LEAD SCORING CASE STUDY

Focused business approach using logistic regression technique

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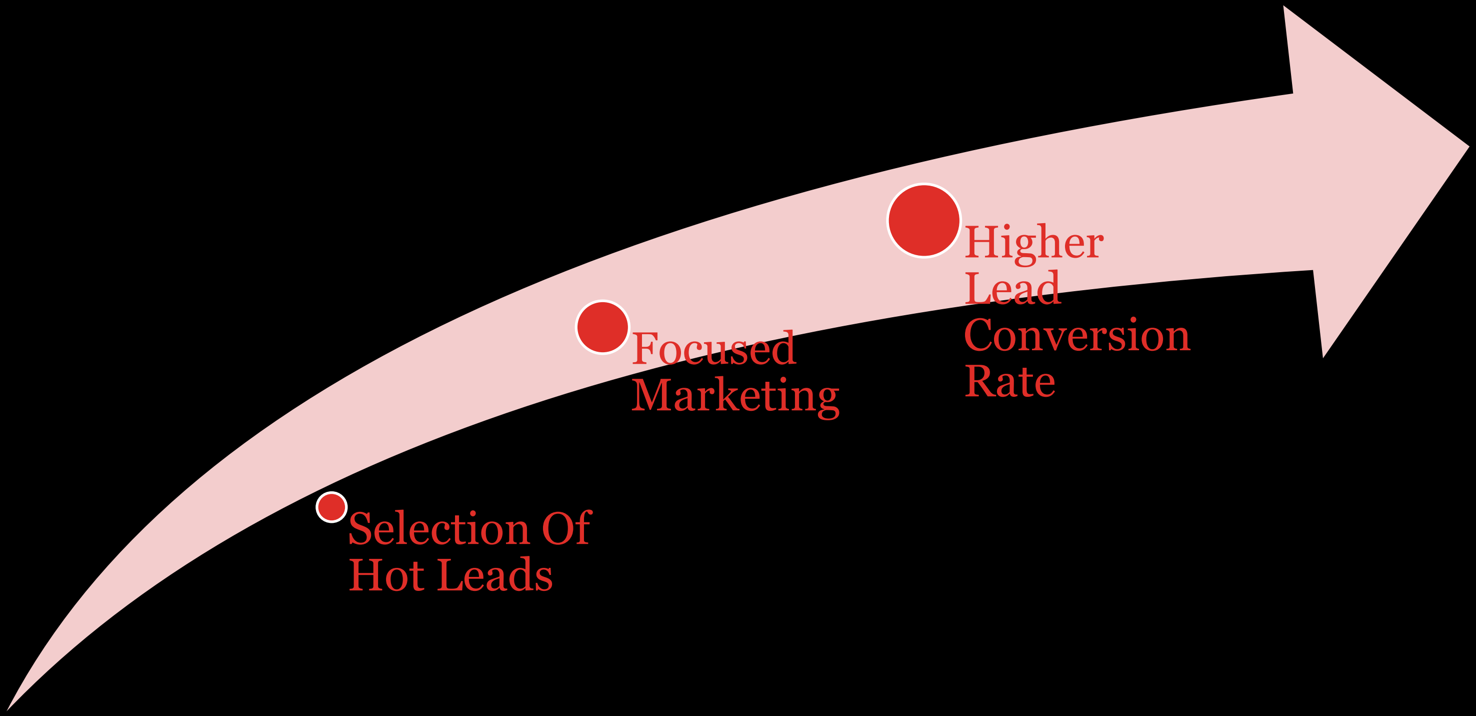
BUSINESS OBJECTIVE

- To help X Education select most promising leads (Hot Leads), i.e. the leads that are most likely to convert into paying customers.



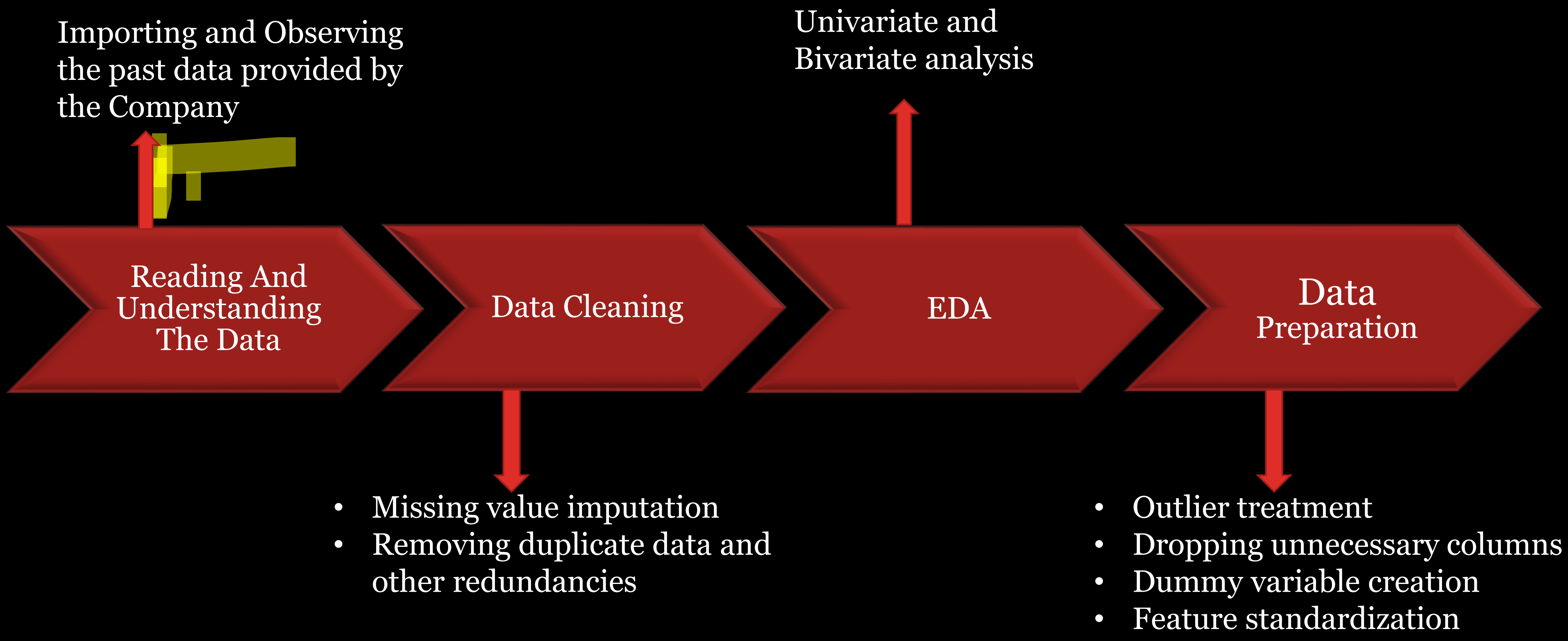
Selection Of Hot Leads

Focused Marketing

Higher Lead Conversion Rate

METHODOLOGY

- To build a Logistic Regression model that assigns lead scores to all leads such that the customers with higher lead score have a higher conversion chance and vice versa. Target Lead Conversion Rate ≈ 80%



Importing and Observing the past data provided by the Company

Univariate and Bivariate analysis

Reading And Understanding The Data

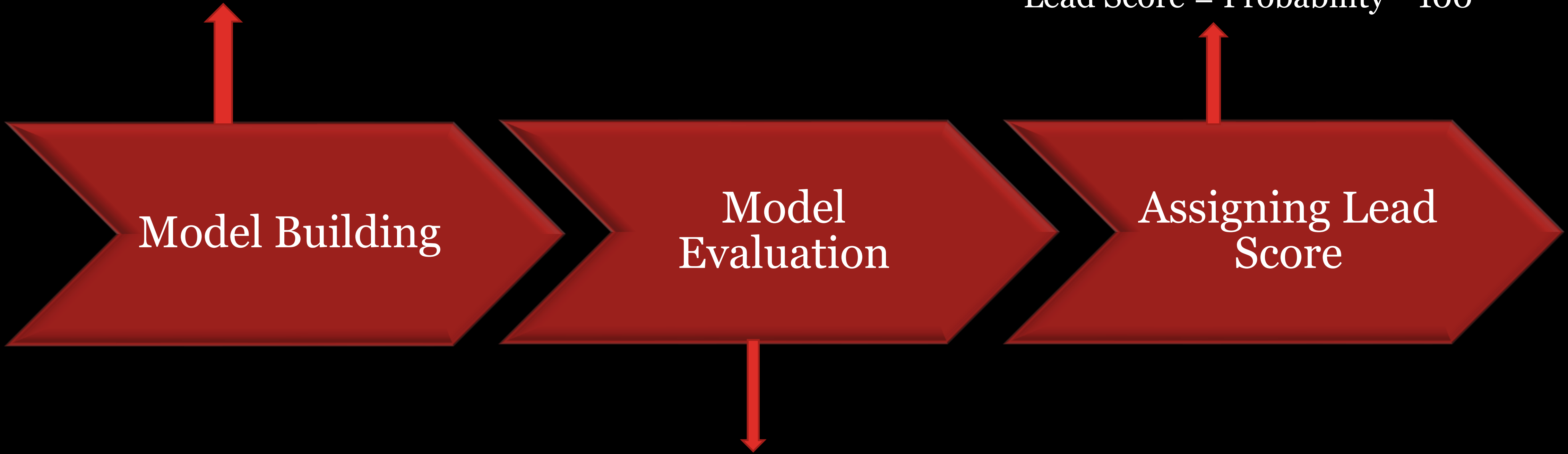
Data Cleaning

EDA

Data Preparation

- Missing value imputation
- Removing duplicate data and other redundancies

- Outlier treatment
- Dropping unnecessary columns
- Dummy variable creation
- Feature standardization



Model Building

- Feature selection using RFE
- Manual feature elimination based on p-values and VIFs

Model Evaluation

- Evaluating model based on various evaluation metrics
- Finding the optimal probability threshold

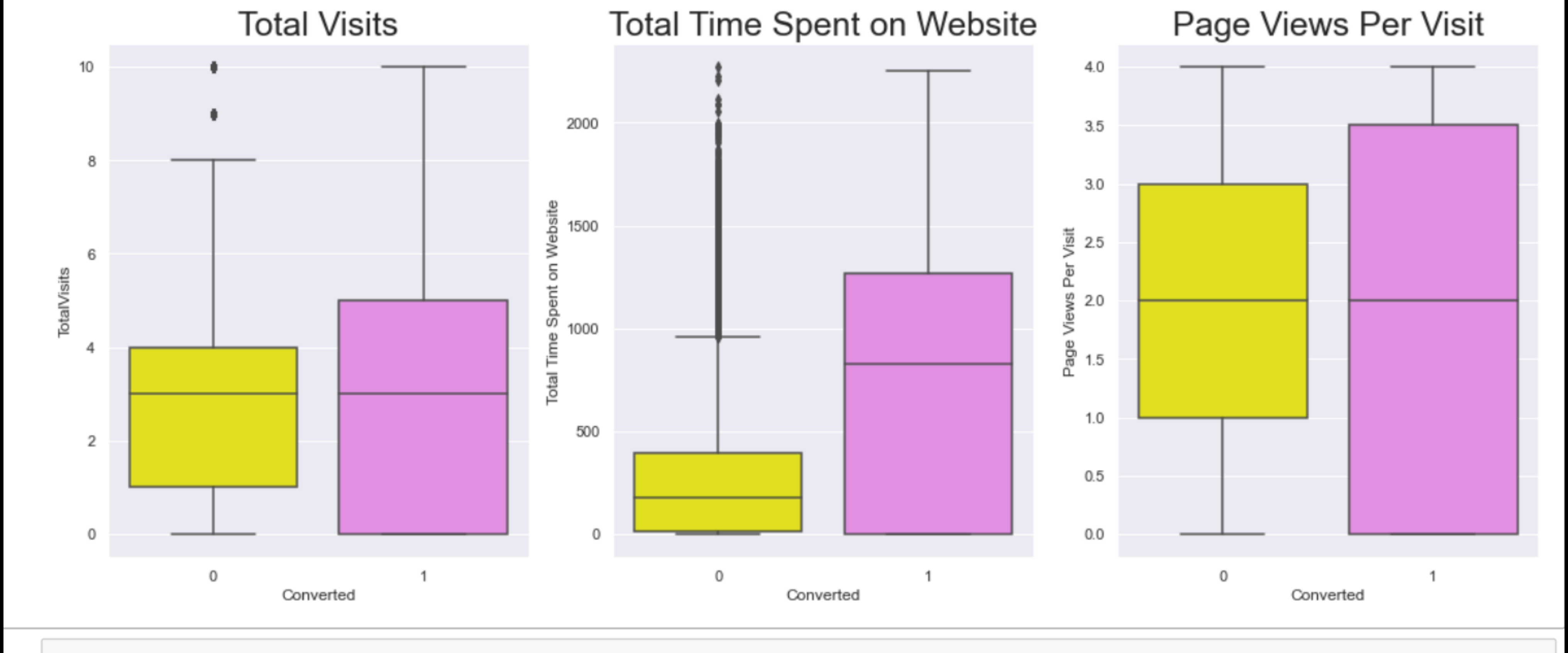
Assigning Lead Score

- Finalizing the first model
- Using predicted probabilities to calculate Lead Scores:
  Lead Score = Probability * 100

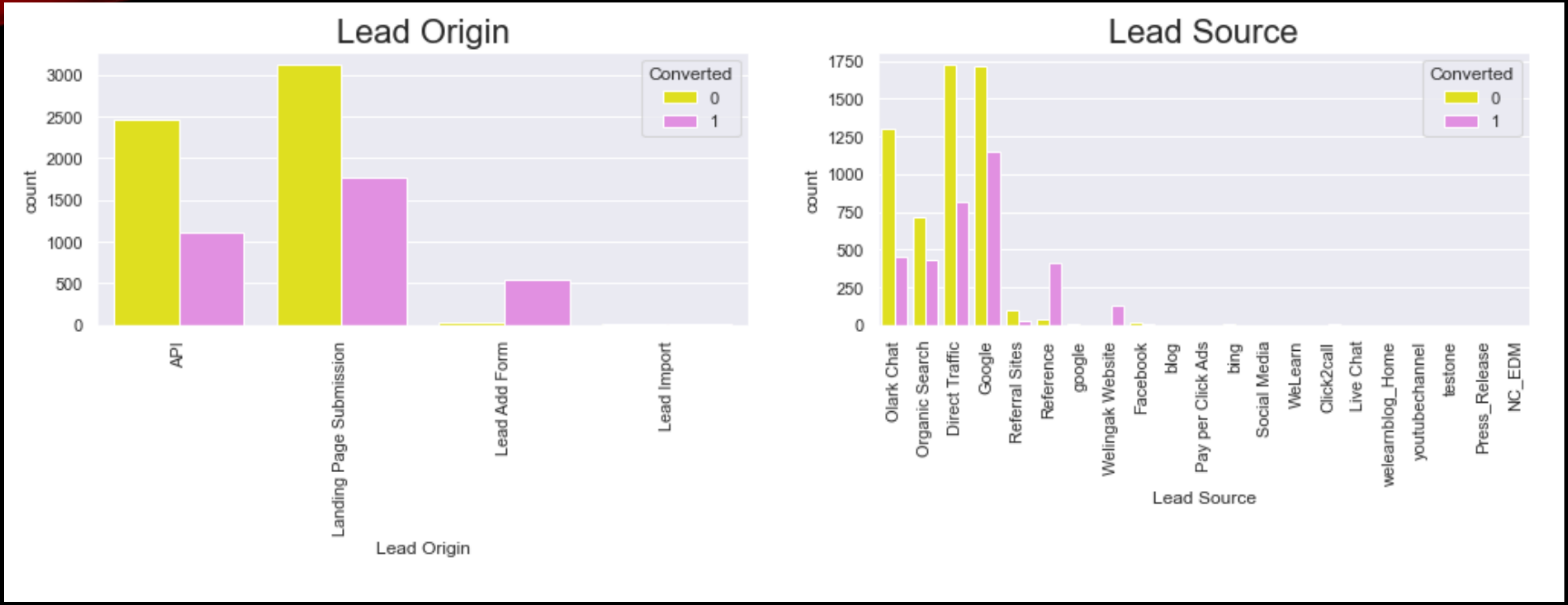
DATA VISUALIZATION

- TO IDENTIFY IMPORTANT FEATURES
- TO GET INSIGHTS

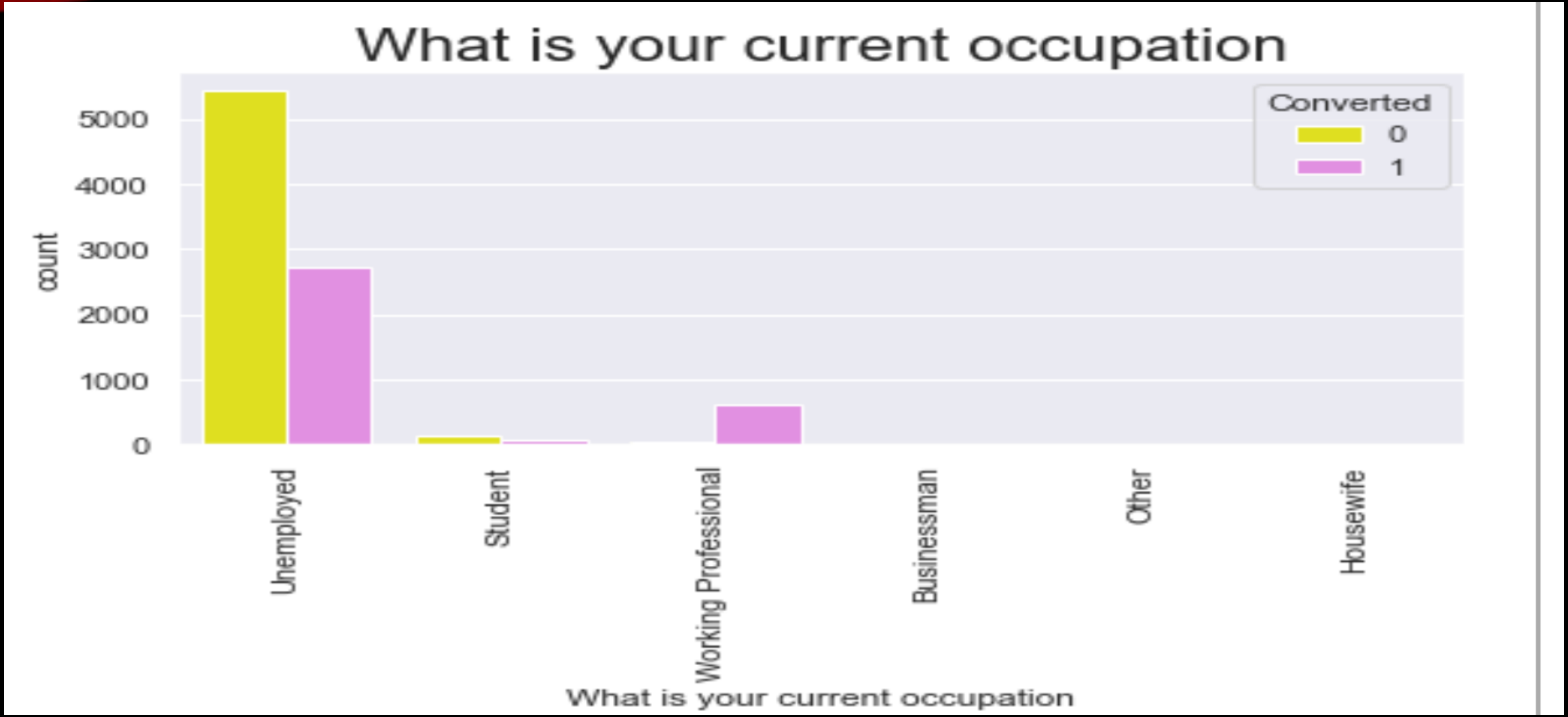
NUMERICAL VARIABLE



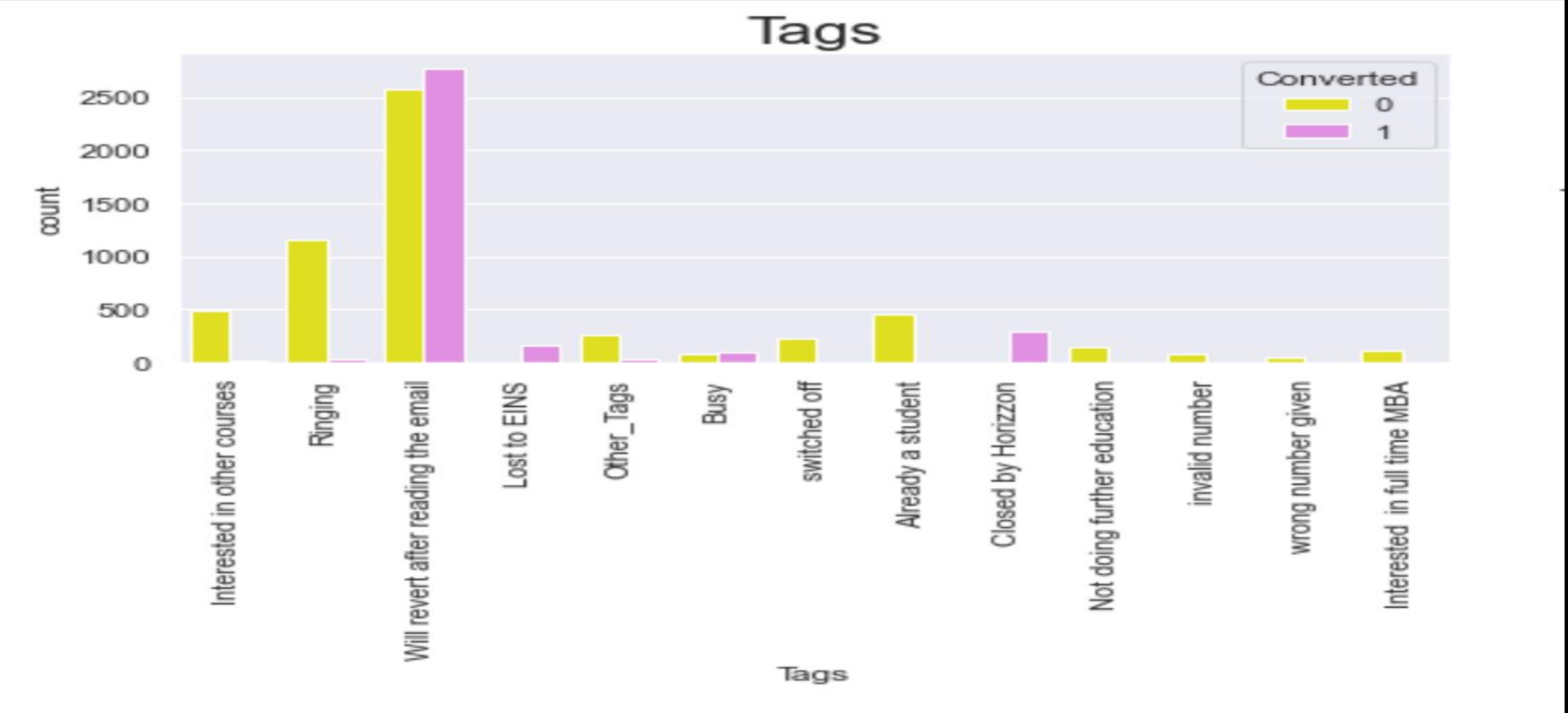
People spending more time on website are more likely to get converted.



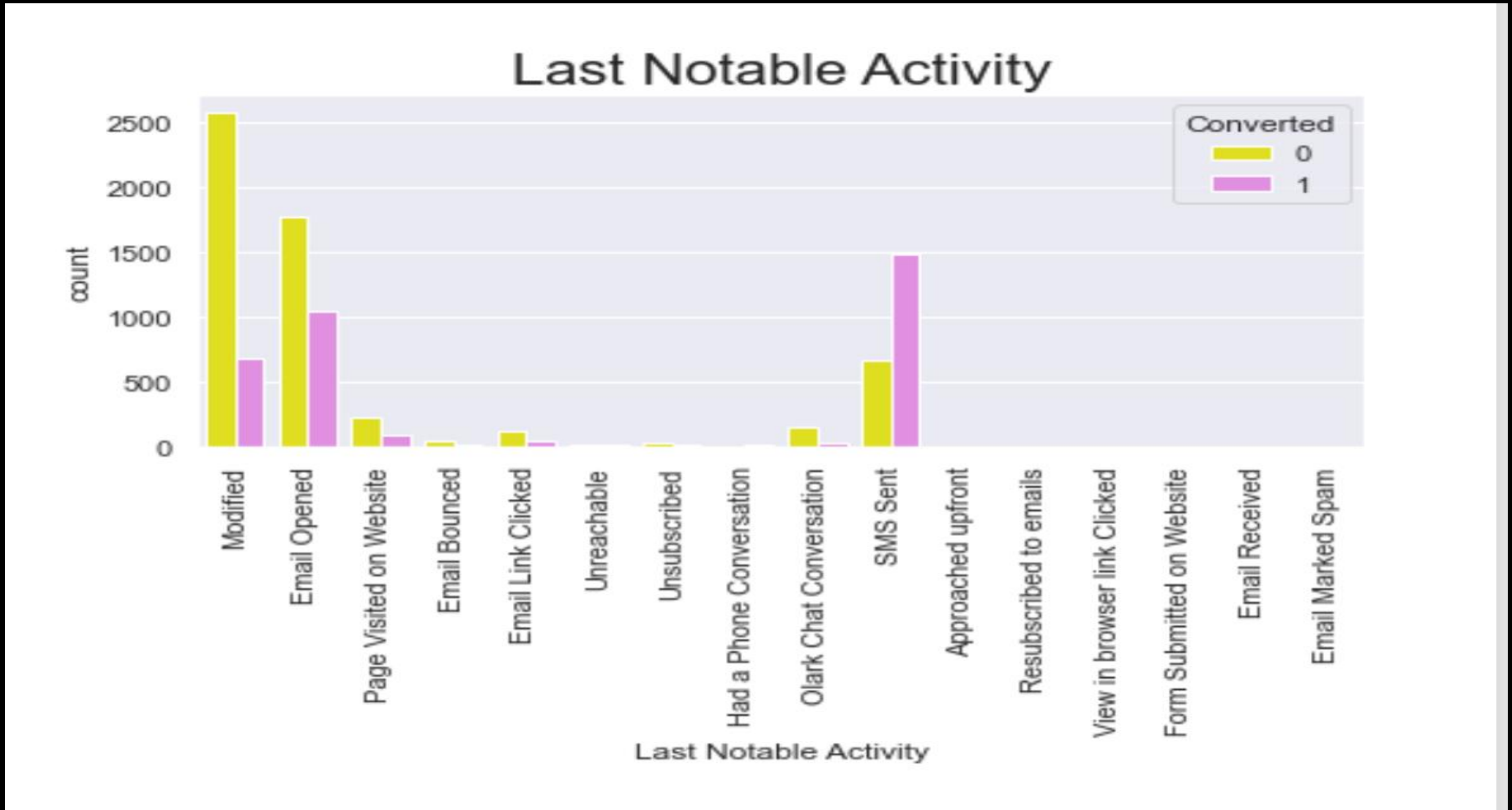
- ‘API’ and ‘Landing Page Submission’ generate the most leads but have less conversion rates, whereas ‘Lead Add Form’ generates less leads but conversion rate is great.
- Try to increase conversion rate for ‘API’ and ‘Landing Page Submission’, and increase leads generation using ‘Lead Add Form’.
- Very high conversion rates for lead sources ‘Reference’ and ‘Welingak Website’.
- Most leads are generated through ‘Direct Traffic’ and ‘Google’.



Working Professionals are most likely to get converted.



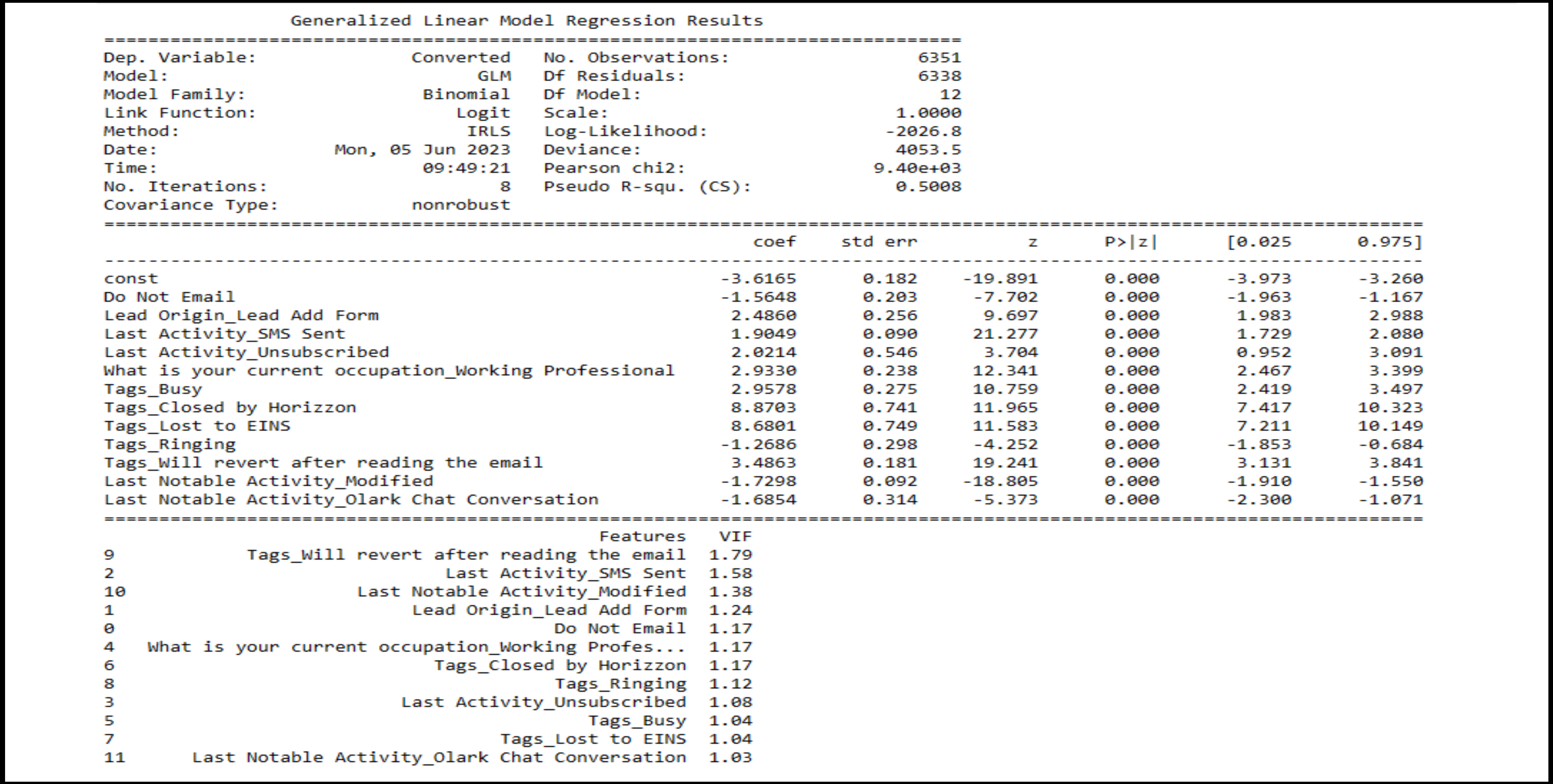
- High conversion rates for tags ‘Will revert after reading the email’, ‘Closed by Horizon’, ‘Lost to EINS’, and ‘Busy’.



Highest conversion rate is for the last notable activity ‘SMS Sent’.

MODEL EVALUATION

FINAL MODEL SUMMARY



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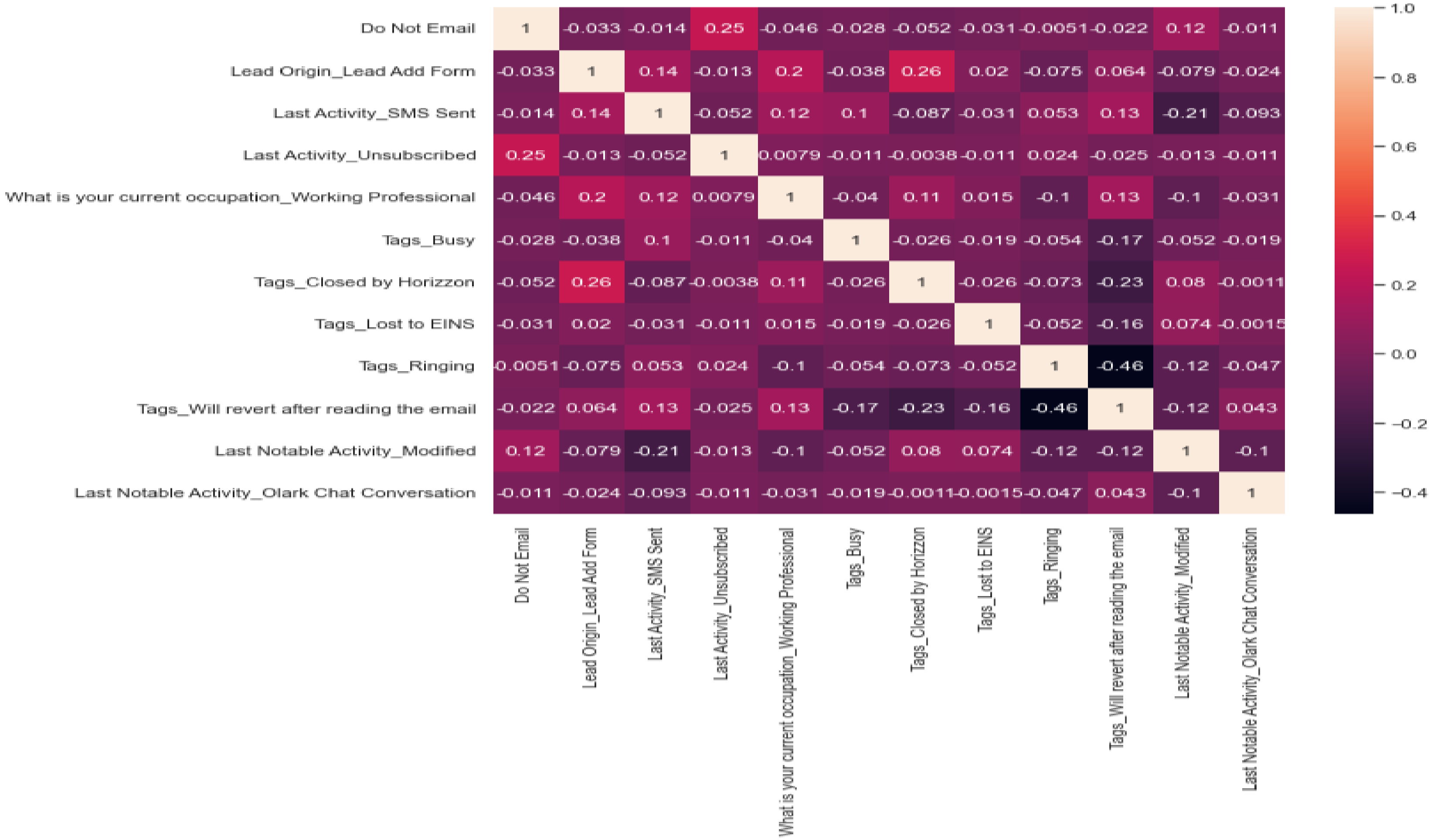
                 Generalized Linear Model Regression Results                  
==============================================================================
Dep. Variable:              Converted   No. Observations:                 6351
Model:                            GLM   Df Residuals:                     6338
Model Family:                Binomial   Df Model:                           12
Link Function:                  Logit   Scale:                          1.0000
Method:                          IRLS   Log-Likelihood:                -2026.8
Date:                Mon, 05 Jun 2023   Deviance:                       4053.5
Time:                        09:49:21   Pearson chi2:                 9.40e+03
No. Iterations:                     8   Pseudo R-squ. (CS):             0.5008
Covariance Type:            nonrobust                                         
=======================================================================================================================
                                                          coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------------------------------------
const                                                  -3.6165      0.182    -19.891      0.000      -3.973      -3.260
Do Not Email                                           -1.5648      0.203     -7.702      0.000      -1.963      -1.167
Lead Origin_Lead Add Form                               2.4860      0.256      9.697      0.000       1.983       2.988
Last Activity_SMS Sent                                  1.9049      0.090     21.277      0.000       1.729       2.080
Last Activity_Unsubscribed                              2.0214      0.546      3.704      0.000       0.952       3.091
What is your current occupation_Working Professional    2.9330      0.238     12.341      0.000       2.467       3.399
Tags_Busy                                               2.9578      0.275     10.759      0.000       2.419       3.497
Tags_Closed by Horizzon                                 8.8703      0.741     11.965      0.000       7.417      10.323
Tags_Lost to EINS                                       8.6801      0.749     11.583      0.000       7.211      10.149
Tags_Ringing                                           -1.2686      0.298     -4.252      0.000      -1.853      -0.684
Tags_Will revert after reading the email                3.4863      0.181     19.241      0.000       3.131       3.841
Last Notable Activity_Modified                         -1.7298      0.092    -18.805      0.000      -1.910      -1.550
Last Notable Activity_Olark Chat Conversation          -1.6854      0.314     -5.373      0.000      -2.300      -1.071
=======================================================================================================================
                                       Features   VIF
9           Tags_Will revert after reading the email  1.79
2                             Last Activity_SMS Sent  1.58
10                    Last Notable Activity_Modified  1.38
1                          Lead Origin_Lead Add Form  1.24
0                                       Do Not Email  1.17
4    What is your current occupation_Working Profes...  1.17
6                            Tags_Closed by Horizzon  1.17
8                                       Tags_Ringing  1.12
3                         Last Activity_Unsubscribed  1.08
5                                          Tags_Busy  1.04
7                                  Tags_Lost to EINS  1.04
11      Last Notable Activity_Olark Chat Conversation  1.03
```

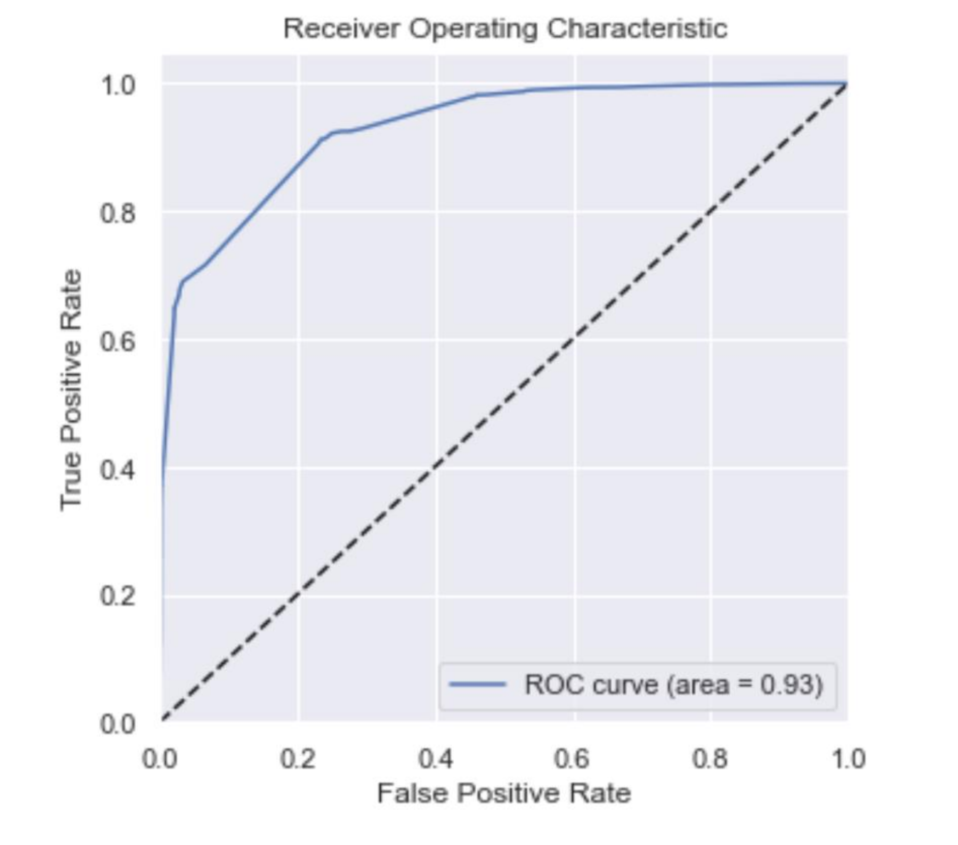
All p-values are zero and VIF is less than 5

HEATMAP



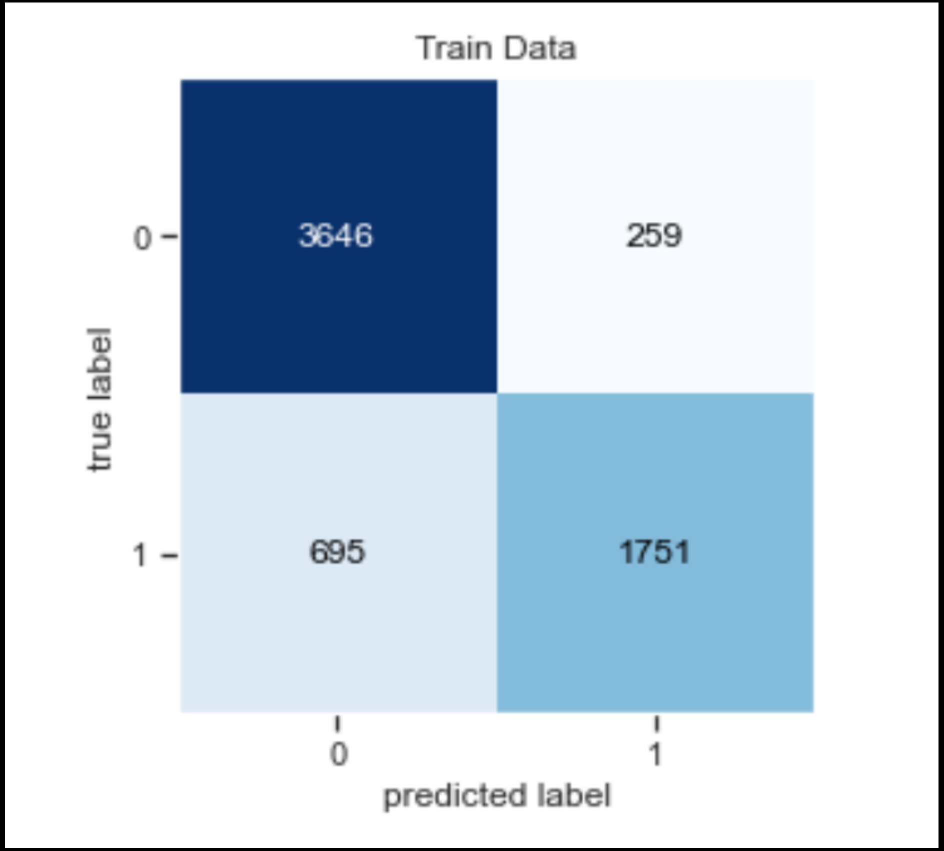
	Do Not Email	Lead Origin_Lead Add Form	Last Activity_SMS Sent	Last Activity_Unsubscribed	What is your current occupation_Working Professional	Tags_Busy	Tags_Closed by Horizzon	Tags_Lost to EINS	Tags_Ringing	Tags_Will revert after reading the email	Last Notable Activity_Modified	Last Notable Activity_Olark Chat Conversation
Do Not Email	1	-0.033	-0.014	0.25	-0.046	-0.028	-0.052	-0.031	-0.0051	-0.022	0.12	-0.011
Lead Origin_Lead Add Form	-0.033	1	0.14	-0.013	0.2	-0.038	0.26	0.02	-0.075	0.064	-0.079	-0.024
Last Activity_SMS Sent	-0.014	0.14	1	-0.052	0.12	0.1	-0.087	-0.031	0.053	0.13	-0.21	-0.093
Last Activity_Unsubscribed	0.25	-0.013	-0.052	1	0.0079	-0.011	-0.0038	-0.011	0.024	-0.025	-0.013	-0.011
What is your current occupation_Working Professional	-0.046	0.2	0.12	0.0079	1	-0.04	0.11	0.015	-0.1	0.13	-0.1	-0.031
Tags_Busy	-0.028	-0.038	0.1	-0.011	-0.04	1	-0.026	-0.019	-0.054	-0.17	-0.052	-0.019
Tags_Closed by Horizzon	-0.052	0.26	-0.087	-0.0038	0.11	-0.026	1	-0.026	-0.073	-0.23	0.08	-0.0011
Tags_Lost to EINS	-0.031	0.02	-0.031	-0.011	0.015	-0.019	-0.026	1	-0.052	-0.16	0.074	-0.0015
Tags_Ringing	-0.0051	-0.075	0.053	0.024	-0.1	-0.054	-0.073	-0.052	1	-0.46	-0.12	-0.047
Tags_Will revert after reading the email	-0.022	0.064	0.13	-0.025	0.13	-0.17	-0.23	-0.16	-0.46	1	-0.12	0.043
Last Notable Activity_Modified	0.12	-0.079	-0.21	-0.013	-0.1	-0.052	0.08	0.074	-0.12	-0.12	1	-0.1
Last Notable Activity_Olark Chat Conversation	-0.011	-0.024	-0.093	-0.011	-0.031	-0.019	-0.0011	-0.0015	-0.047	0.043	-0.1	1

ROC CURVE



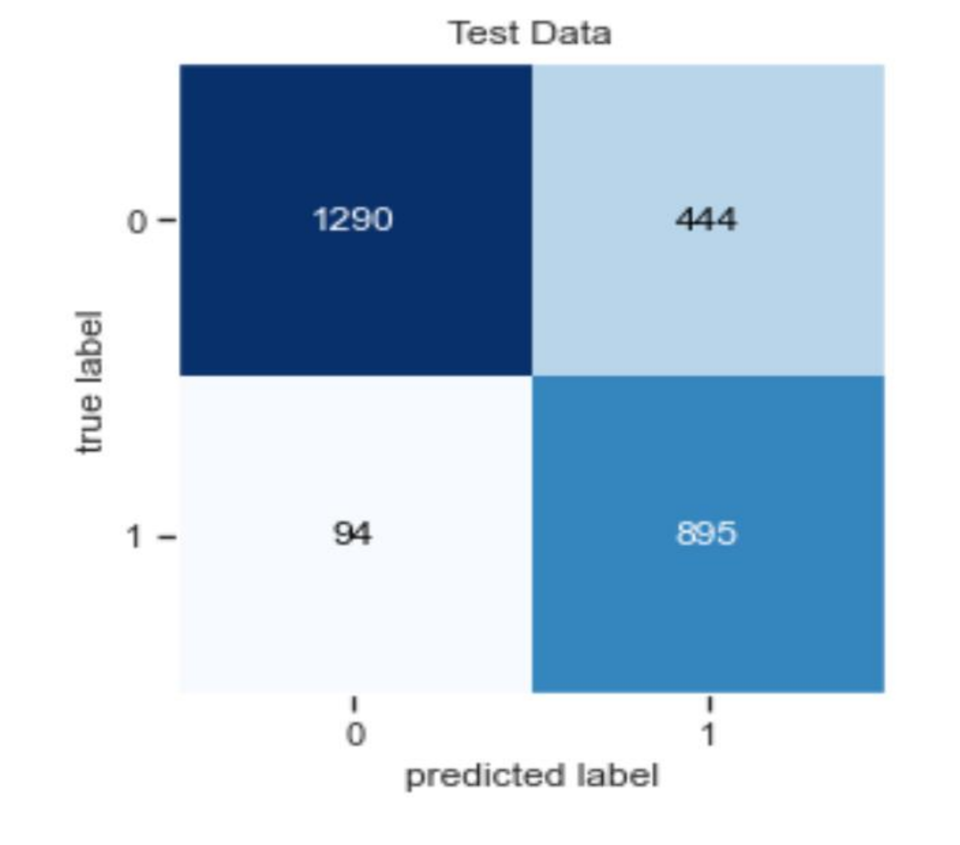
Area under curve = 0.93

CONFUSION MATRIX



Train Data

	0	1
0	3646	259
1	695	1751

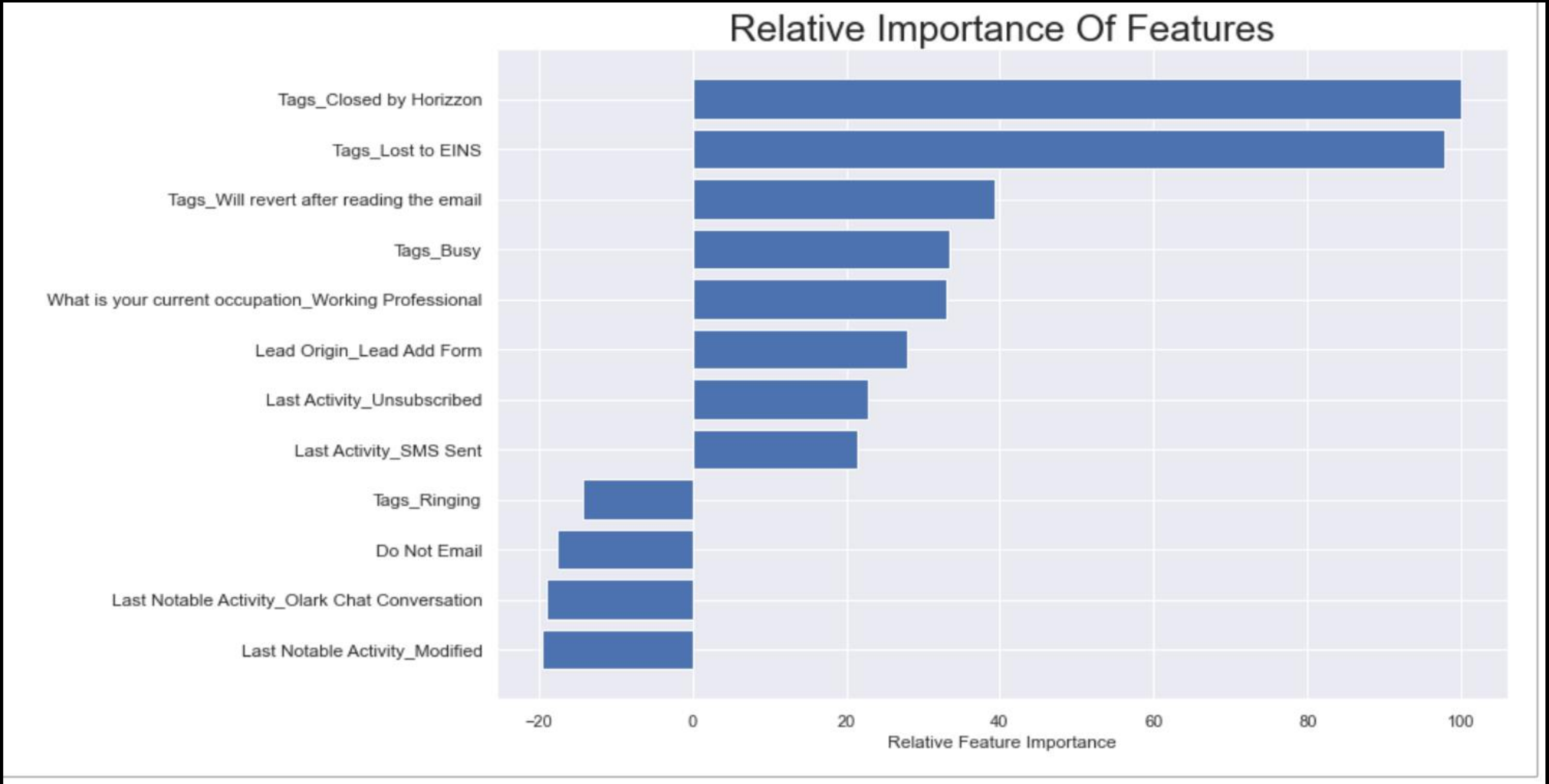


Test Data

	0	1
0	1290	444
1	94	895

FINAL RESULT

Data	Train set	Test set
Accuracy	0.849	0.802
sensitivity	0.715	0.904
Specificity	0.933	0.743
Precision	0.871	0.668


Relative Importance Of Features
Tags_Closed by Horizzon
Tags_Lost to EINS
Tags_Will revert after reading the email
Tags_Busy
What is your current occupation_Working Professional
Lead Origin_Lead Add Form
Last Activity_Unsubscribed
Last Activity_SMS Sent
Tags_Ringing
Do Not Email
Last Notable Activity_Olark Chat Conversation
Last Notable Activity_Modified
−20
0
20
40
60
80
100
Relative Feature Importance

INFERENCES

FEATURES IMPORTANCE

- Three variables which contribute most towards the probability of a lead conversion in decreasing order of impact are:
    - Tags_Closed by Horizzon
    - Tags_Lost to EINS
    - Tags_Will revert after reading the email

- These are dummy features created from the categorical variable Tags.
- All three contribute positively towards the probability of a lead conversion.
- These results indicate that the company should focus more on the leads with these three tags.

RECOMMENDATIONS

- By referring to the data visualizations, focus on
  - Increasing the conversion rates for the categories generating more leads and
  - Generating more leads for categories having high conversion rates.
- Pay attention to the relative importance of the features in the model and their positive or negative impact on the probability of conversion.
- Based on varying business needs, modify the probability threshold value for identifying potential leads.

THANK YOU