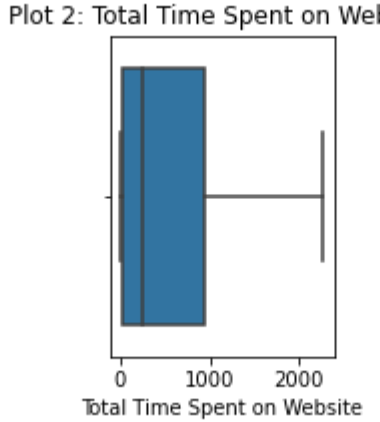
Lead Scoring Model

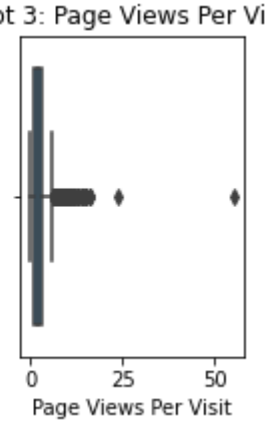
Problem Statement

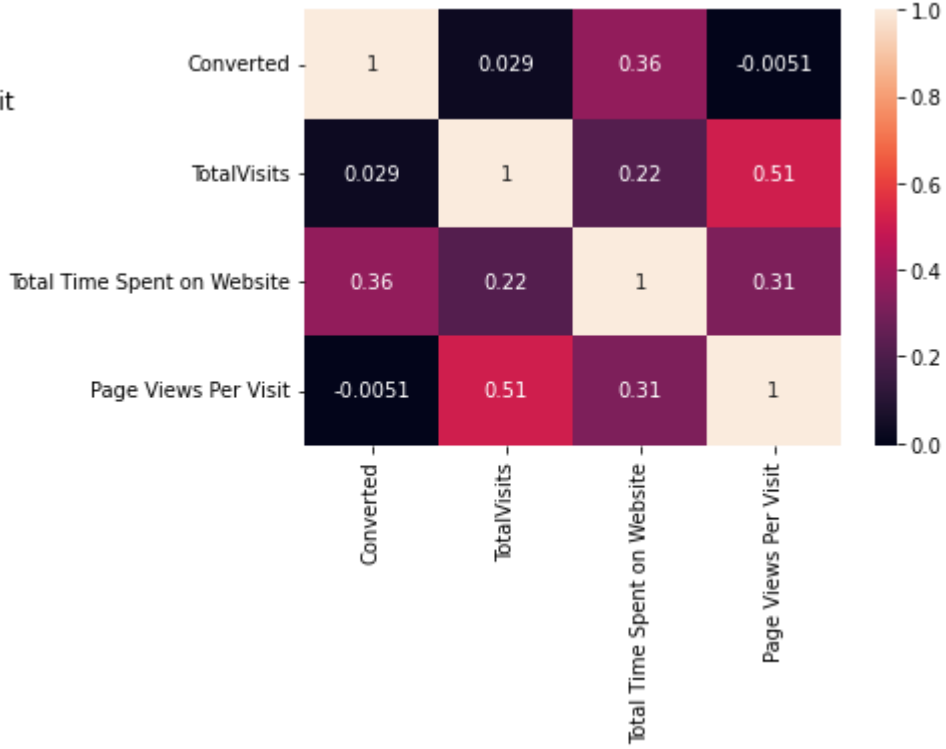
- To build a Lead Scoring(logistic regression) model to assign a lead score to each of the leads which can be used by X Education to target potential leads which would help the company to get more customers.

Pre-Process Approach

- Initially, columns with more than 30% of missing value percentage is removed.
- Categorical variables 'Do Not Call', 'Newspaper Article', 'X Education Forums', 'Search', 'Newspaper', 'Digital Advertisement' and 'Through Recommendations' is observed to be near to constant with more than 99% of data points having same category and hence dropped.
- For remaining categorical variables, the missing values were imputed with Mode and numerical with Median.
- Numerical Variables 'TotalVisits' and 'Page Views Per Visit' seemed to have outlier values but since these variables didn't have much correlation with the target, these were dropped.
- The remaining numerical variables were normalized using standard scalar and categorical variables were encoded using dummy variables.



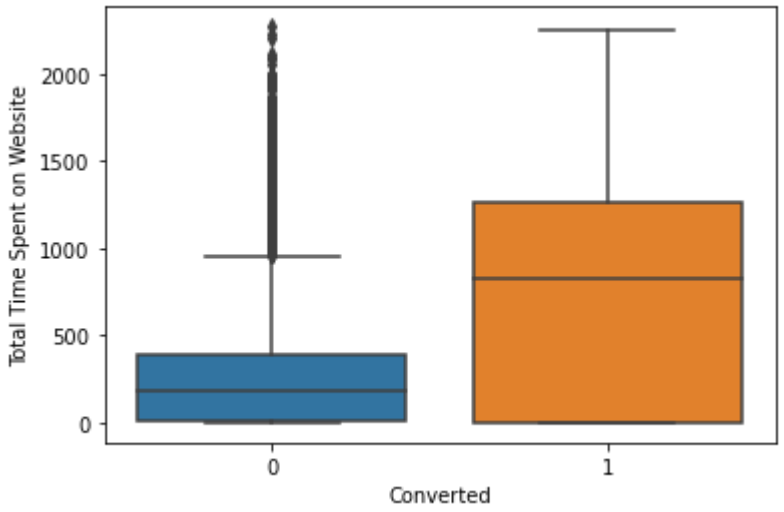


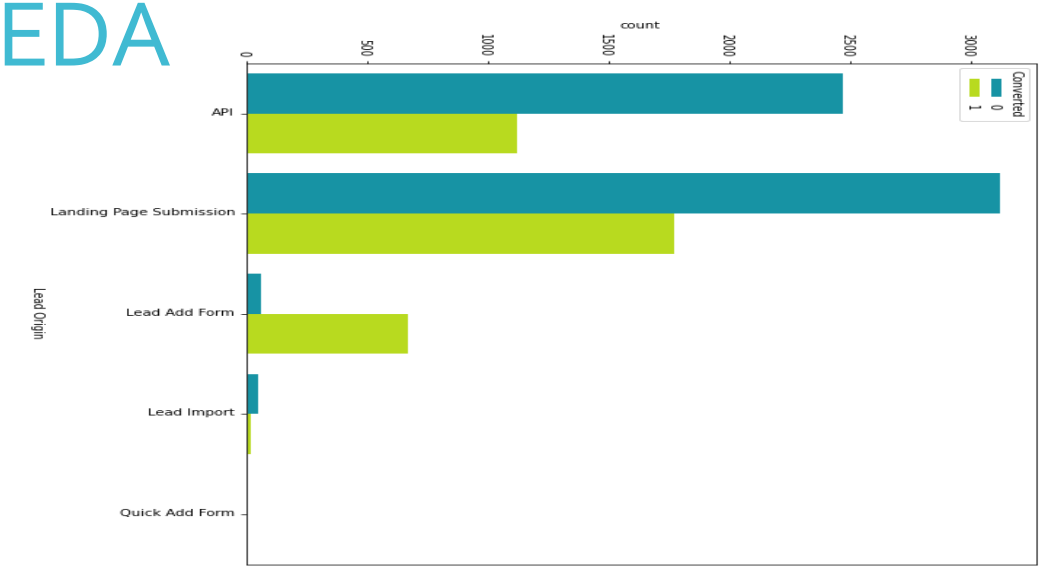


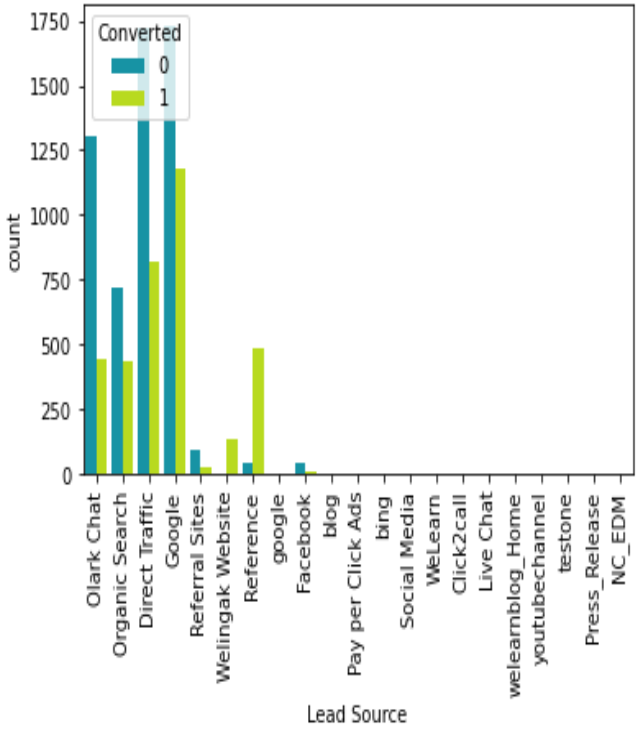
EDA

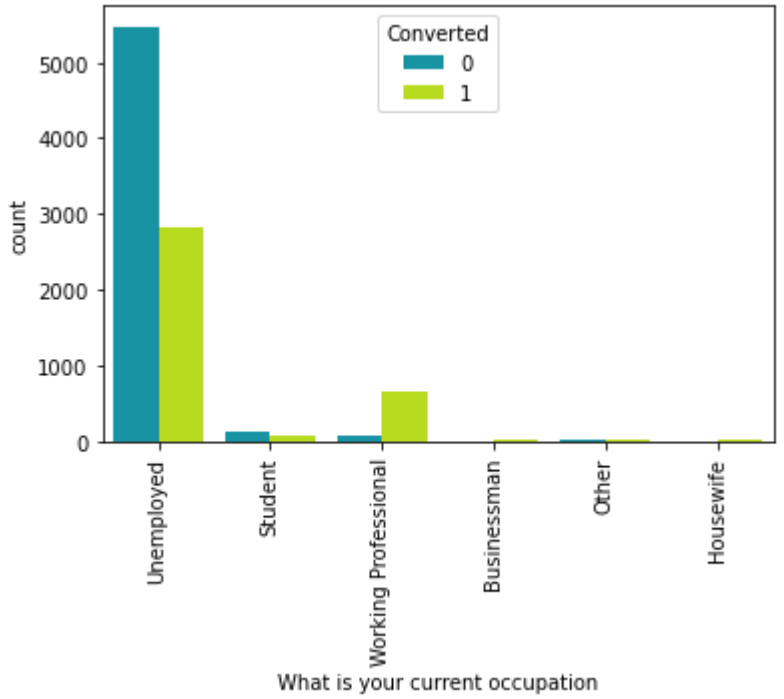
- API and Landing Page submission brings most of the leads whereas the conversion rate is higher for Lead Add Form.
- Lead Import and Quick Add Form brings very few leads and Quick Add Form is having a zero conversion rate.
- In lead source, Direct Traffic and Olark Chat brings in huge number of leads but suffers very low conversion whereas Google has good lead inputs and decent conversion.
- In lead source, reference shows the highest conversion rate.
- In Last Activity, Had a Phone Conversation and SMS sent seems to generate hot leads having good conversion rate.
- Unemployed people seems to be making up for most of the leads but with low conversion of about half.
- Businessman and Working Professional contribute for higher conversions.
- Housewives are having less lead generation percentage, but the generated leads tend to be converted.
- Leads spending more time in website has higher probability to be converted.

EDA


Total Time Spent on Website
2000
1500
1000
500
0
0
1
Converted


count
0
500
1000
1500
2000
2500
3000
Converted
0
1
API
Landing Page Submission
Lead Add Form
Lead Import
Quick Add Form
Lead Origin


Converted
0
1
count
1750
1500
1250
1000
750
500
250
0
Olark Chat
Organic Search
Direct Traffic
Google
Referral Sites
Welingak Website
Reference
google
Facebook
blog
Pay per Click Ads
bing
Social Media
WeLearn
Click2call
Live Chat
welearnblog_Home
youtubechannel
testone
Press_Release
NC_EDM
Lead Source


Converted
0
1
count
5000
4000
3000
2000
1000
0
Unemployed
Student
Working Professional
Businessman
Other
Housewife
What is your current occupation

Model Performance

- The final model was fit after taking in only relevant features based on p-value and VIF.

	variable	vif
11	Last Notable Activity_Modified	2.053099
6	Last Activity_Olark Chat Conversation	2.038582
5	Last Activity_Email Bounced	1.878718
3	Do Not Email_Yes	1.844504
2	Lead Source_Olark Chat	1.676651
12	Last Notable Activity_Olark Chat Conversation	1.337010
4	Last Activity_Converted to Lead	1.250938
0	Total Time Spent on Website	1.213874
1	Lead Origin_Lead Add Form	1.162495
7	Last Activity_Page Visited on Website	1.117900
8	What is your current occupation_Working Profes...	1.116013
10	Last Notable Activity_Email Opened	1.098823
9	Last Notable Activity_Email Link Clicked	1.017879

Generalized Linear Model Regression Results

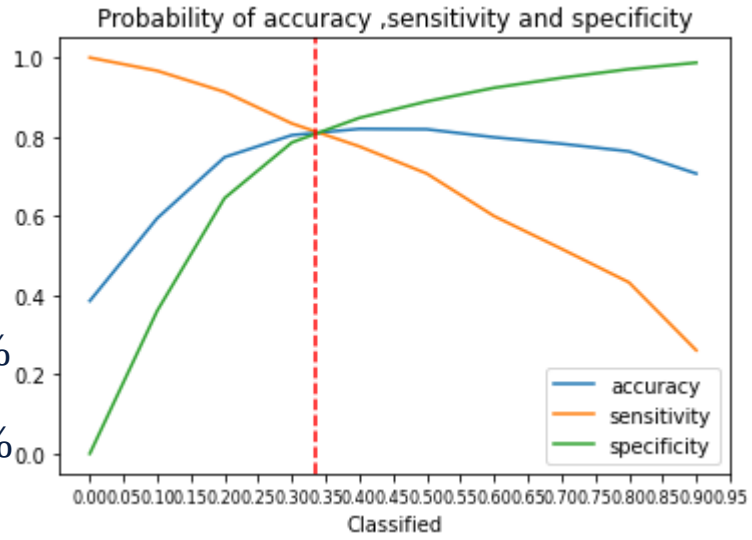
Dep. Variable:	Converted	No. Observations:	6468
Model:	GLM	Df Residuals:	6454
Model Family:	Binomial	Df Model:	13
Link Function:	Logit	Scale:	1.0000
Method:	IRLS	Log-Likelihood:	-2690.7
Date:	Fri, 12 Apr 2024	Deviance:	5381.3
Time:	11:54:46	Pearson chi2:	8.07e+03
No. Iterations:	6	Pseudo R-squ. (CS):	0.3944
Covariance Type:	nonrobust		

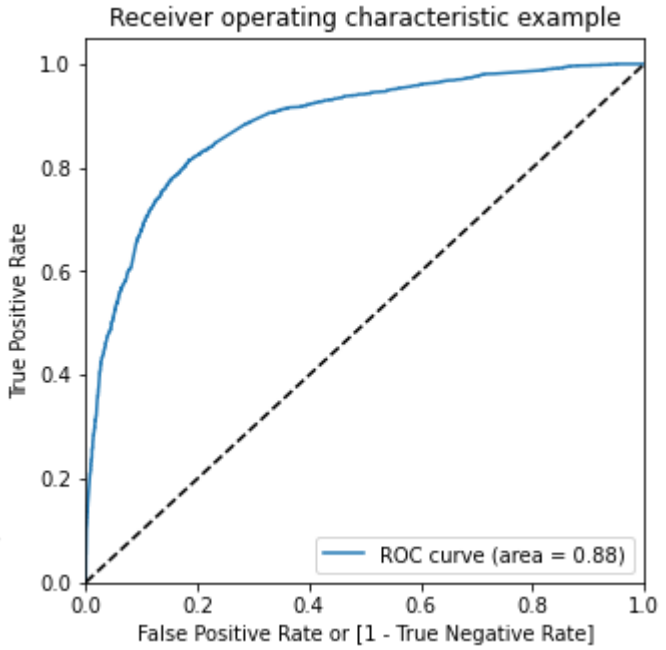
	coef	std err	z	P>|z|	[0.025	0.975]
const	0.0792	0.068	1.171	0.241	-0.053	0.212
Total Time Spent on Website	1.1539	0.041	28.459	0.000	1.074	1.233
Lead Origin_Lead Add Form	4.0715	0.195	20.912	0.000	3.690	4.453
Lead Source_Olark Chat	1.2939	0.103	12.577	0.000	1.092	1.496
Do Not Email_Yes	-1.2895	0.189	-6.814	0.000	-1.660	-0.919
Last Activity_Converted to Lead	-0.9888	0.218	-4.546	0.000	-1.415	-0.563
Last Activity_Email Bounced	-1.0947	0.344	-3.187	0.001	-1.768	-0.421
Last Activity_Olark Chat Conversation	-1.3905	0.185	-7.516	0.000	-1.753	-1.028
Last Activity_Page Visited on Website	-1.2526	0.156	-8.009	0.000	-1.559	-0.946
What is your current occupation_Working Professional	2.8560	0.194	14.702	0.000	2.475	3.237
Last Notable Activity_Email Link Clicked	-1.7813	0.247	-7.212	0.000	-2.265	-1.297
Last Notable Activity_Email Opened	-1.3212	0.086	-15.344	0.000	-1.490	-1.152
Last Notable Activity_Modified	-1.4927	0.098	-15.270	0.000	-1.684	-1.301
Last Notable Activity_Olark Chat Conversation	-1.4772	0.373	-3.959	0.000	-2.208	-0.746

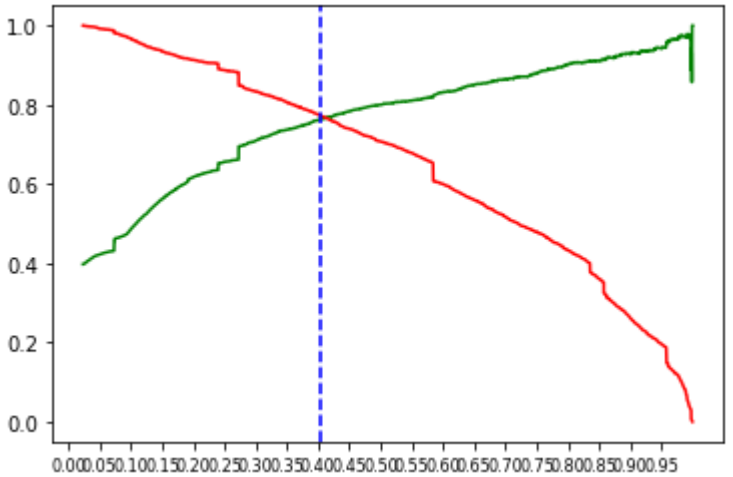
Model Performance

For Train Data set

- Model Accuracy value is 81.91 %
- Model Sensitivity value is 70.73 %
- Model Specificity value is 88.93 %
- Model Precision value is 80.04 %
- Model Recall value is 70.73 %
- Model True Positive Rate (TPR) 70.73 %
- Model False Positive Rate (FPR) is 11.07 %
- Model Positive Prediction Value is 80.04 %
- Model Negative Prediction value is 82.88 %







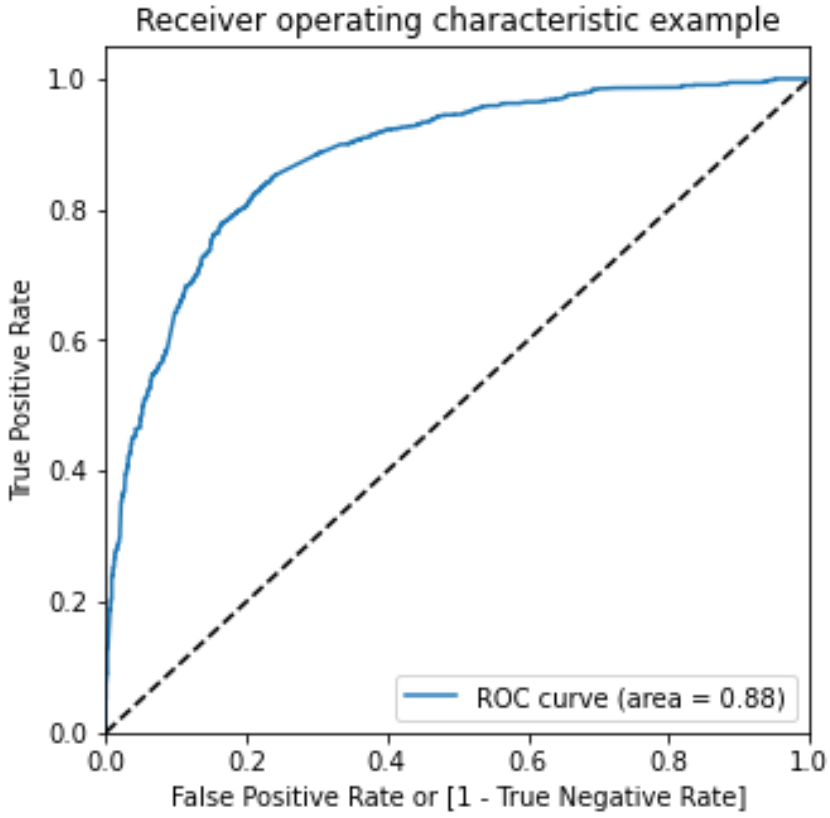
Precision recall trade-off

74.93

Model Performance

For Test Data set

- Model Accuracy value is 81.1 %
- Model Sensitivity value is 76.48 %
- Model Specificity value is 83.99 %
- Model Precision value is 74.93 %
- Model Recall value is 76.48 %
- Model True Positive Rate (TPR) 76.48 %
- Model False Positive Rate (FPR) is 16.01 %
- Model Positive Prediction Value is 74.93 %
- Model Negative Prediction value is 85.09 %



Conclusion

- Working professionals tends to be converted most whereas unemployed leads are less likely to be converted despite of greater lead numbers.
- Leads spending more time on the website gets converted more and should be given high focus.
- Lead Add Form seems to be the best Lead Source.