# Summary of Logistic Regression Model for Lead Scoring

**Objective**: Build a logistic regression model to assign a lead score (0-100) to each lead, indicating their likelihood to convert. Higher scores suggest "hot" leads, while lower scores indicate "cold" leads.

**Steps Taken to Reach Solution**

1. **Exploratory Data Analysis**:

* **Library Imports**: Utilized libraries such as NumPy, pandas, matplotlib, seaborn, Scikitlearn, and stats models.
* **Data Cleaning**:
* Dropped columns with over 30% missing values and city variable.
* Removed "select" options in columns like "Lead Profile" and "How did you hear about X Education".
* Filled missing values in categorical columns with mode and updated "specialization" column.
* Dropped rows with null values in "Page views per visit".
* Removed "Prospect ID" and "Lead Number" columns.
* **Outlier Detection and Removal**: Used boxplots to detect and drop outliers in "TotalVisits" and "Page Per visits".
* **Visualization and Correlation**: Created various plots and heatmaps to understand data distribution and collinearity.
* **Dummy Variables**: Created and concatenated dummy variables for categorical columns.

1. **Model Building**:

* **Train-Test Split**: Split data into train (70%) and test (30%) sets.
* **Feature Scaling**: Applied MinMaxScaler to rescale features.
* **Feature Selection**: Used Recursive Feature Elimination (RFE) to select 15 significant features.
* **Logistic Regression Model**: Added a constant, created a Generalized Linear Model (GLM), and refined by removing insignificant variables using VIF and p-values.

1. **Model Prediction**:

* Predicted probabilities using the logistic model.
* Created a data frame to store conversion probabilities and applied a 0.5 threshold to classify leads.

1. **Model Evaluation**:

* **Confusion Matrix**: Evaluated model performance by calculating accuracy, sensitivity, and specificity from the confusion matrix.
* **Finding Optimal Cutoff**:
* Created ROC curve and identified optimal cutoff based on the trade-off between accuracy, sensitivity, and specificity.
* Updated threshold and recalculated performance metrics.
* **Test Dataset Evaluation**:
* Transformed test dataset, added constant, and predicted using the logistic model.
* Evaluated test predictions using confusion matrix, sensitivity, specificity, precision, and recall.
* Made final predictions on test dataset with 0.42 as the cutoff.

1. **Conclusion**

**1. Key Variables Influencing Lead Conversion**:

* TotalVisits: 1.454840
* Total Time Spent on Website: 4.713648
* Lead Origin\_Lead Add Form: 4.972153
* Lead Origin\_Lead Import: 1.834902
* Lead Source\_Olark Chat: 1.603159
* Last Activity\_Had a Phone Conversation: 2.070172
* Last Activity\_Olark Chat Conversation: -1.515929
* Last Activity\_SMS Sent: 1.384397
* Current Occupation Working Professional: 2.879075
* Last Notable Activity Unreachable: 2.158080
* Do Not Email: -1.474431

**2.** the final model, with a cutoff threshold of 0.42, successfully segments leads into "hot" and "cold", aiding the sales team in targeting efforts more efficiently.

**3**. **Total Time Spent on Website**: This is a strong indicator with a high coefficient (4.713648), suggesting that more time spent on the website correlates with a highe likelihood of conversion.