data

$$H_0$$

δ*

p-value

distribution of δ under H_0

-We stated the hypothesis as:
Ho : d=0 *Null hypothesis*
Ha : d != 0 *Alternate hypothesis*

Where d is the difference between the Engagements rates between the group.

-In our experiment we used t-test and also we scaled by using z-test.

- Different methods and approaches to classical were deployed, with all the results converging to one conclusion

RESULTS FROM CLASSICAL A/B TESTING

zscore is -2.10754, with p-value 0.98246

Area=0.01754
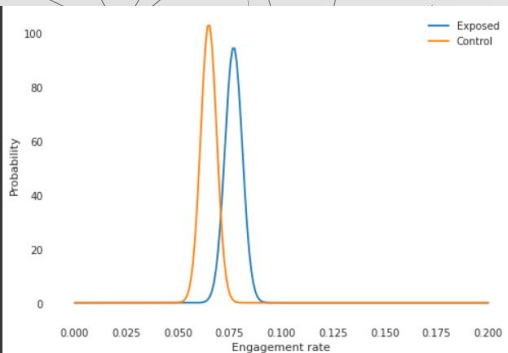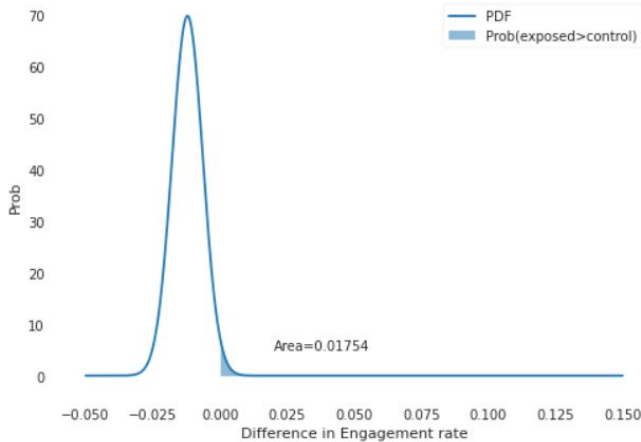
```
SE 1: 0.028319932727228023
Analysis:


Ad Campaign Exposed group"s EngR: 0.4688 with Standard Error 0.00037810369553450236.
Ad Campaign Control group"s EngR: 0.4505 with Standard Error 0.0004239148941402185.

Confidence Interval [-0.06490256228293323, 0.028331323691964887]
T Statistic: -0.65

We have critical value t^* at 1.65
and p-value of 0.52


Components for variants Ad Campaign Exposed group's
& Ad Campaign Control group's, respectively:
Difference d: -0.018285619295484168
SE terms within SE calculation: [0.00037810369553450236, 0.0004239148941402185]
SE: 0.028319932727228023
Calcualted T-statistic: -0.645680181221037
T critical value: 1.646082405507605
Conclusion:


If the p-value is less than our defined alpha = 0.05, then we reject the null hypothesis H_0.
If not, then we fail to reject the null hypothesis H_0.
Confidence Interval: [-0.06490256228293323, 0.028331323691964887]
P-value: 0.5186058623605803
Alpha: 0.05

We fail to reject the Null Hypothesis H_0

Therefore, we can say that there is no statistical significant difference between the two campaigns.
```
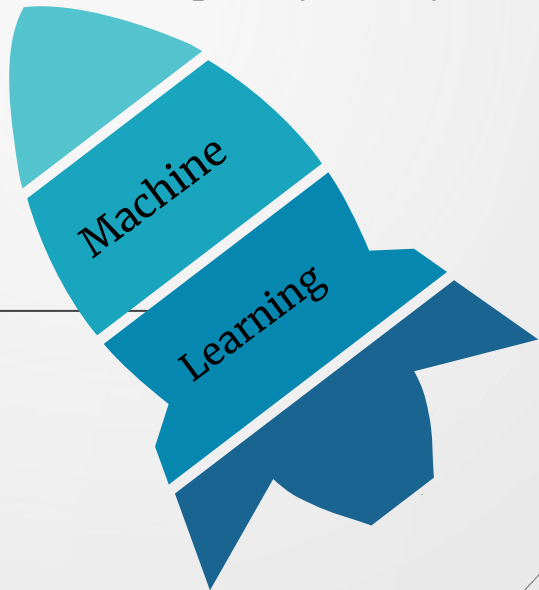

- From the results, it is evident that there was no significant lift in brand Awareness.

02 A/B TESTING WITH MACHINE LEARNING

-With A/B testing we compare between two, but with machine learning we can incorporate the complexity and dynamic nature of data and draw insights.

- – Using k–fold cross validation we were able to train three different models and determine their accuracy in predicting our data.

- – We also determined the loss function of our model and also computed feature importance for the models.

Machine

Learning

MEAN PERFORMANCE OF THE MODELS

92.92% XGBOOST

92.83% LOGISTIC REGRESSION
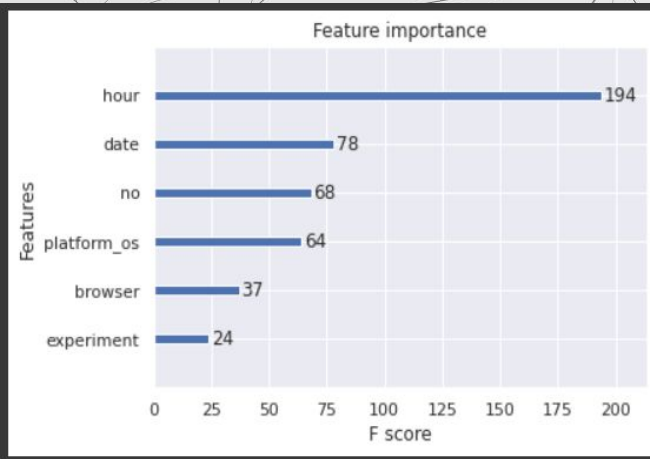
91.64% DECISION TREE

MACHINE LEARNING UNVEILS

Feature importance
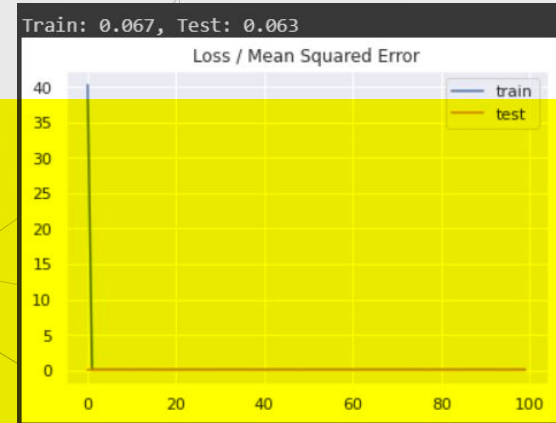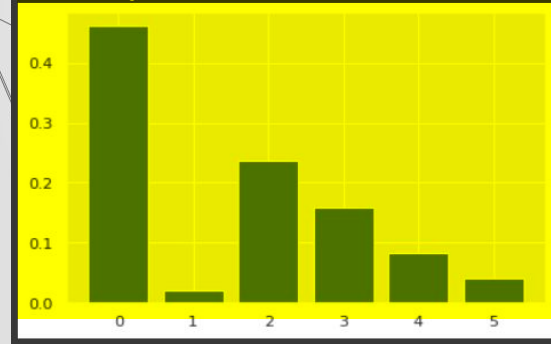

- The hours of the day and the dates counts towards the gaining more "yes " results.

- The squared distance between our target variable and predicted values is 6.7% for our training set and 6.3% for our test set.


```
Feature: 0, Score: 0.46119
Feature: 1, Score: 0.02111
Feature: 2, Score: 0.23677
Feature: 3, Score: 0.15795
Feature: 4, Score: 0.08260
Feature: 5, Score: 0.04038
```

Classical A/B test vs Machine learning

With Machine Learning, we discover that the other features like hour of the day, the dates, determine the conversion in brand awareness

With classical A/B testing we determined if there was significant lift in brand awareness which is instrumental to smartAd in making next move.

What about the dynamics of the users? Could it be there are other features which play a part in brand awareness???
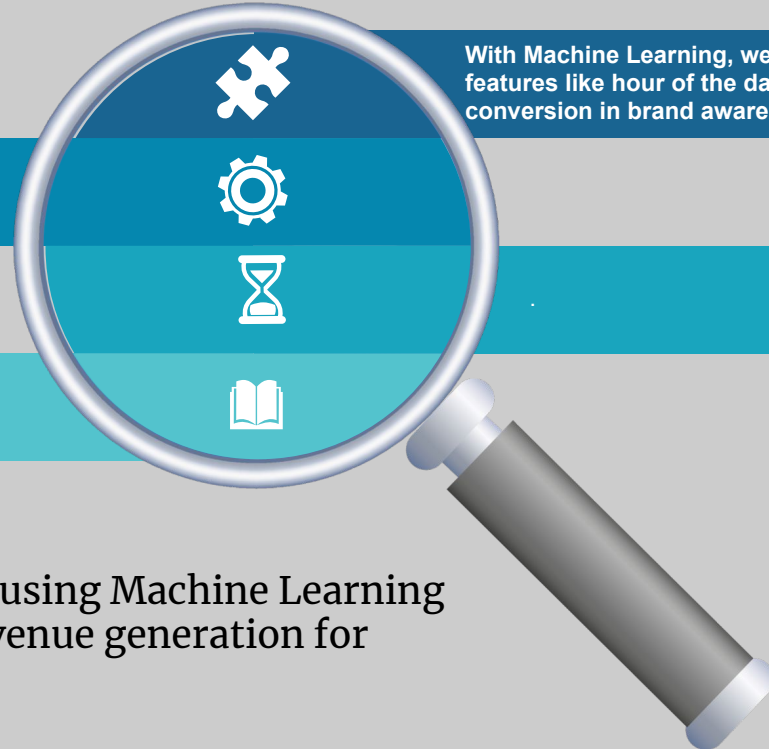
Predict positive outcomes using Machine Learning algorithms to optimize revenue generation for your company.

OUTCOME FROM THE PROJECT

CHANGEPOINT

Where should we focus for positive results???

There is a greater potential to have a significant lift in brand awareness.

CLASSICAL A/B

There is no significant lift in brand awareness.

MACHINE LEARNING

The hour of the day,date, and platform leads to more "yes".

RECOMMENDATIONS

- To reduce likelihood of errors and also use less money in experiment, the company should use sequential testing.

. -Due to the complexity and dynamic nature of users data, the company should use machine learning algorithms to get more insights to data.

-The questionnaire should be let out at certain days, certain hours of the day and through chrome platform as the main channel this is because of the dynamics of the users.

LIMITATIONS OF THE ANALYSIS

- Lack of enough information about the online users which limited our analysis e.g the geographical place of the user.
- Outliers in the data which reduced the accuracy in the analysis.

REFERENCES

Articles

1.https://medium.com/analytics-vidhya/a-b-testing-clearly-explained-56488430156

2.https://cxl.com/blog/ab-testing-statistics/

Github repository

1.https://github.com/sayakpaul/A-B-testing-with-Machine-Learning/blob/master/A%20B%20tests%20with%20Machine%20Learning.ipynb