Lead Scoring Case Study

- **Problem Statement** : An education company named X Education sells online courses to industry professionals. On any given day, many professionals who are interested in the courses land on their website and browse for courses. X Education has appointed us to help them select the most promising leads, i.e. the leads that are most likely to convert into paying customers. The company requires you to build a model wherein we need to assign a lead score to each of the leads such that the customers with higher lead score have a higher conversion chance and the customers with lower lead score have a lower conversion chance. The CEO, in particular, has given a ballpark of the target lead conversion rate to be around 80%

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Steps for Data Understanding and Cleaning :

- We are removing few of the columns which doesn't have proper existence in their values. e.g. either Yes or No or negligible count for the secondary value
- Dropped further columns which has 46% of data NULL
- Dropping Country as 95.77% is India from the Non-NULL values
- Columns having values count of less than 200 we are going to merge all of those to a single value as *##Others e.g. LA*Others, LAN_Others and rest wherever applicable.
- For Specialization column we can see NULL & Select values adds up to 3380 which is approx. 30% of the total population. Moreover please note NULL and Select can be considered as identical. Hence merging all those to a new value as Unknown_Specialization
- More than 60% for "How did you hear about X Education" is Select and we can't manipulate this with any other ways like random variable or anything else. Hence dropping this too
- Now for Occupation we will club Student/Other/Housewife/Businessman in one group due to the low count and the NULL to Unknown to maintain the difference
- Again for "What matters most to you in choosing a course" the variance of the values for Other AND Flexibility & Convenience is negligible and this column will not make and sense or difference in our analysis. Hence dropping this too.
- 40% of the City is Unknown hence dropped that too
- For the columns TotalVisits & Page Views Per Visit are having around 137 rows with NULL values which is very less in comparison to the whole dataset. Hence, we are dropping those NULL records

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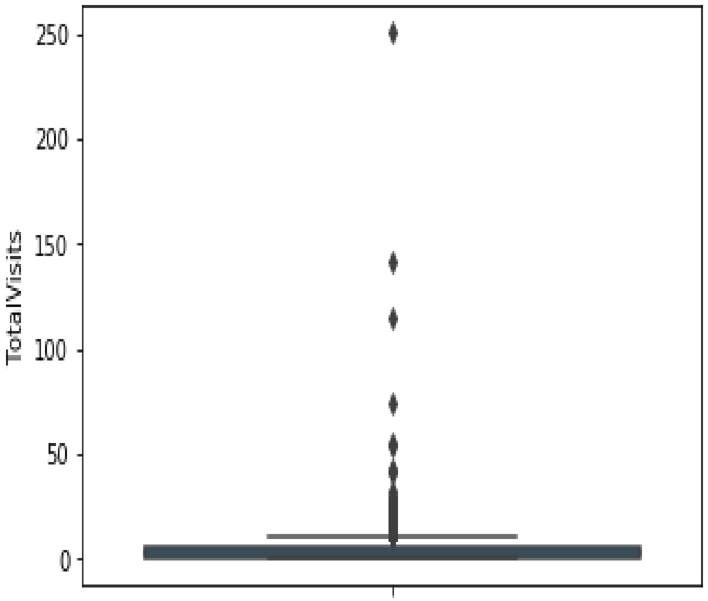
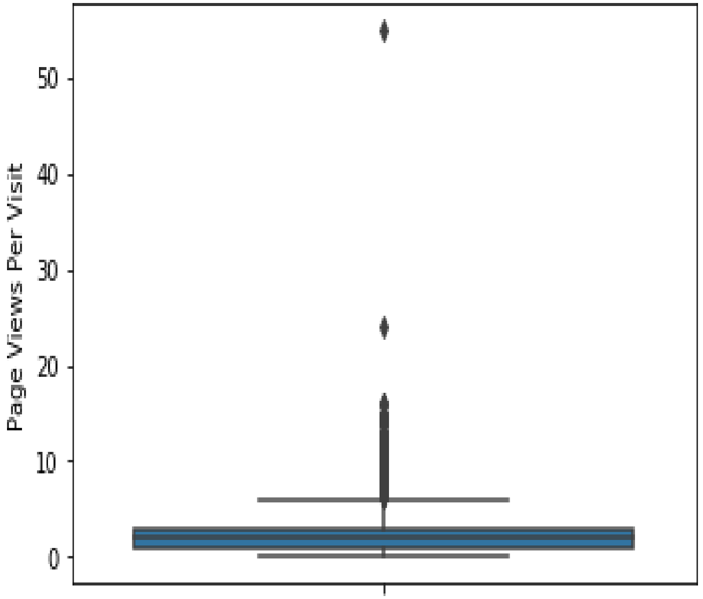
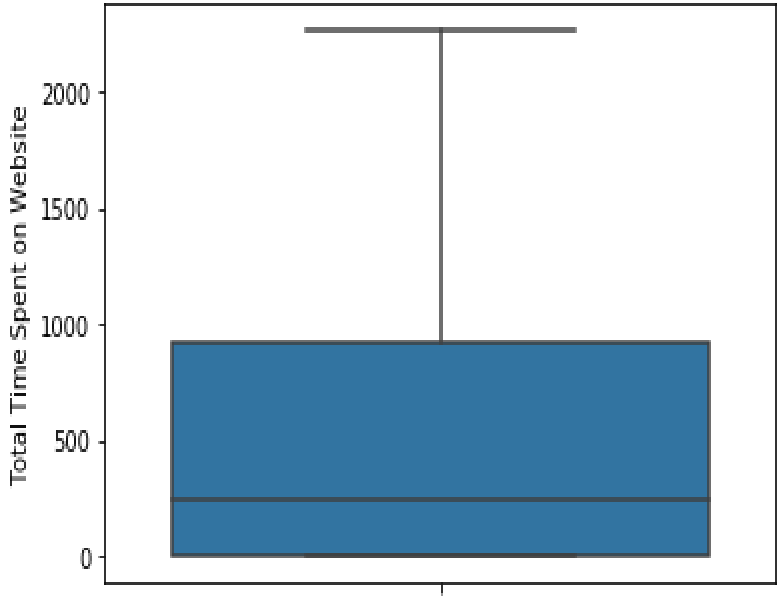
Outliers Analysis :







Looking into the boxplots we are considering to remove the outliers for TotalVisits & Page views Per Visit with 0.05 %

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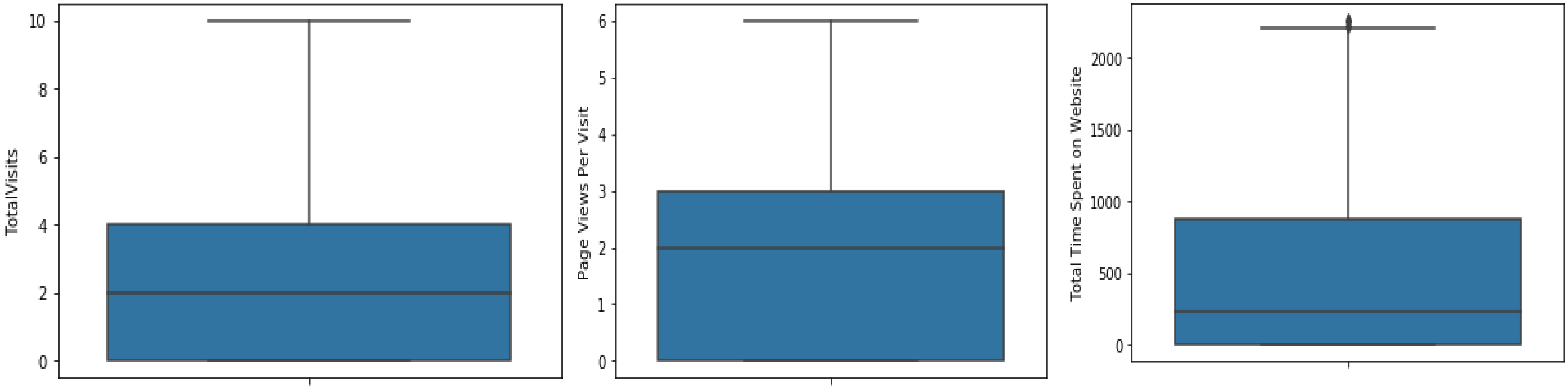
Post Outliers Treatment :



We observed Prospect ID & Lean Number is UNIQUE and can be the used as Identity in future purpose. Hence, preserving these columns for future use.

Current Lead Conversion rate post Outliers treatment is 38%

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Steps for Data Preparation:

- Conversion of column data with binary values
- Dummy variable creation
  - Initially we have manipulated the data on few columns with "Others/Unknown" values hence, deleting "Others/Unknown" dummy column to be clean and simple
- Started with Training and Test Data Set Split
  - Feature Scaling
  - Model Building
  - Running 1st Training Model
  - Feature Selection using RFE
  - Model assesment with Statsmodel
  - Running 2nd Training Model
  - Insignificant feature: LeadProfile_Lateral Student ➔ **p value – 0.999**
  - Running 3rd Training Model
  - Insignificant feature: LeadQuality_High in Relevance ➔ **p value – 0.067**

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Continued…

Steps for Data Preparation Cont…:

- Started with Training and Test Data Set Split
  - Running 4th Training Model
  - Insignificant feature: Specialization_Travel and Tourism ➔ **p value – 0.052**
  - Running 5th Training Model
  - Create a dataframe that will contain the names of all the feature variables and their respective VIFs
  - We have few highly correlated feature like - LastNotableActivity_SMS Sent & LastActivity_SMS Sent
  - Running 6th Training Model by removing the first one
  - Create a dataframe that will contain the names of all the feature variables and their respective VIFs
  - All VIFs are below 5
  - Creating Dataframe with the actual converted flag and predicted probabilities from 6th model
  - Accuracy, Sensitivity and Specificity -- Train Data
  - **Accuracy – 91%   Sensitivity – 85%   Specificity – 95%**
- **Correlation coefficients among the variables presented in next slide.**
  - **There are many variable which are highly correlated to each other.**

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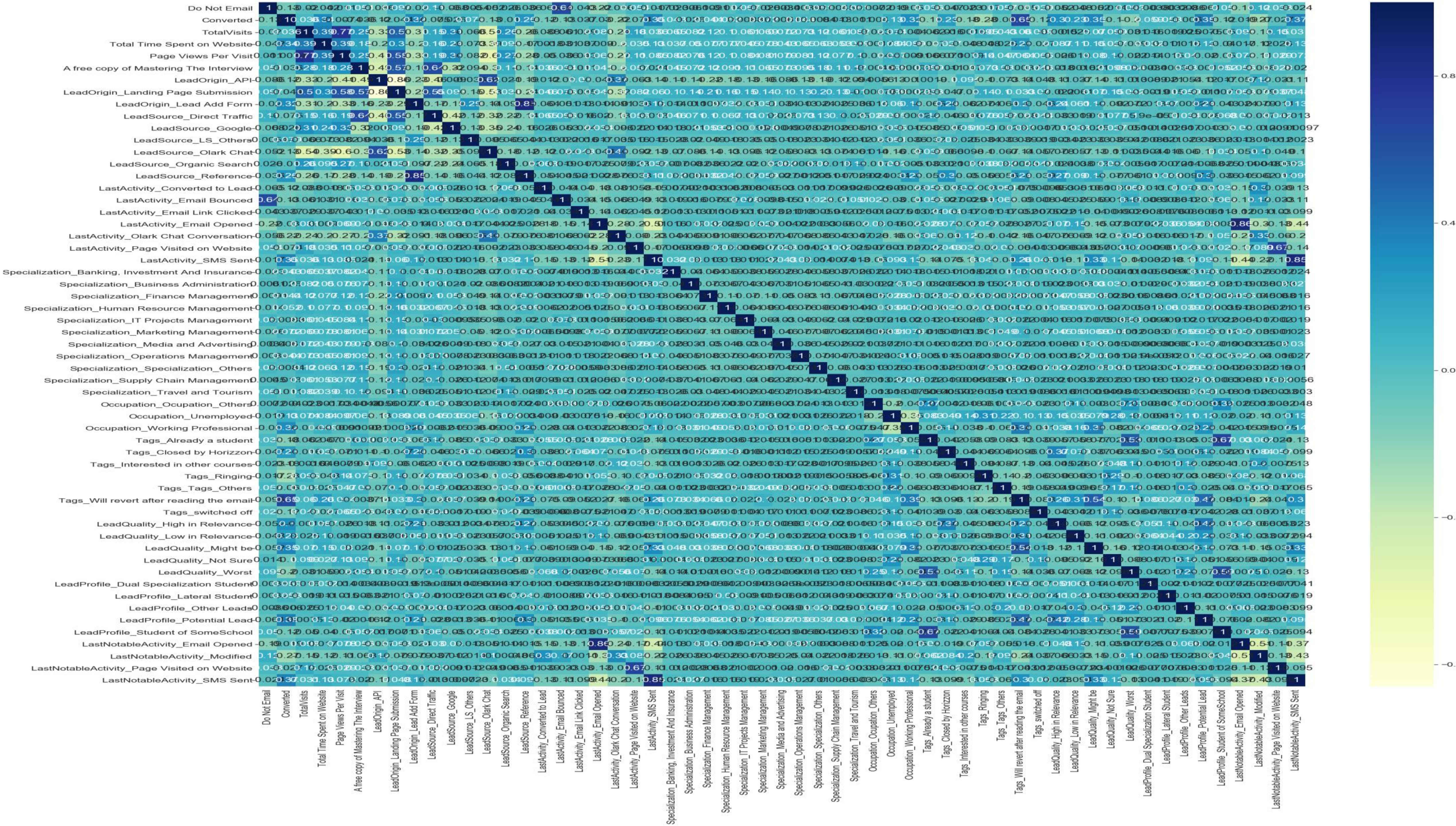
Do Not Email
Converted
TotalVisits
Total Time Spent on Website
Page Views Per Visit
A free copy of Mastering The Interview
LeadOrigin_API
LeadOrigin_Landing Page Submission
LeadOrigin_Lead Add Form
LeadSource_Direct Traffic
LeadSource_Google
LeadSource_LS_Others
LeadSource_Olark Chat
LeadSource_Organic Search
LeadSource_Reference
LastActivity_Converted to Lead
LastActivity_Email Bounced
LastActivity_Email Link Clicked
LastActivity_Email Opened
LastActivity_Olark Chat Conversation
LastActivity_Page Visited on Website
LastActivity_SMS Sent
Specialization_Banking, Investment And Insurance
Specialization_Business Administration
Specialization_Finance Management
Specialization_Human Resource Management
Specialization_IT Projects Management
Specialization_Marketing Management
Specialization_Media and Advertising
Specialization_Operations Management
Specialization_Specialization_Others
Specialization_Supply Chain Management
Specialization_Travel and Tourism
Occupation_Ocupation_Others
Occupation_Unemployed
Occupation_Working Professional
Tags_Already a student
Tags_Closed by Horizzon
Tags_Interested in other courses
Tags_Ringing
Tags_Tags_Others
Tags_Will revert after reading the email
Tags_switched off
LeadQuality_High in Relevance
LeadQuality_Low in Relevance
LeadQuality_Might be
LeadQuality_Not Sure
LeadQuality_Worst
LeadProfile_Dual Specialization Student
LeadProfile_Lateral Student
LeadProfile_Other Leads
LeadProfile_Potential Lead
LeadProfile_Student of SomeSchool
LastNotableActivity_Email Opened
LastNotableActivity_Modified
LastNotableActivity_Page Visited on Website
LastNotableActivity_SMS Sent
Do Not Email
Converted
TotalVisits
Total Time Spent on Website
Page Views Per Visit
A free copy of Mastering The Interview
LeadOrigin_API
LeadOrigin_Landing Page Submission
LeadOrigin_Lead Add Form
LeadSource_Direct Traffic
LeadSource_Google
LeadSource_LS_Others
LeadSource_Olark Chat
LeadSource_Organic Search
LeadSource_Reference
LastActivity_Converted to Lead
LastActivity_Email Bounced
LastActivity_Email Link Clicked
LastActivity_Email Opened
LastActivity_Olark Chat Conversation
LastActivity_Page Visited on Website
LastActivity_SMS Sent
Specialization_Banking, Investment And Insurance
Specialization_Business Administration
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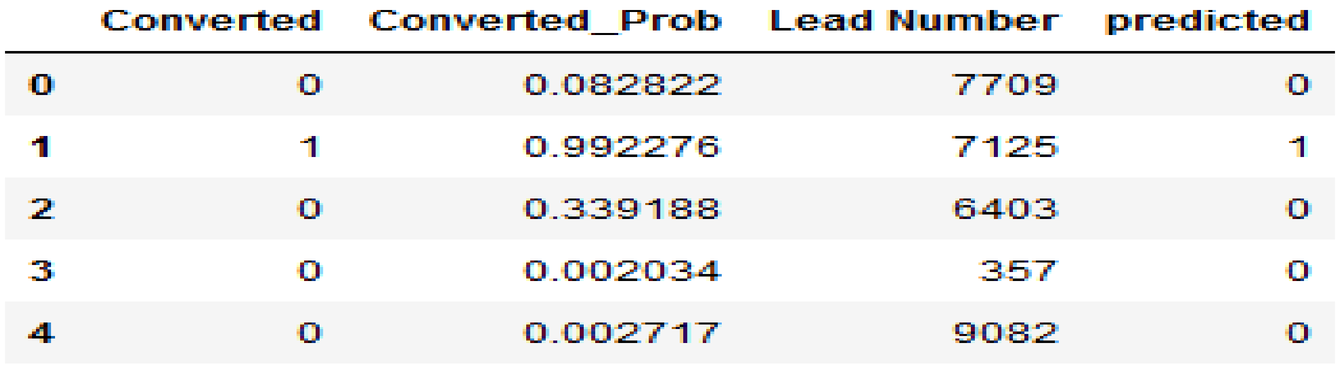
LeadProfile_Lateral Student
LeadProfile_Other Leads
LeadProfile_Potential Lead
LeadProfile_Student of SomeSchool
LastNotableActivity_Email Opened
LastNotableActivity_Modified
LastNotableActivity_Page Visited on Website
LastNotableActivity_SMS Sent
0.8
0.4
0.0
−0.4
−0.8

Testing model on Test Data :

- Scaling of Test Data
- Prediction on the Test Data
- Predicted Dataset head ➔➔



	Converted	Converted_Prob	Lead Number	predicted
0	0	0.082822	7709	0
1	1	0.992276	7125	1
2	0	0.339188	6403	0
3	0	0.002034	357	0
4	0	0.002717	9082	0

- Accuracy, Sensitivity and Specificity -- Test Data
- **Accuracy – 91%   Sensitivity – 84%   Specificity – 96%**

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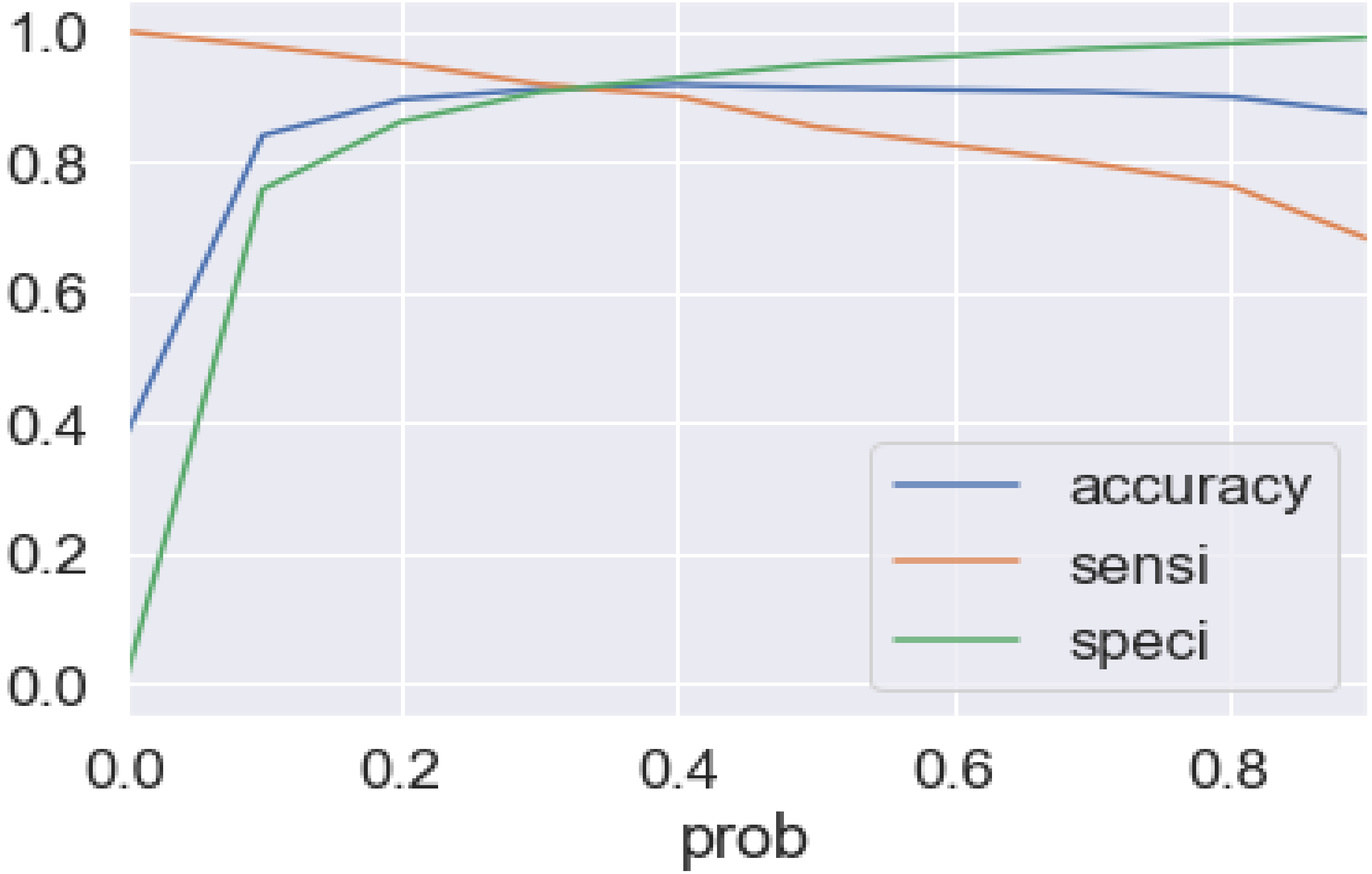
Finding Optimal Cutoff Point:



Above curve suggests the optimum point to take it as a cutoff probability.

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