LEAD SCORING CASE STUDY

Focused Business Approach Using Logistic Regression Technique

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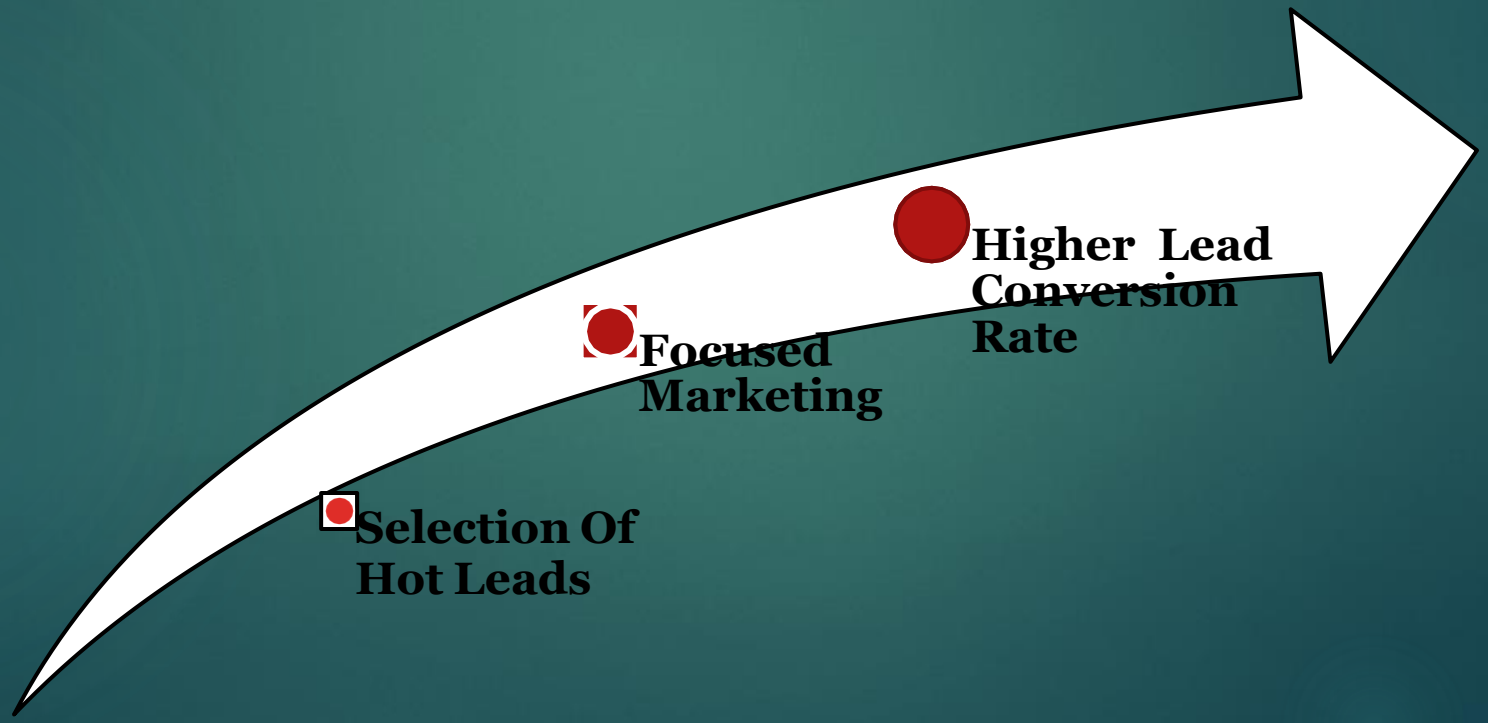
BUSINESS OBJECTIVE

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



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

Reading And Understanding The Data

Data Cleaning

- Missing value imputation
- Removing duplicate data and other redundancies

Univariate and Bivariate analysis

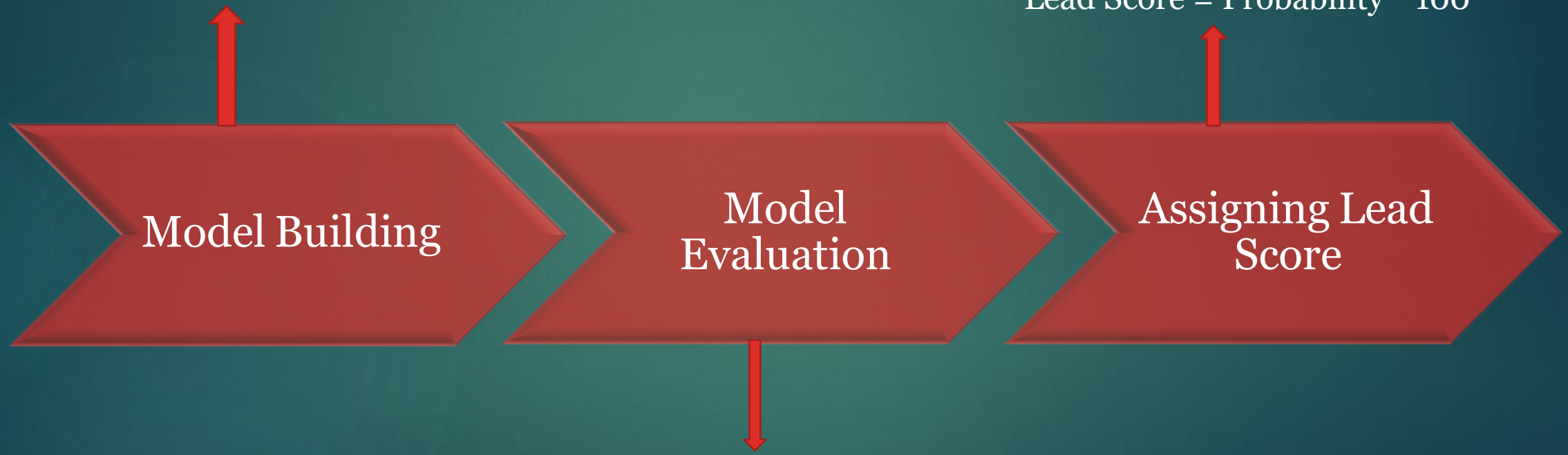
EDA

Data Preparation

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

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

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



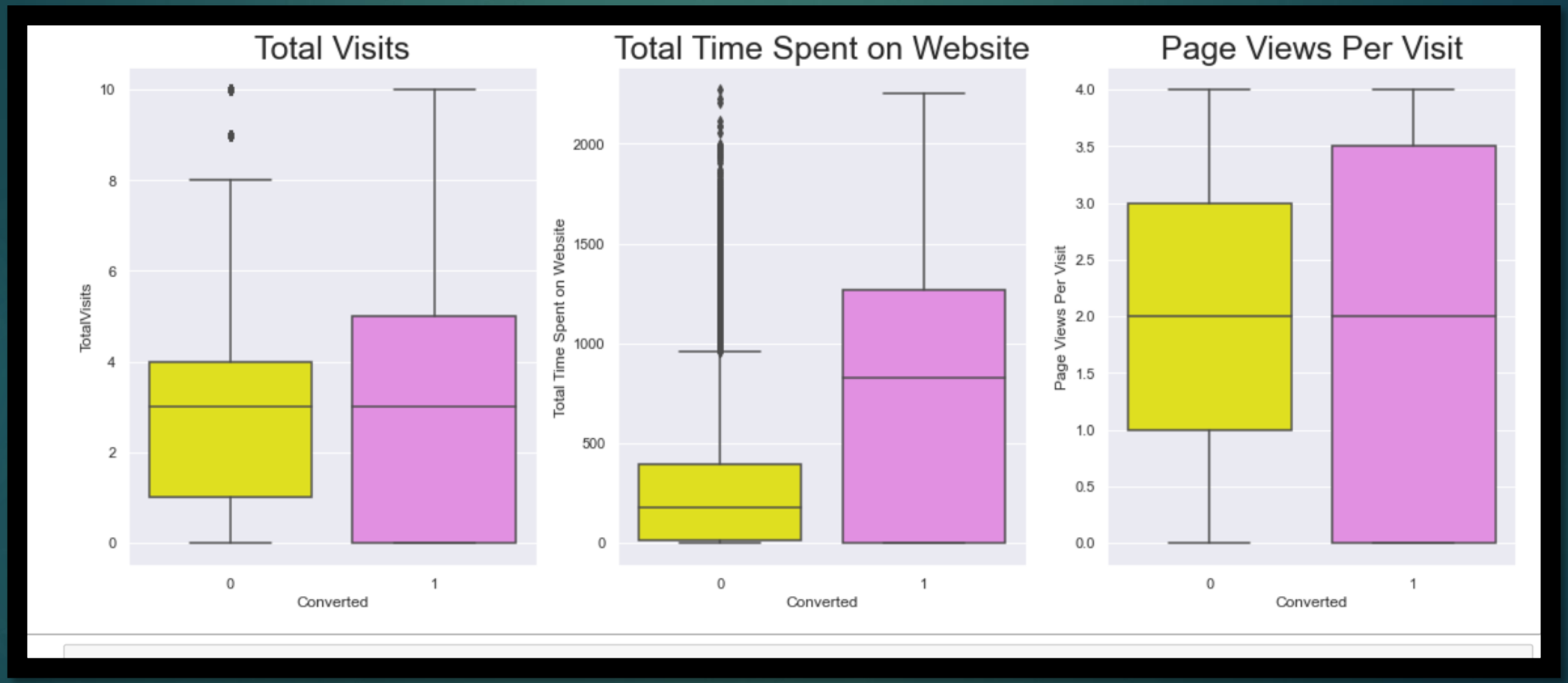
- Evaluating model based on various evaluation metrics
- Finding the optimal probability threshold

DATA VISUALIZATION

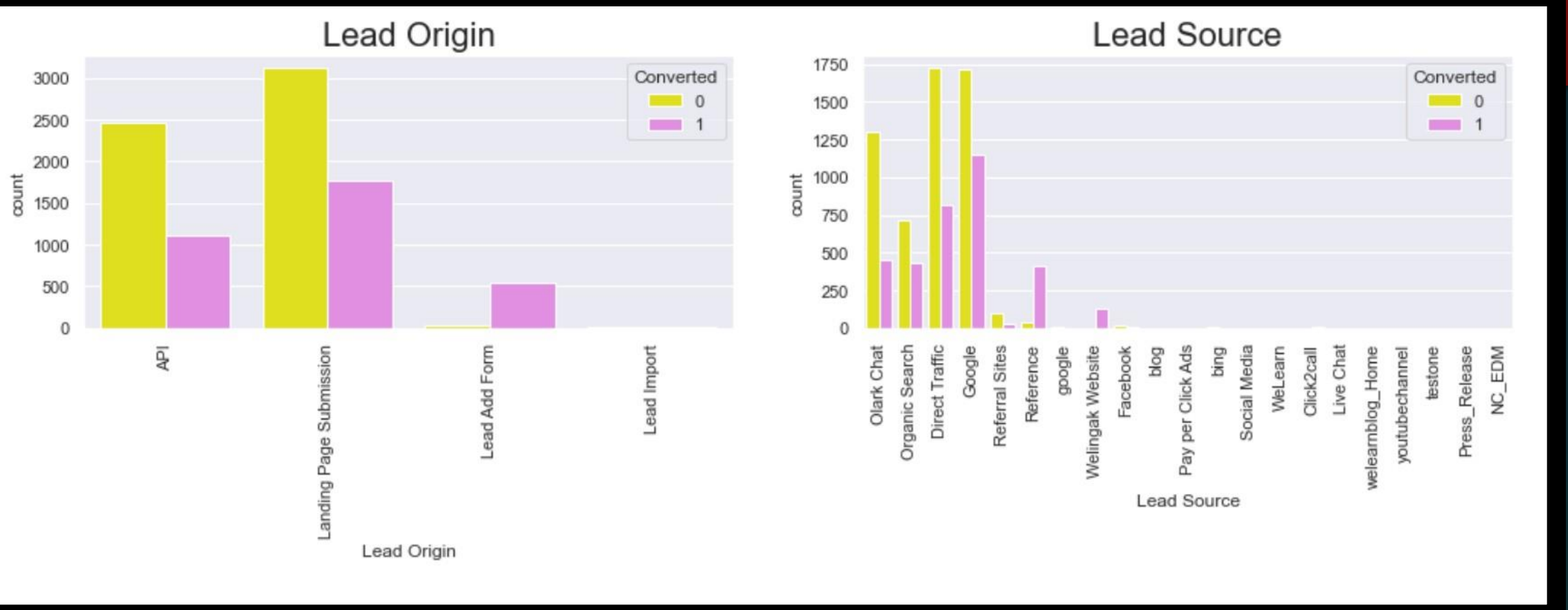
TO IDENTIFY IMPORTANT FEATURES

TO GET INSIGHTS

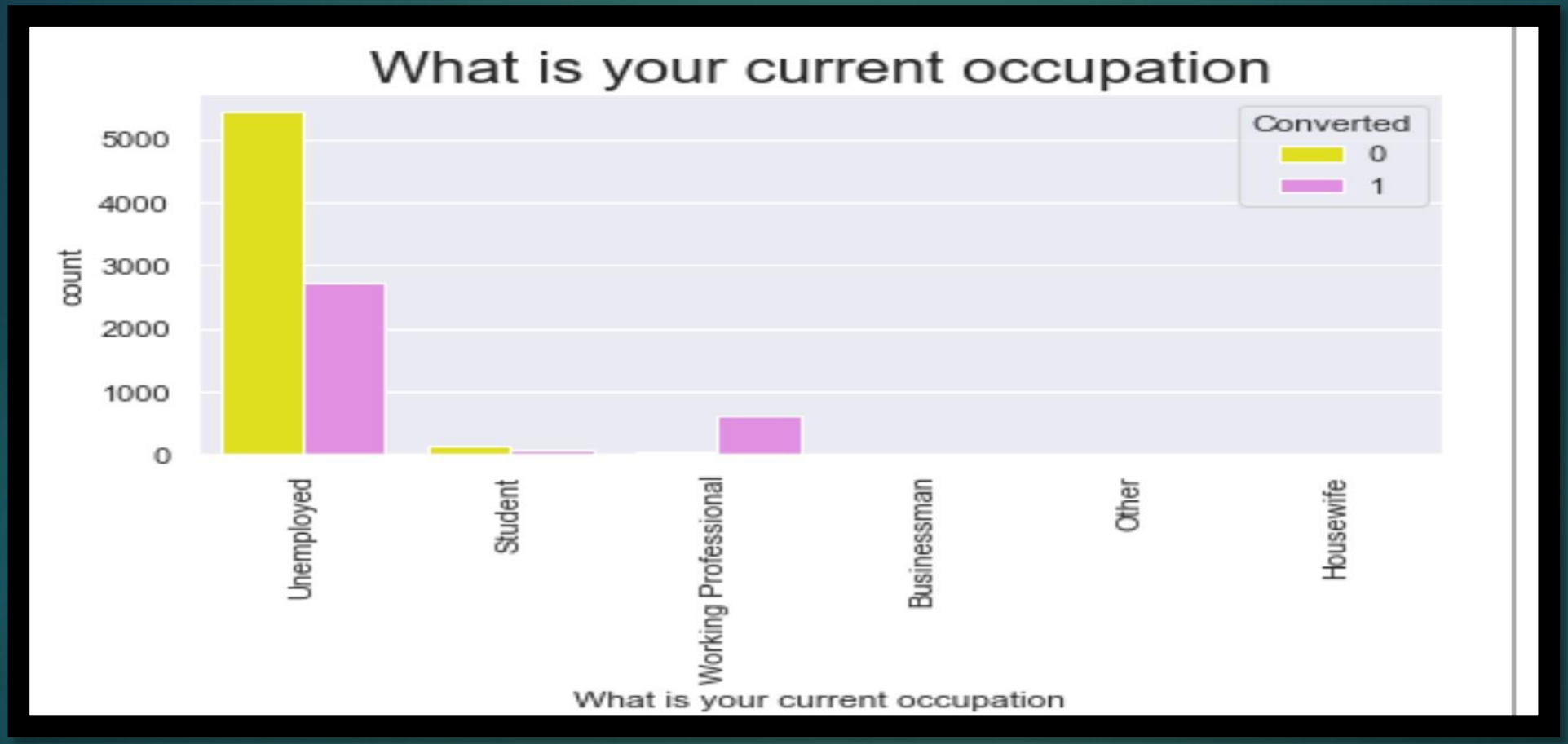
NUMERICAL VARIABLE



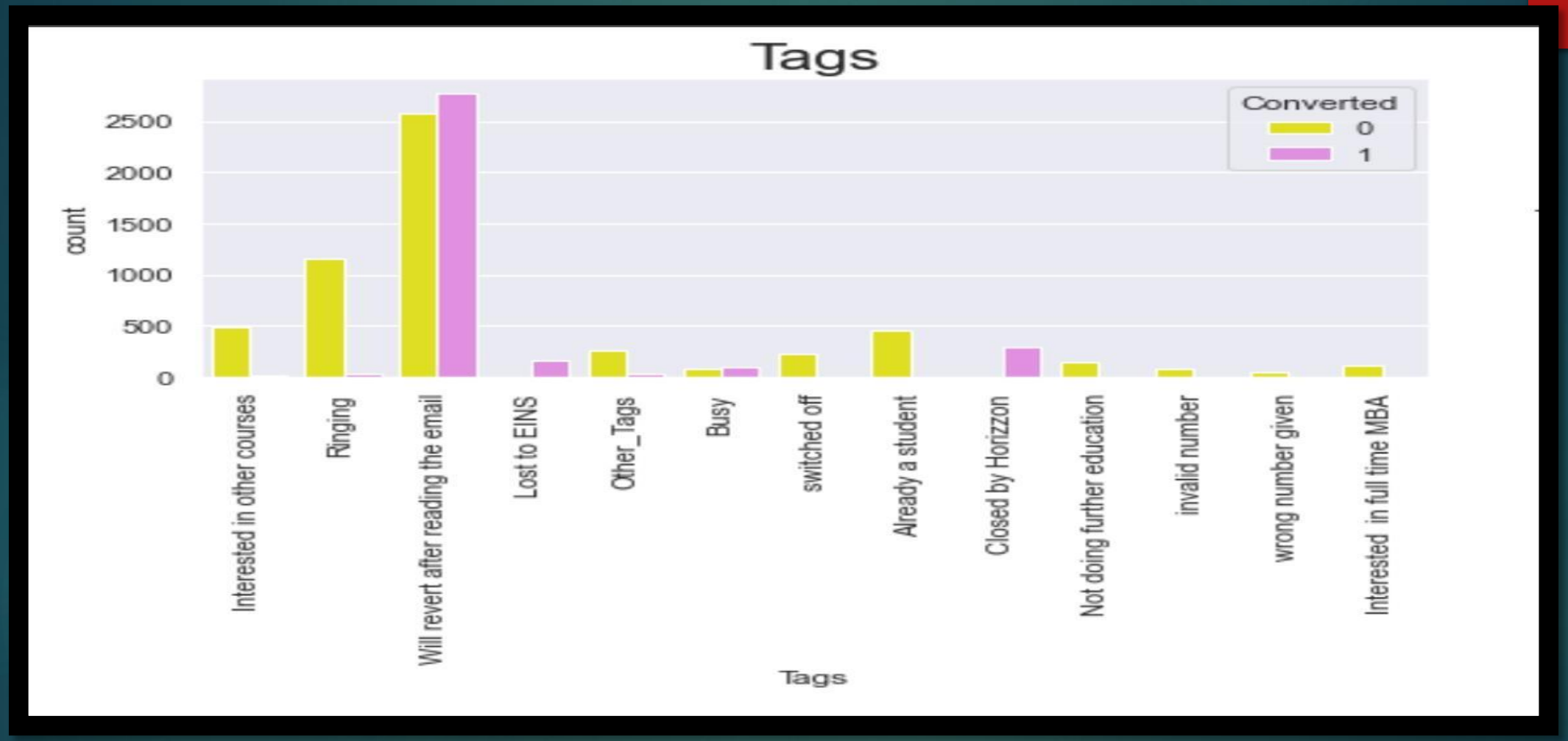
People spending more time on website are more likely to get converted.



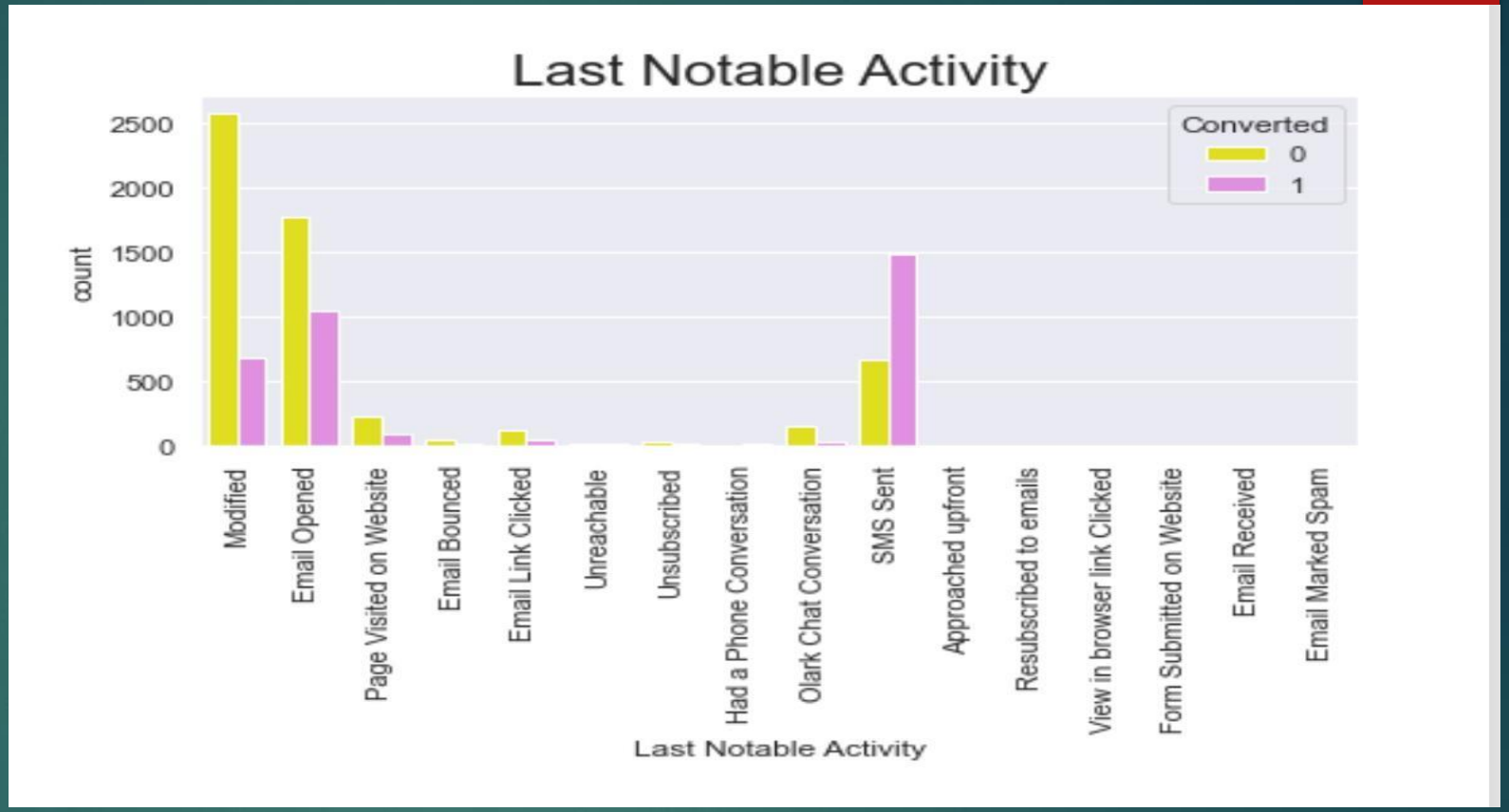
- **'API'** and **'Landing Page Submission'** generate the most leads but have less conversion rates, whereas **'Lead Add Form'** generates less leads but conversion rate is great.
- Try to increase conversion rate for **'API'** and **'Landing Page Submission'**, and increase leads generation using **'Lead 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

Generalized Linear Model Regression Results

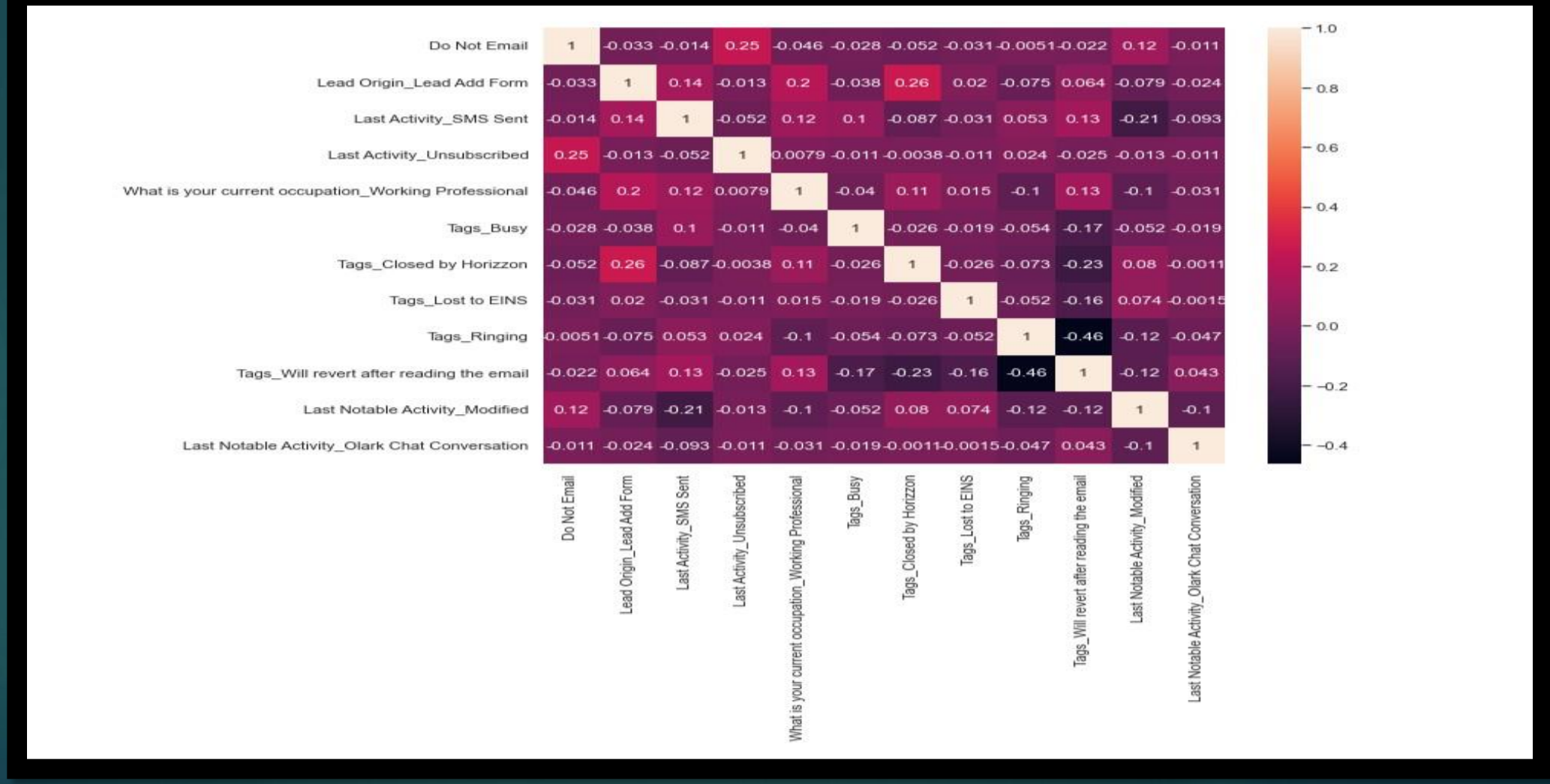
Dep. Variable:	Converted	No. Observations:	6351
Model:	GLM	Df Residuals:	6338
Model Family:	Binomial	Df Model:	12
Link Function:	Logit	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-2026.8
Date:	Mon, 05 Jun 2023	Deviance:	4053.5
Time:	09:49:21	Pearson chi2:	9.40e+03
No. Iterations:	8	Pseudo R-squ. (CS):	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

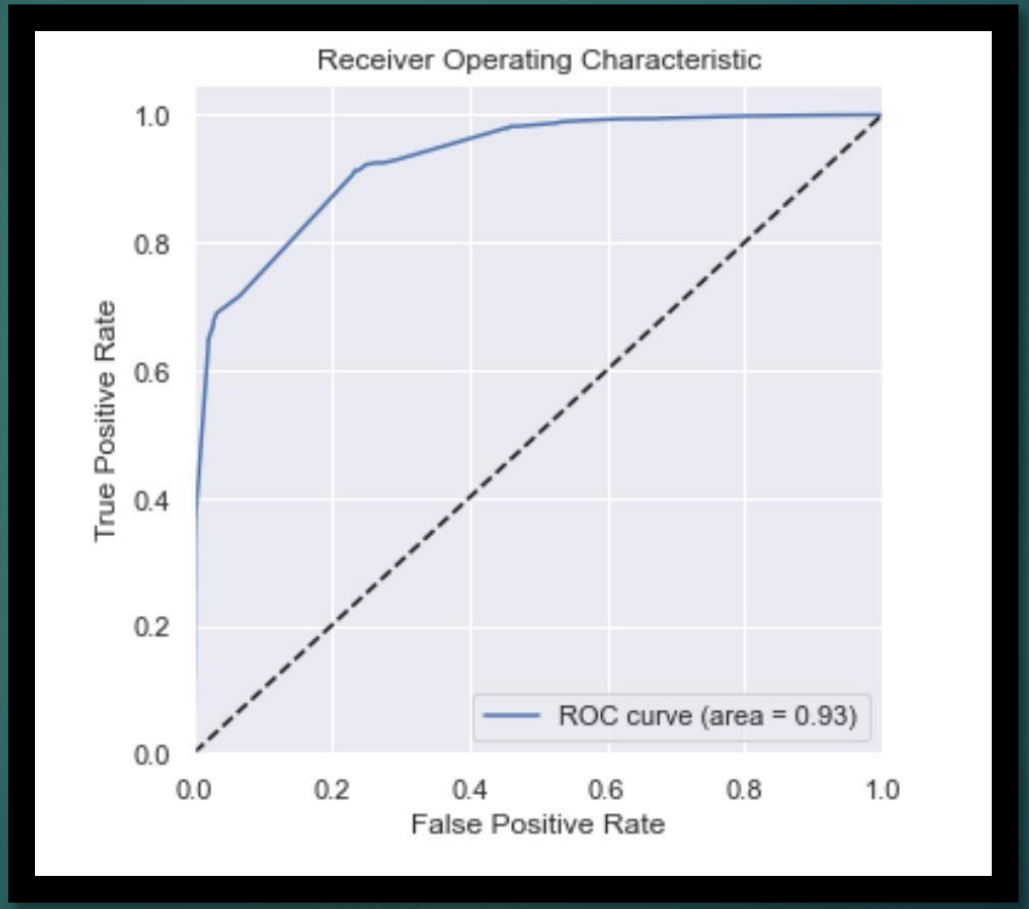
	Features	VIF
9	Tags_Will revert after reading the email	1.79
2	Last Activity_SMS Sent	1.58
10	Last Notable Activity_Modified	1.38
1	Lead Origin_Lead Add Form	1.24
0	Do Not Email	1.17
4	What is your current occupation_Working Profes...	1.17
6	Tags_Closed by Horizzon	1.17
8	Tags_Ringing	1.12
3	Last Activity_Unsubscribed	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

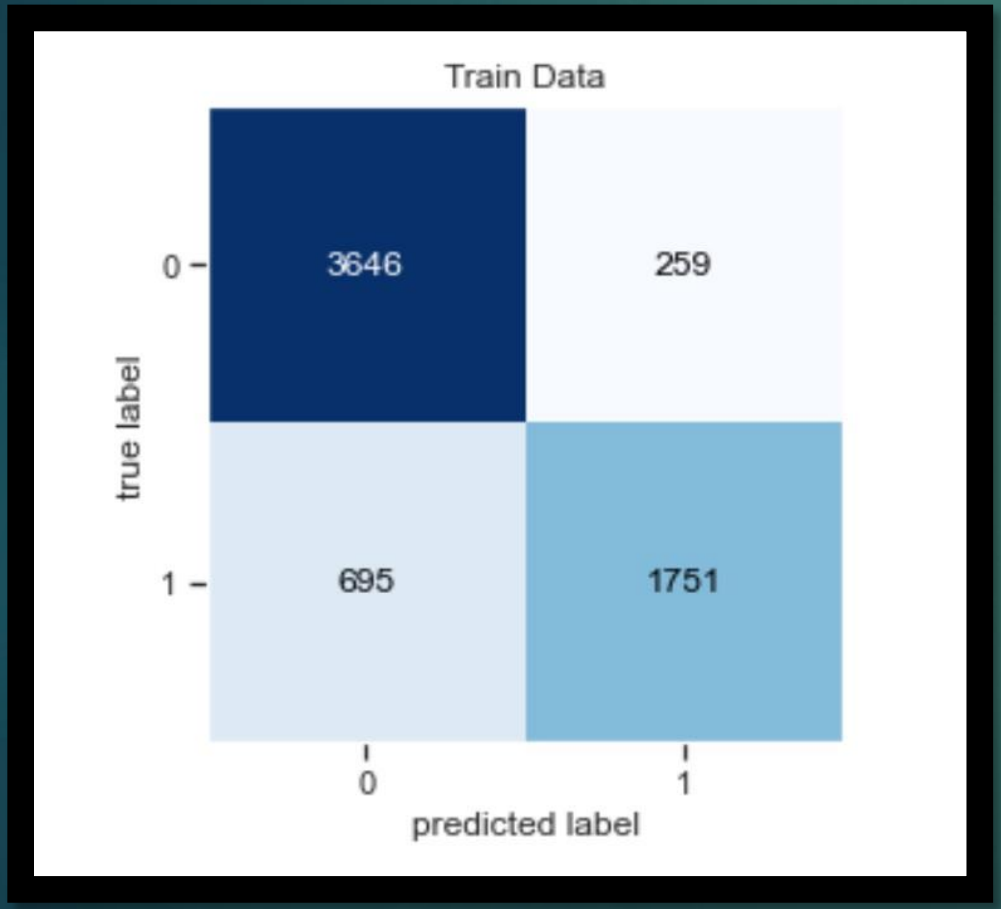

Do Not Email 1 -0.033 -0.014 0.25 -0.046 -0.028 -0.052 -0.031 -0.0051 -0.022 0.12 -0.011
Lead Origin_Lead Add Form -0.033 1 0.14 -0.013 0.2 -0.038 0.26 0.02 -0.075 0.064 -0.079 -0.024
Last Activity_SMS Sent -0.014 0.14 1 -0.052 0.12 0.1 -0.087 -0.031 0.053 0.13 -0.21 -0.093
Last Activity_Unsubscribed 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
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
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4

ROC CURVE



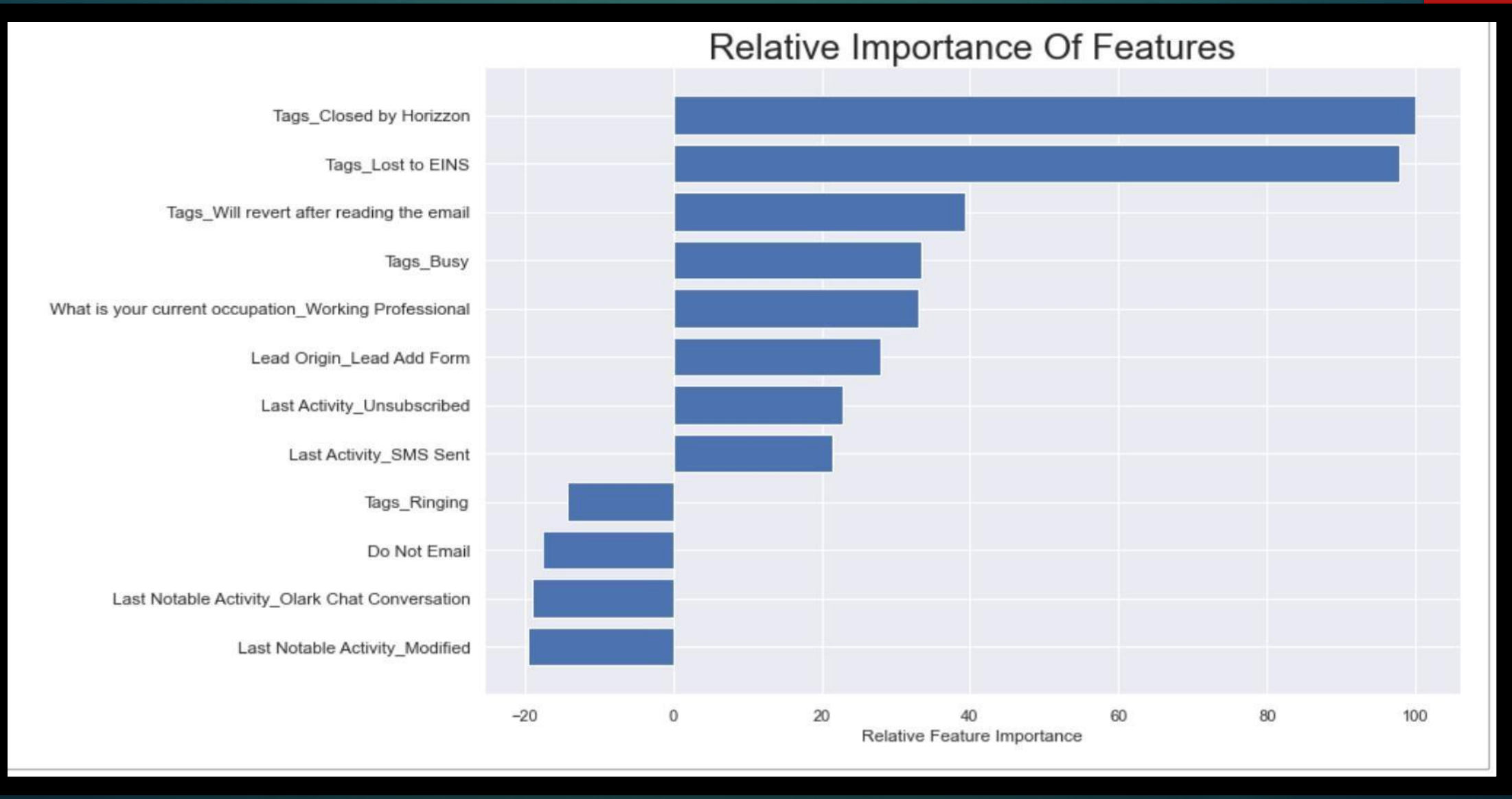
Area under curve = 0.93

CONFUSION MATRIX



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