Lead scoring case study

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Problem Statement

Low Conversion Rate: X Education experiences a low lead conversion rate, with only 30% of leads turning into paying customers.

Efficiency Concerns: Despite a high volume of daily leads, the conversion process lacks efficiency, resulting in suboptimal outcomes.

Identifying 'Hot Leads': X Education aims to identify 'Hot Leads'—those most likely to convert—to enhance the overall conversion rate.

Lead Scoring Model: Develop a lead scoring model to assign scores to leads, prioritizing high-scoring leads for targeted sales efforts.

Target Conversion Rate: The CEO sets a target conversion rate of 80%, emphasizing the need for significant improvement in the current conversion rate.

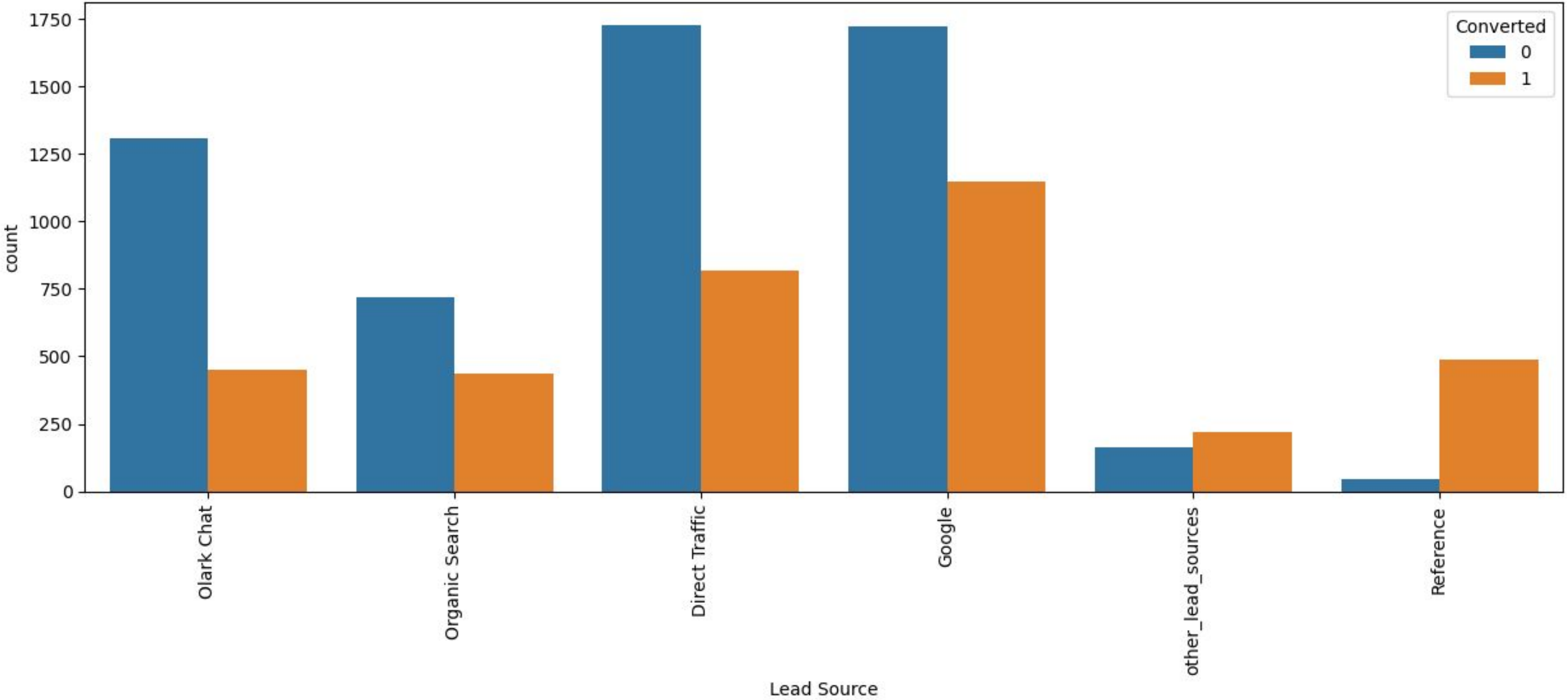
Solution Approach

1. **Data Understanding**
   - Initial exploration to comprehend the dataset's structure and variables.
2. **Exploratory Data Analysis (EDA)**
   - Handle missing values.
   - Analyze categorical and numerical columns.
3. **Preparing Data for Modeling**
   - Create dummy variables.
   - Split data into train/test sets.
   - Scaling Features.
4. **Model Building and Training**
   - Train logistic regression model.
5. **Testing and Validation**
   - Test model on test data.
   - Validate model performance.

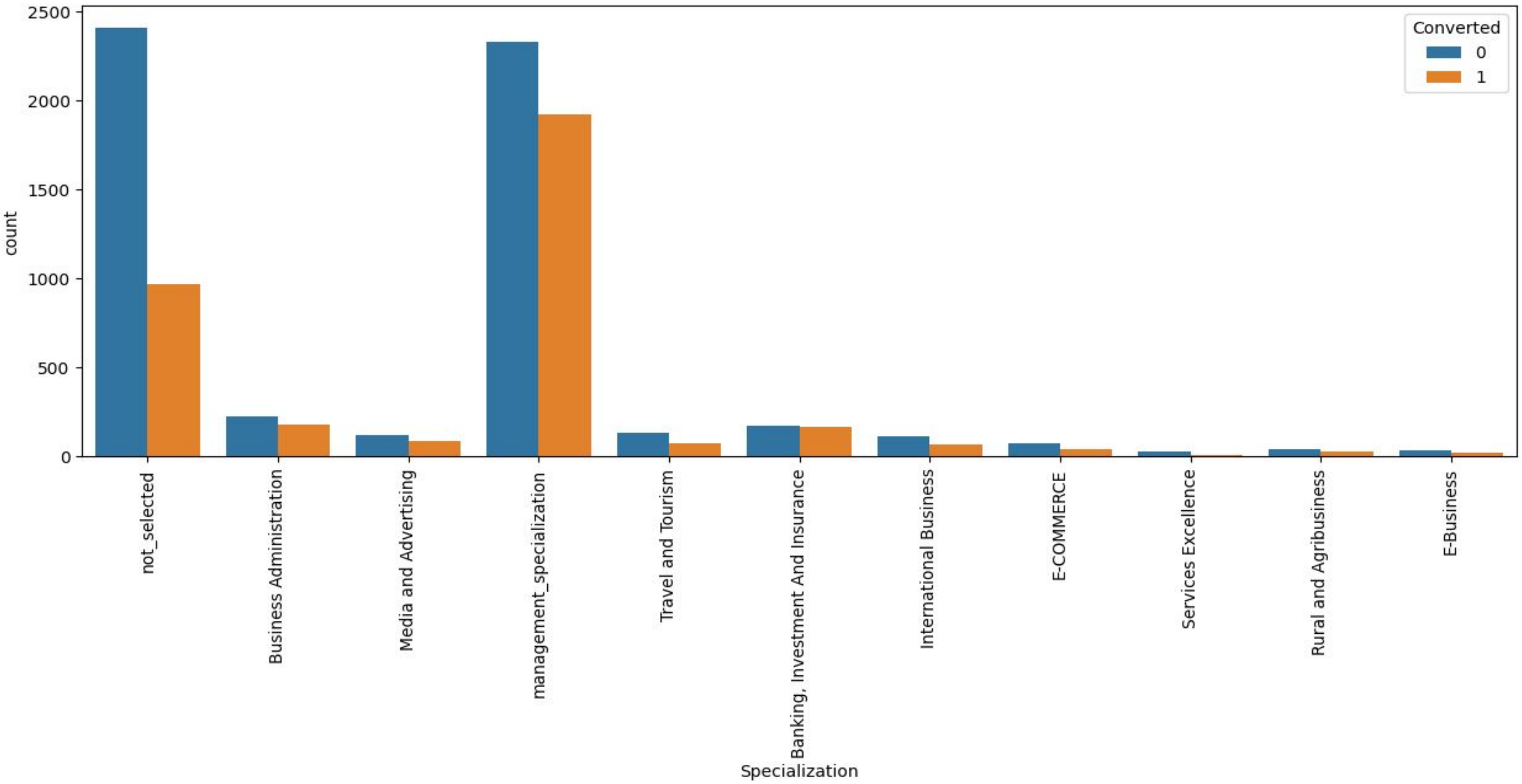
Exploratory Data Analysis (EDA)

1. **Handling Null Values**:
    - Removed columns with null values exceeding 40% to ensure data integrity and model performance.
2. **Categorical Column Analysis**:
    - Conducted detailed analysis of each categorical column:
        - Examined distribution and importance of each category.
        - Identified columns deemed unimportant and removed them from further analysis.
3. **Numerical Column Analysis**:
    - Investigated each numerical column:
        - Conducted outlier treatment to ensure data consistency and model robustness.
        - Assessed correlation between numerical columns and the target variable "converted" to identify potential predictors.

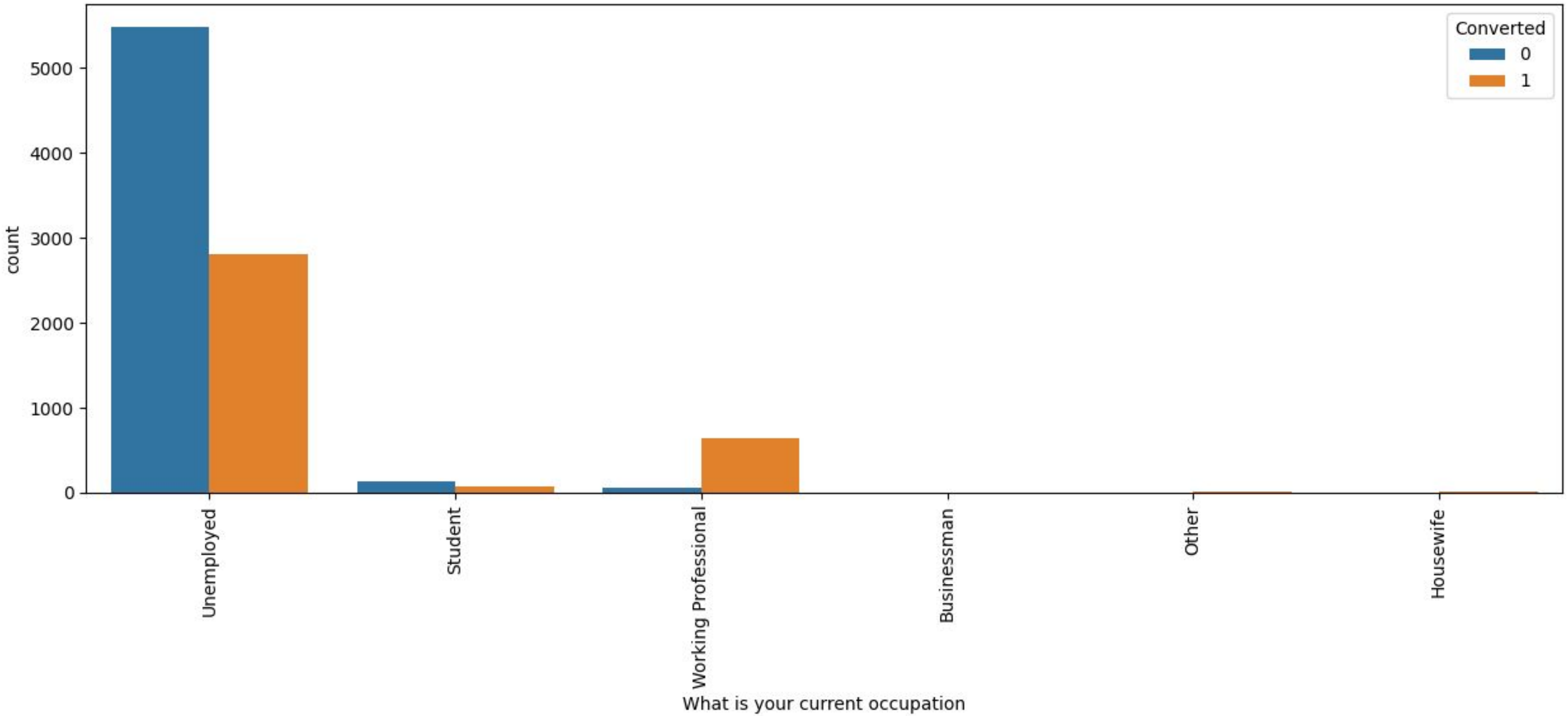
Correlation of Categorical Variables - “Lead Source”



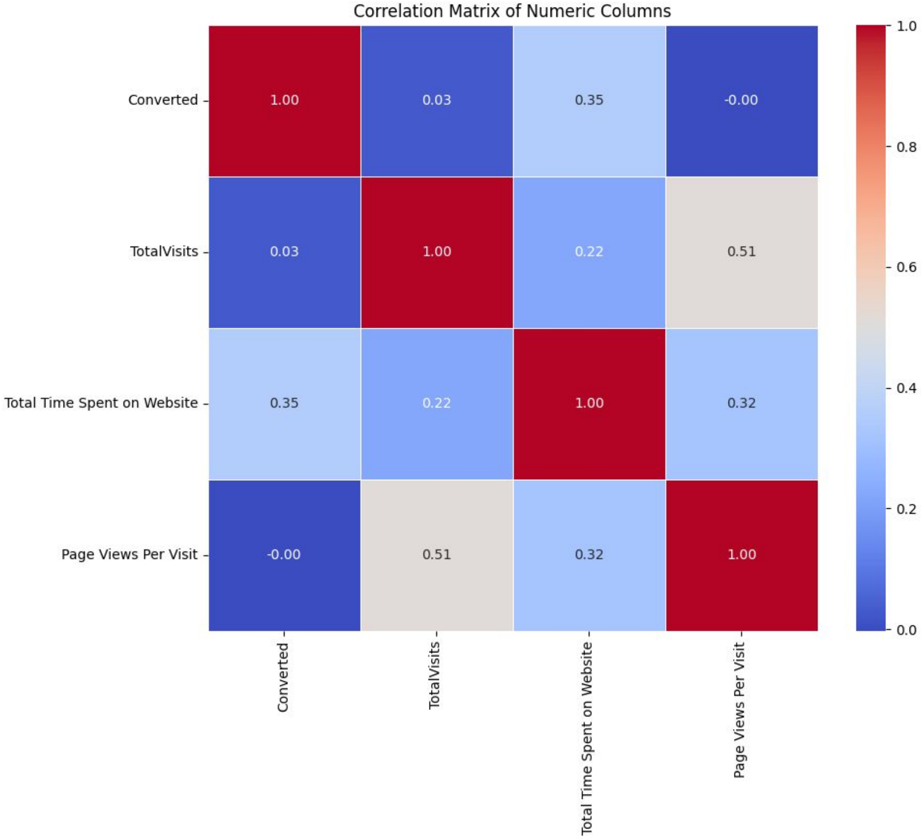
Correlation of Categorical Variables - “Specialization”



Correlation of Categorical variables - “What is your current occupation”



Numerical Column Analysis



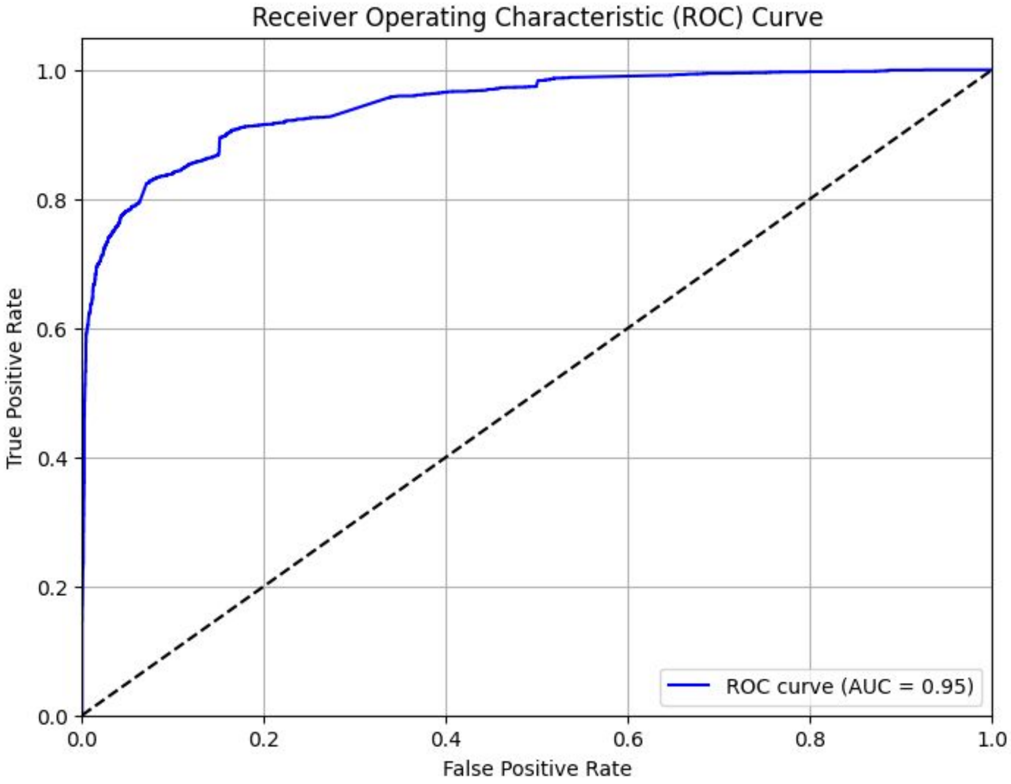
Preparing Data for Modeling

1. **Creation of Dummy Variables**:
   - Converted categorical variables into numerical format using dummy encoding.
   - Ensured compatibility with machine learning algorithms by representing categorical data as binary indicators.
2. **Splitting Data into Train and Test Datasets**:
   - Divided the dataset into training (70%) and testing (30%) sets to assess model performance.
   - Maintained data separation to prevent overfitting and ensure unbiased evaluation of the model.
3. **Scaling the Features with StandardScaler**:
   - Applied StandardScaler() for feature scaling to standardize feature magnitudes.
   - Facilitated convergence and stability of the logistic regression model during training.

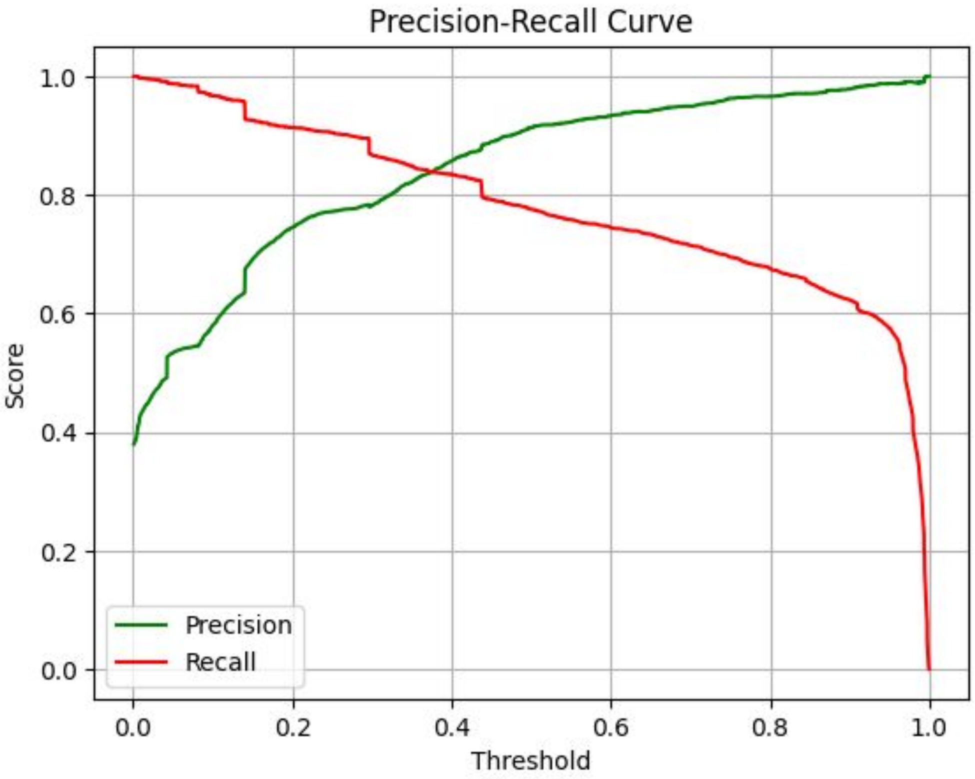
Model Building and Training

1. **Feature Selection with Recursive Feature Elimination (RFE)**:
   - Utilized Recursive Feature Elimination (RFE) to select the best 15 features for model training.
   - Identified the most relevant features contributing to predictive performance.
2. **Model Creation with Statsmodel Library**:
   - Constructed initial logistic regression models using the Statsmodel library.
3. **Iterative Model Refinement**:
   - Iteratively refined the models by evaluating feature importance based on statistical significance.
   - Retained features with p-values less than 0.05 to ensure statistical significance.
   - Implemented Variance Inflation Factor (VIF) analysis to address multicollinearity, keeping VIF values below 5.
   - Iteratively created and evaluated a total of four logistic regression models to optimize predictive accuracy.
4. **Model Evaluation**:
   - Assessed the performance of each model using accuracy metrics.
   - Achieved a high accuracy rate of 88.66% through iterative refinement and feature selection.

ROC Curve


Receiver Operating Characteristic (ROC) Curve
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0
ROC curve (AUC = 0.95)

Precision-Recall Curve



Conclusion

Focusing on following key variables can lead to substantial improvements in lead conversion rates, optimizing sales efforts and driving growth for the company.

1. **Lead Source - Reference:**
    - To enhance conversion rates, focus on implementing referral bonuses and cashback incentives.
2. **What is your current occupation - Working Professional:**
    - Working Professionals demonstrate the highest conversion rates.
    - Prioritize leads from this category and avoid targeting students.
3. **Total Time Spent on Website:**
    - There's a strong correlation between total time spent on the website and lead conversion rates.