Lead Scoring Case Study

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Problem Statement

X Education specializes in selling online courses tailored for industry professionals. However, the company faces a significant challenge with its low lead conversion rate. For example, out of 100 leads acquired daily, only about 30 are converted into paying customers.

To address this, X Education aims to identify its most promising leads, referred to as Hot Leads. By focusing its sales efforts on these high-potential prospects, the company hopes to boost its lead conversion rates and overall efficiency.

Objective

The primary goal is to build a model that identifies potential hot leads and deploy this model for future use.

Solution Approach

The solution is implemented through the following steps:

1. Data Cleaning and Preparation
- Duplicate Data: Identified and handled duplicates.
- Missing Values: Addressed missing data by dropping unnecessary columns or imputing values as needed.
- Irrelevant Features: Removed columns that either had low variance or were not useful for analysis, such as "Do Not Call," "Digital Advertisement," etc.
- Outliers: Reviewed and managed outliers to maintain data quality.

2. Exploratory Data Analysis (EDA)
- Univariate Analysis: Examined individual variables for their value distributions.
- Bivariate Analysis: Assessed relationships between variables, using correlation coefficients and patterns.

Continued

3. Data Transformation

- Feature Scaling: Normalized numerical variables.
- Encoding: Created dummy variables for categorical data.

4. Model Development

- Data Splitting: Divided data into training (70%) and testing (30%) sets.
- Feature Selection: Used Recursive Feature Elimination (RFE) to identify the top 15 variables.
- Model Refinement: Iteratively removed variables with high p-values (>0.05) or high Variance Inflation Factors (VIF > 5).
- Model Accuracy: Achieved an overall accuracy of 81%.

5. Model Validation

- ROC Curve: Used the Receiver Operating Characteristic (ROC) curve to identify the optimal cutoff point for balanced sensitivity and specificity.
- Optimal Cutoff Probability: Determined to be 0.4.

Data Manipulation

During the data preparation phase, several steps were taken to refine the dataset for analysis:

1. Initial Dataset Overview
- Rows: 37
- Columns: 9,240

2. Eliminating Features with Single Values
- Certain columns that contained only one unique value and provided no meaningful variation were removed. Examples include:
- "Magazine"
- "Receive More Updates About Our Courses"
- "Update Me on Supply"
- "Chain Content"
- "Get Updates on DM Content"
- "I Agree to Pay the Amount Through Cheque"

3. Removing Irrelevant Identifiers

- Columns such as "Prospect ID" and "Lead Number," which did not contribute to the analysis, were discarded.

4. Dropping Low-Variance Features

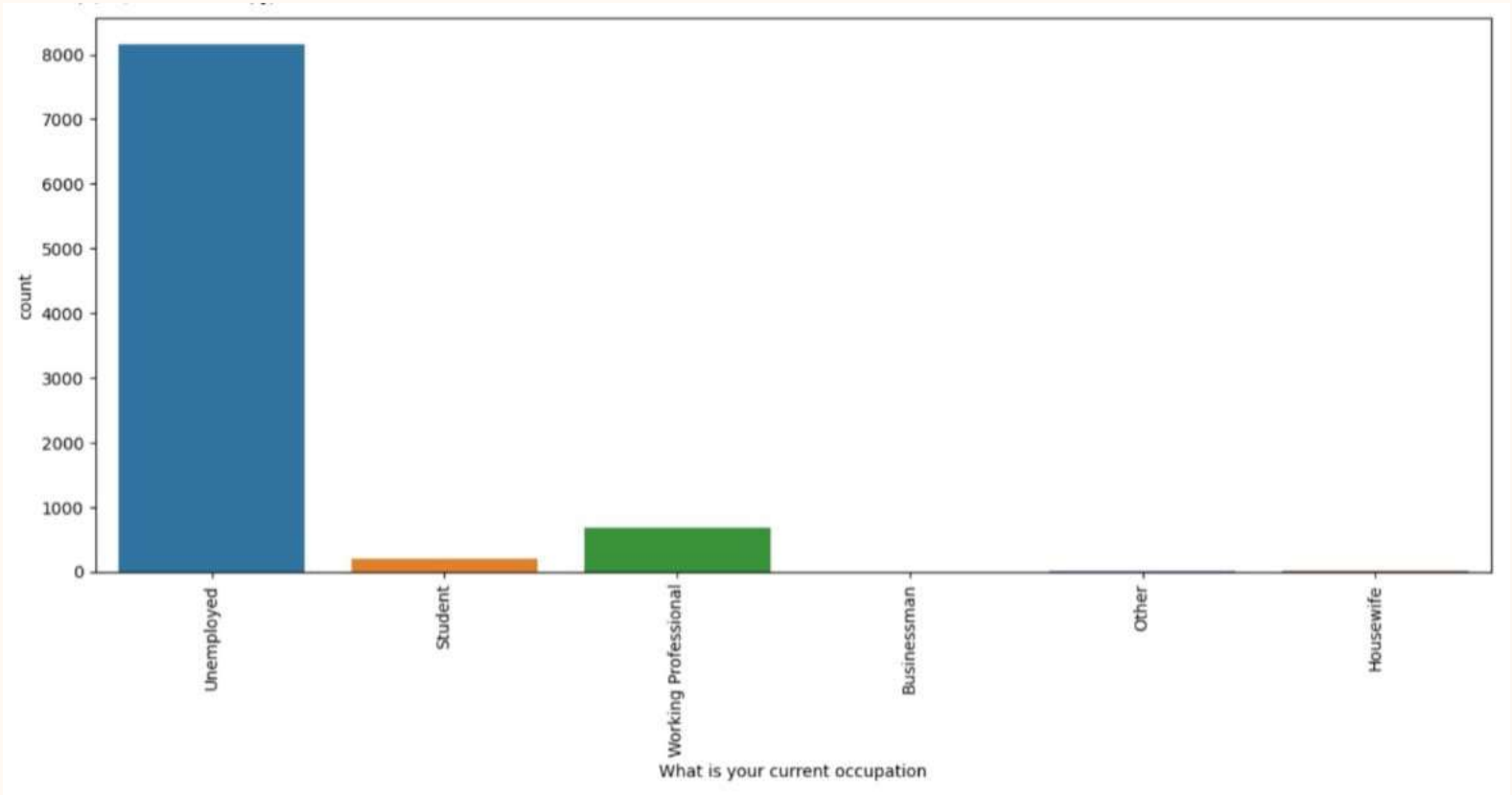
- Features with minimal variability were identified and excluded. These included:
- "Do Not Call"
- "What Matters Most to You in Choosing a Course"
- "Search"
- "Newspaper Article"
- "X Education Forums"
- "Newspaper"
- "Digital Advertisement"

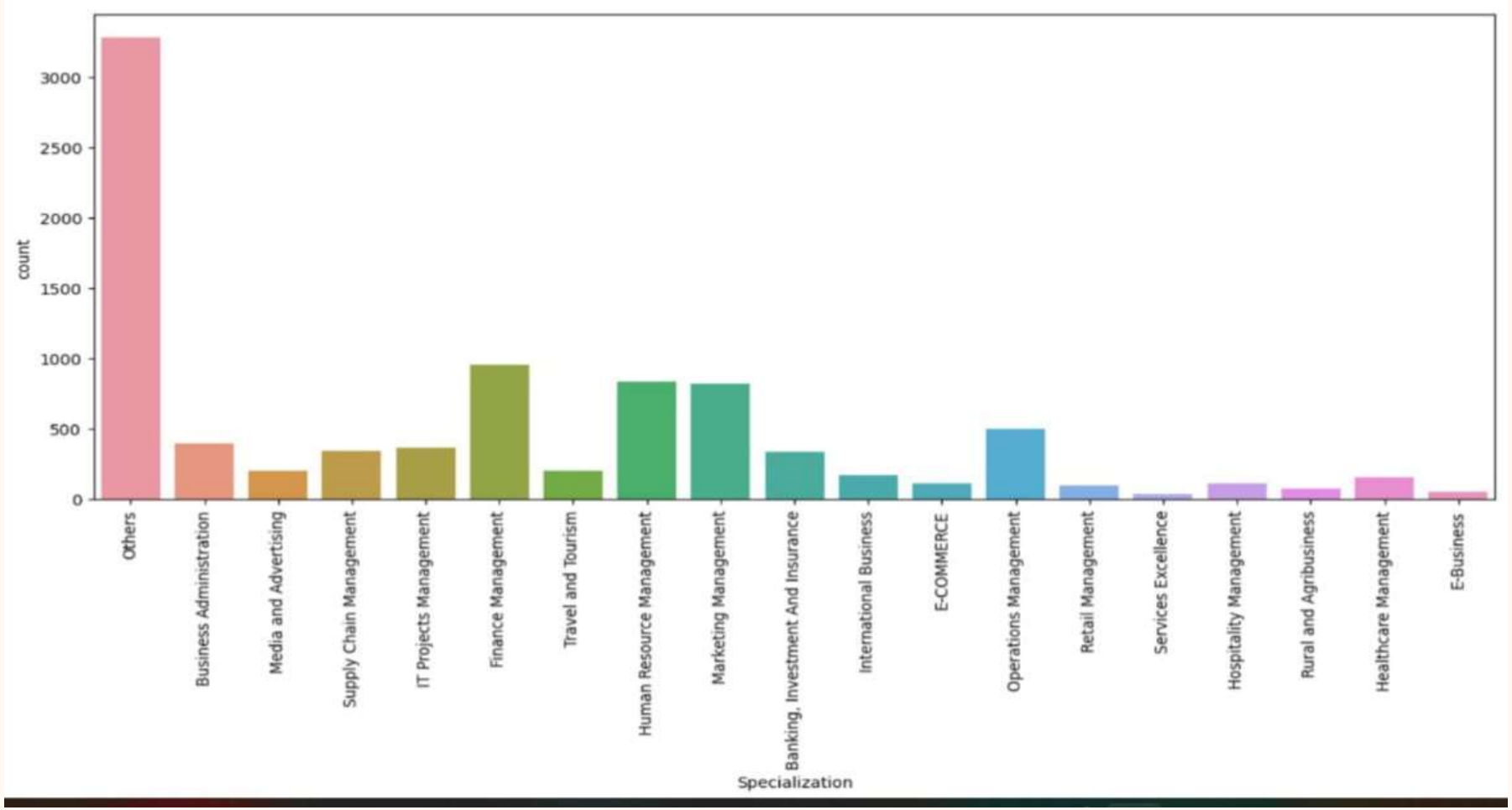
5. Handling Columns with Excessive Missing Data

- Columns with over 35% missing values were dropped, including:
- "How Did You Hear About X Education"
- "Lead Profile"

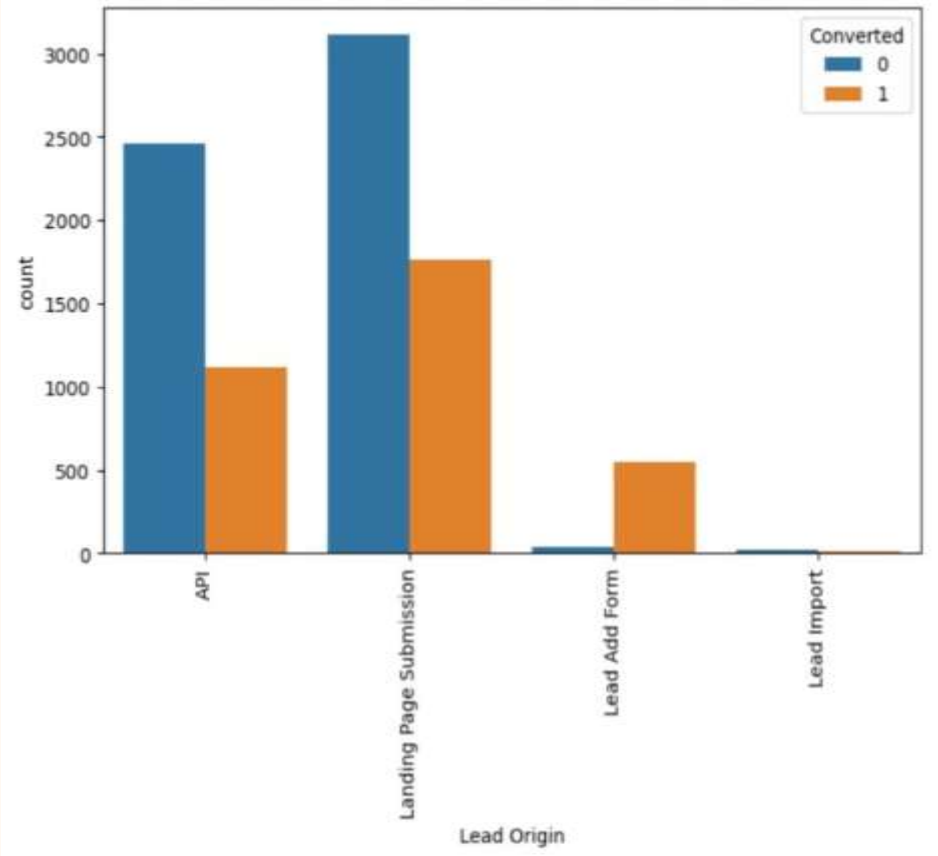
By applying these steps, the dataset was significantly streamlined, ensuring only relevant and high-quality data was retained for further analysis.

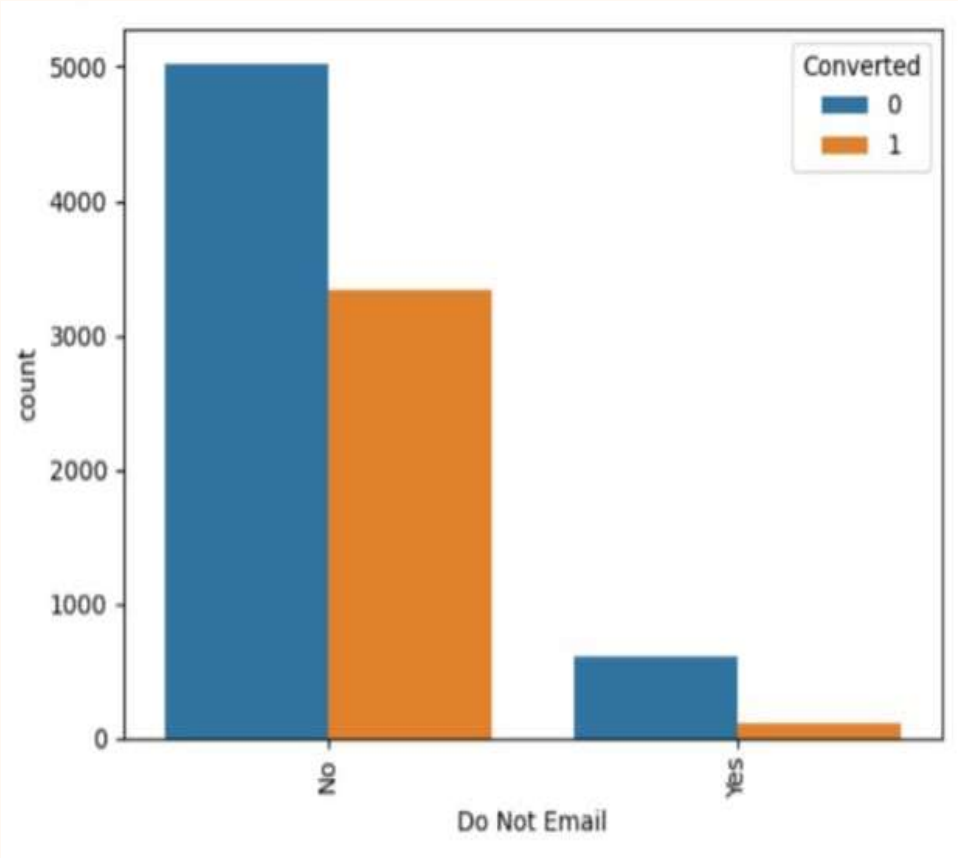
EDA

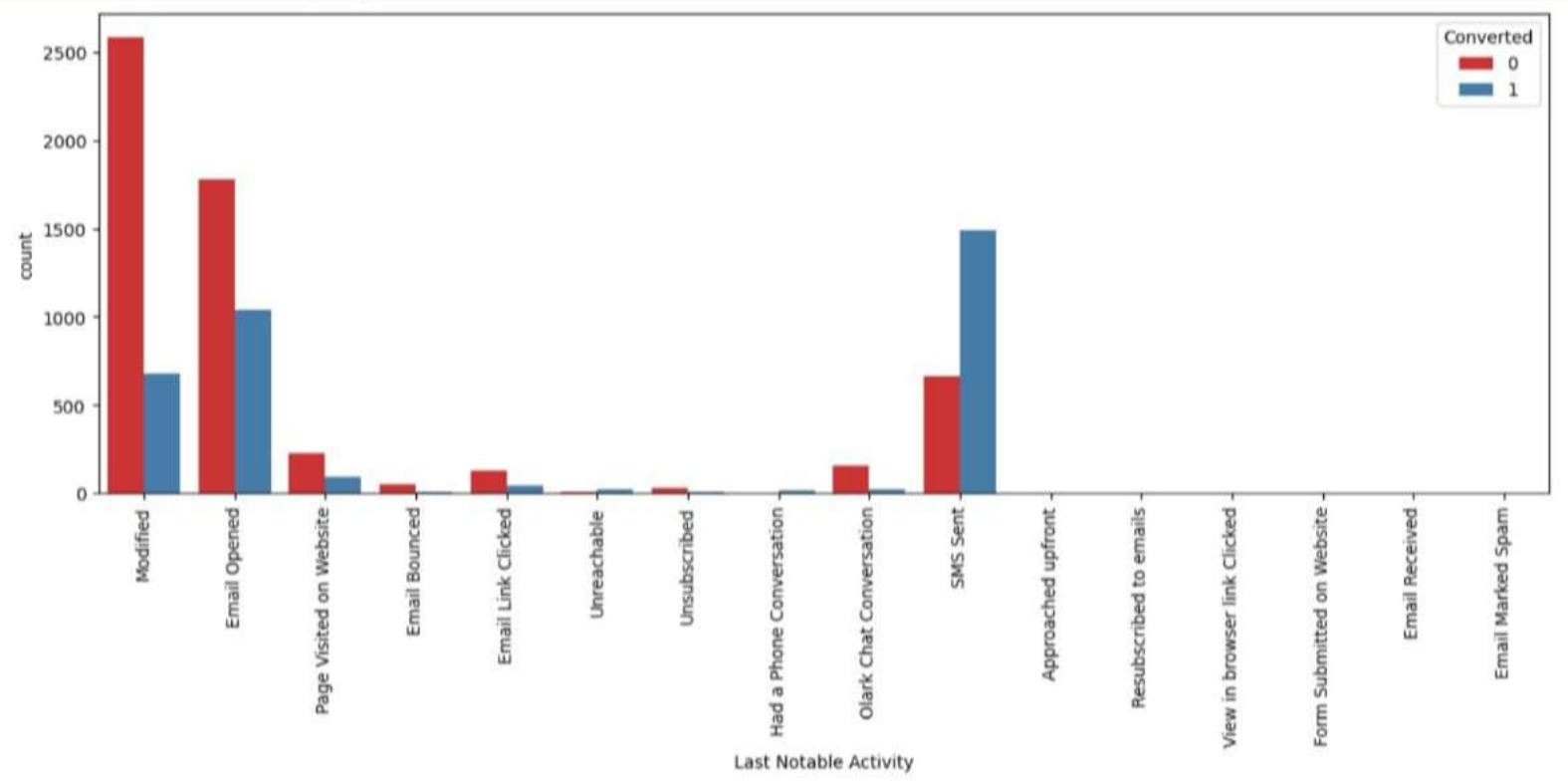

8000
7000
6000
5000
4000
3000
2000
1000
0
count
Unemployed
Student
Working Professional
Businessman
Other
Housewife
What is your current occupation

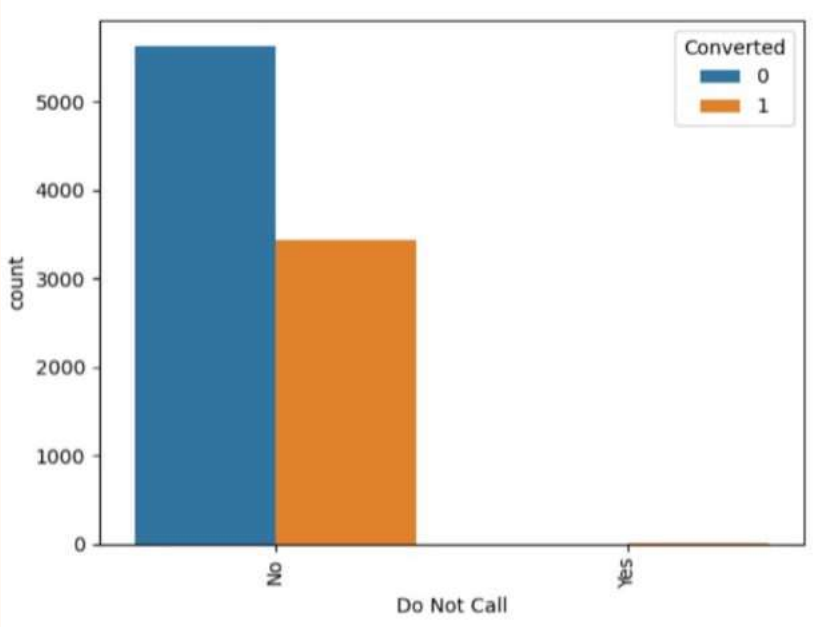

count
3000
2500
2000
1500
1000
500
0
Others
Business Administration
Media and Advertising
Supply Chain Management
IT Projects Management
Finance Management
Travel and Tourism
Human Resource Management
Marketing Management
Banking, Investment And Insurance
International Business
E-COMMERCE
Operations Management
Retail Management
Services Excellence
Hospitality Management
Rural and Agribusiness
Healthcare Management
E-Business
Specialization

Categorical Variable Relation






Converted
0
1
count
2500
2000
1500
1000
500
0
Modified
Email Opened
Page Visited on Website
Email Bounced
Email Link Clicked
Unreachable
Unsubscribed
Had a Phone Conversation
Olark Chat Conversation
SMS Sent
Approached upfront
Resubscribed to emails
View in browser link Clicked
Form Submitted on Website
Email Received
Email Marked Spam
Last Notable Activity


Converted
0
1
count
5000
4000
3000
2000
1000
0
No
Yes
Do Not Call

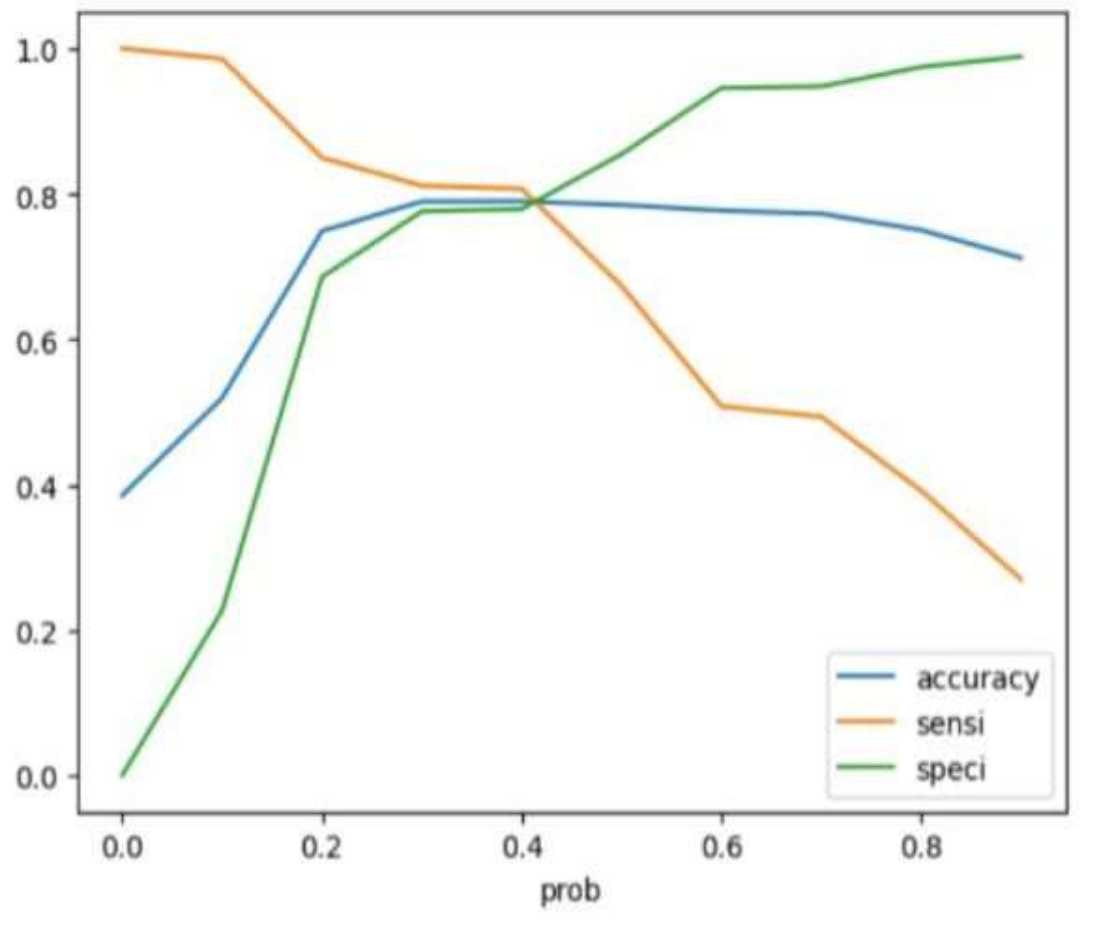
Data Conversion

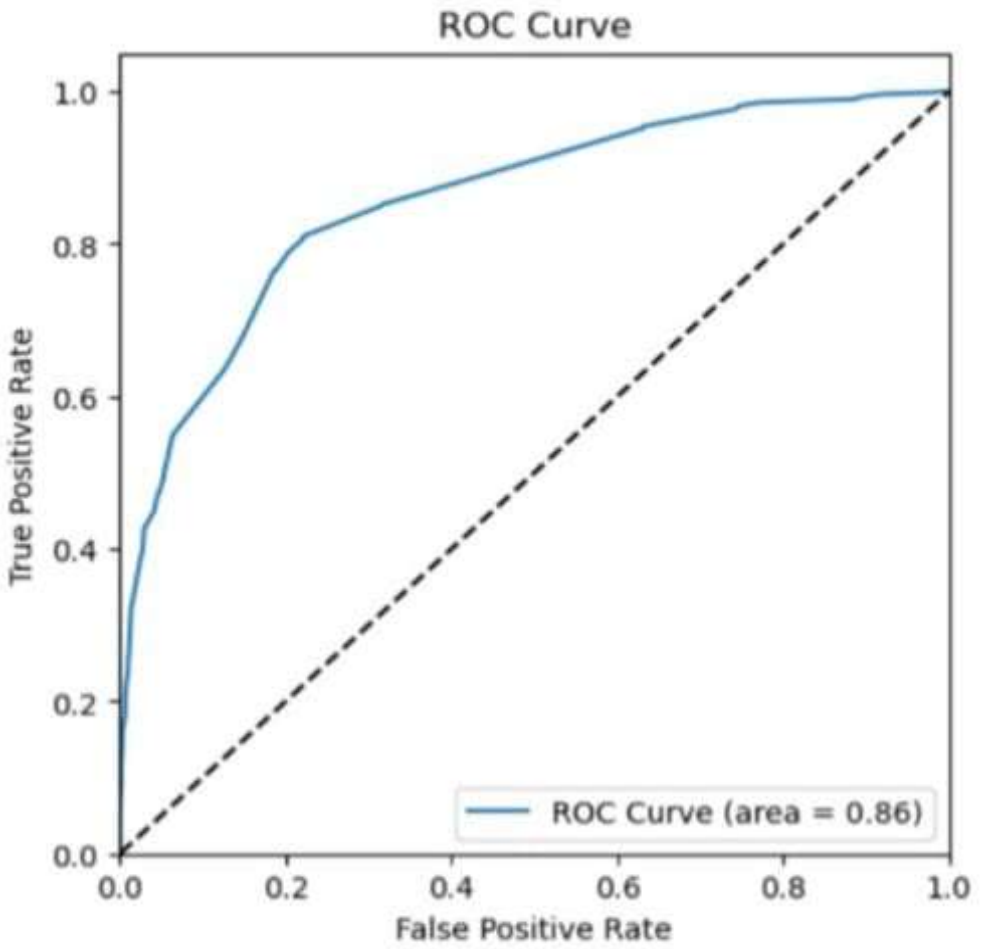
- Numerical Data: All numeric variables have been normalized to ensure consistent scaling and comparability.
- Categorical Data: Dummy variables were created to represent non-numeric (object type) categories, converting them into a usable format for analysis.
- Dataset Overview: The dataset contains 8,792 rows (individual entries) and 43 columns (features) ready for analysis.

Building Model

- Data Splitting: The dataset was divided into training (70%) and testing (30%) sets for model evaluation.
- Feature Selection: Recursive Feature Elimination (RFE) was used to narrow down the features, selecting the 15 most relevant variables.
- Model Optimization: The model was refined by systematically removing variables with a p-value > 0.05 (indicating low statistical significance) or a VIF > 5 (indicating multicollinearity).
- Predictions: The refined model was tested on the test dataset to make predictions.
- Performance: The model achieved an overall accuracy of 81% on the test data.

ROC Curve


1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
prob
accuracy
sensi
speci


ROC Curve
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
ROC Curve (area = 0.86)

Conclusion

The analysis revealed key factors influencing potential buyers, listed in order of importance:

1. Time Spent on the Website: The more time users spend on the website, the higher the likelihood of conversion.

2. Number of Visits: Frequent visits indicate stronger interest.

3. Lead Sources: Buyers are more likely to convert when leads come from:
- Google
- Direct Traffic
- Organic Search
- The Welingkar Website

4. Last Activity: Certain actions like:
- Receiving an SMS
- Engaging in an Olark Chat Conversation
- show strong potential for conversion.

5. Lead Origin: Leads originating from Lead Ad Forms are highly valuable.

6. Occupation: Working Professionals are significantly more likely to purchase courses.

By focusing on these key variables, X Education can enhance its strategies and effectively convert a majority of potential buyers into actual customers, driving growth and success.