Bank Customer Churn

INFO 583 - Introduction to Data Mining for Business

Final Term Project

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Group 7

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Introduction and Business Case

Bank Customer Churn:

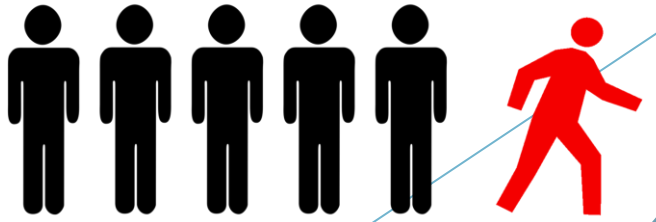
Frequency with which customers leave bank or close account.

Implications:

- Financial loss
- Negative reputation and reduced client trust

Solution:

Decrease Bank Churn Rate



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Objective

To decrease Bank Customer Churn.

How:

- Develop the best model to predict Bank Customer Churn.
- Determine key predictors that affect Customer Churn.

Who:

- Bank's Marketing Team
- Bank's Operations Team

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Data Exploration

Date Source:

Originally collected from undisclosed European bank.

Downloaded from Kaggle:

https://www.kaggle.com/datasets/radheshyamkollipara/bank-customer-churn

Dataset Size:

10,000 records of customers

Target Variable:

Exited

1- Churned Customer

0- Not Churned Customer

Customer Attributes:

14 columns

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Data Dictionary

Attribute	Definition
Target Variable:	
Exited	Shows whether the customer has churned or not.
Customer's Information and Demography	
Surname	Second name of the customer.
Geography	Location of the given customer.
Gender	Sex of the customer.
Age	Given age of the customer.
Estimated Salary	Given income of the said customer.
Customer's Account and Financial Information	
Customer ID	Unique number given to every customer for identification.
Credit Score	Number indicating the credit worthiness of the customer
Tenure	Number of years the customer has been with the bank.
Balance	Amount of money currently in the given customer's account.

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Data Dictionary

Attribute	Definition
Customer's Account and Financial Information	
NumOfProducts	Number of products utilized by customer of the bank.
HasCrCard	An indication of whether the customer has been issued with a physical credit card or not.
IsActiveMember	An indication showing whether the customer is actively transacting in their account.
Complain	The number of complaints customer has raised with the bank before.
Satisfaction Score	Rating given by the customer to the bank indicating the quality of services offered.
Card Type	Level of the card that has been issued to the customer.
Points Earned	Number of awarded points that has been given to the customer for transacting with the bank.

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Data Processing

Prepare data for analysis by removing and modifying data

Dropping Unwanted Variables

Variables Dropped:

- RowNumber
- CustomerID
- Surname
- Complain

Exploring Missing Variables

- All the variables have 10,000 records.
- Hence, there are no null values.

Encoding Variables Dummy Coding Variables

Encoded Variable:

Gender:

- Female encoded to 0
- Male encoded to 1

Dummy Coding Categorical Variables:

- Geography
- Card Type

Resulting Total Number of Variables for Analysis: 14 Variables

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Churn Model Approaches, Training and Testing

Applied Models:

For our machine learning and prediction, we settled on training and testing six models namely:

- Logistic Regression
- KNN
- Naive Bayes
- Decision Tree
- Random Forest
- Artificial Neural Network
- Deep Learning

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Churn Model Approaches and Metrics

Model	ROC AUC	Accuracy	Precision	Recall	F1 Score
Boosted Forest	0.85	0.84	0.88	0.25	0.39
Random Forest	0.85	0.84	0.88	0.25	0.39
Deep Learning	0.84	0.86	0.84	0.38	0.53
Artificial Neural Network	0.76	0.81	0.69	0.20	0.31
Logistic Regression	0.69	0.79	0.41	0.05	0.09
KNN Model	0.66	0.79	0.50	0.01	0.02
Naïve Bayes	0.54	0.54	0.24	0.53	0.33

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Model Selection

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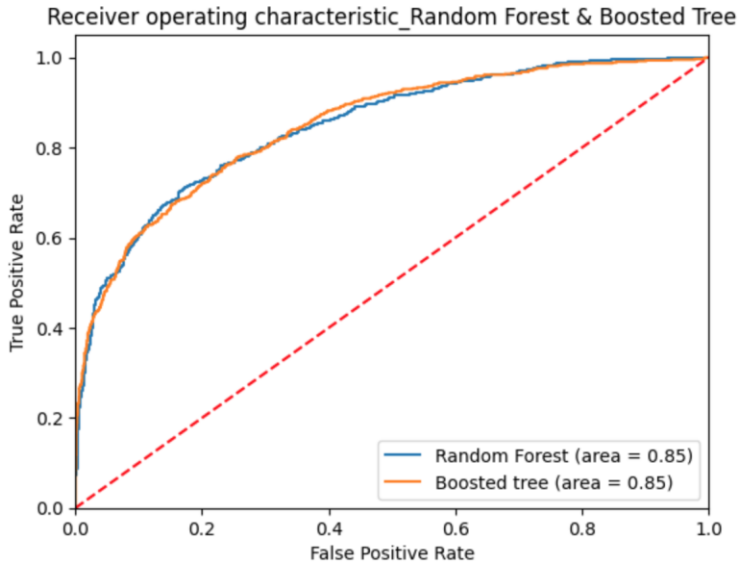
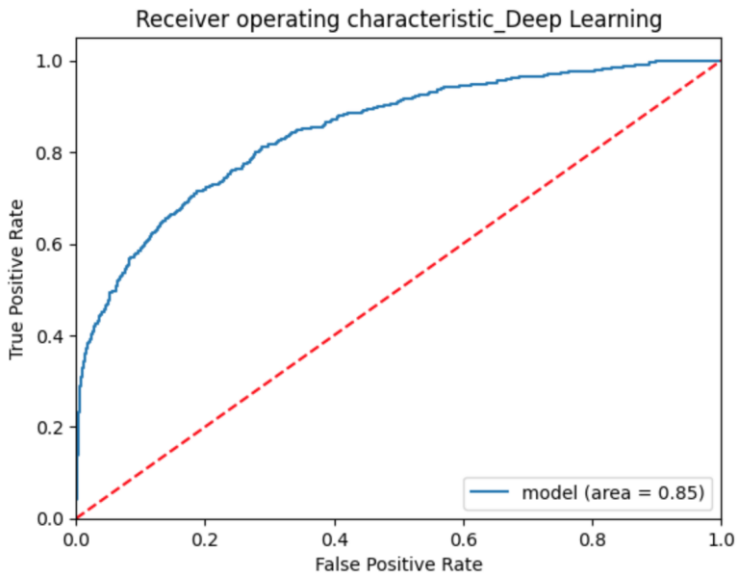
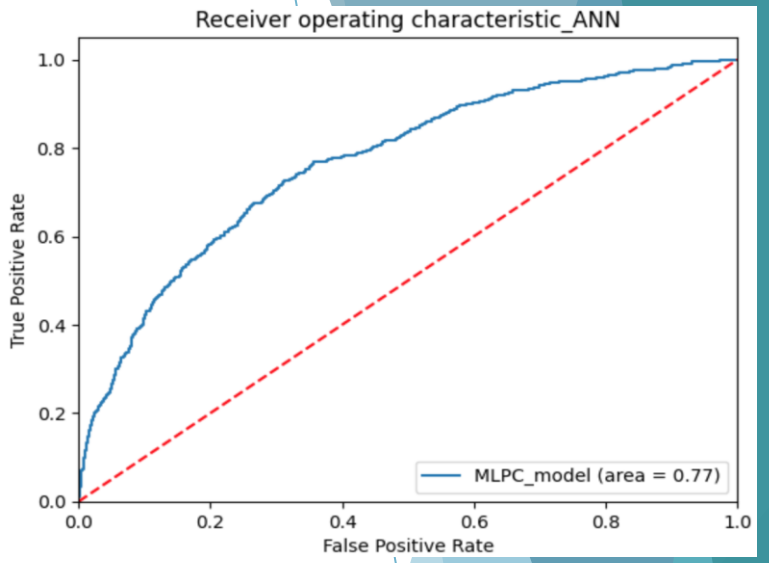
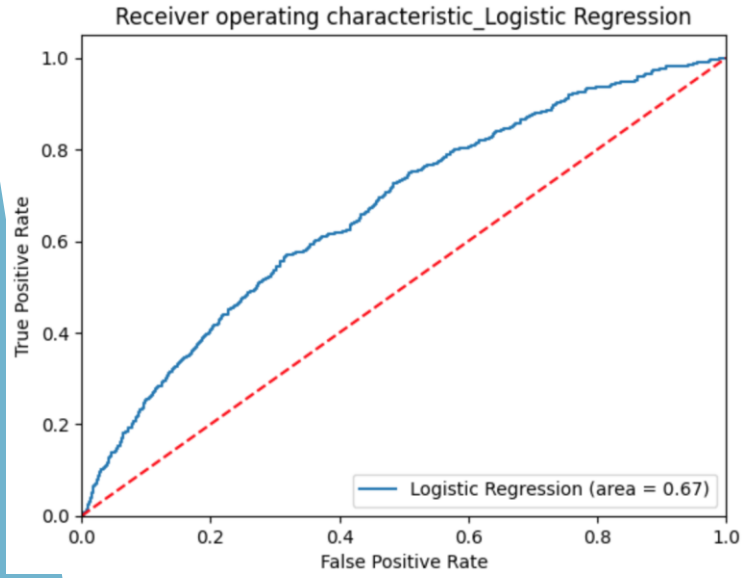
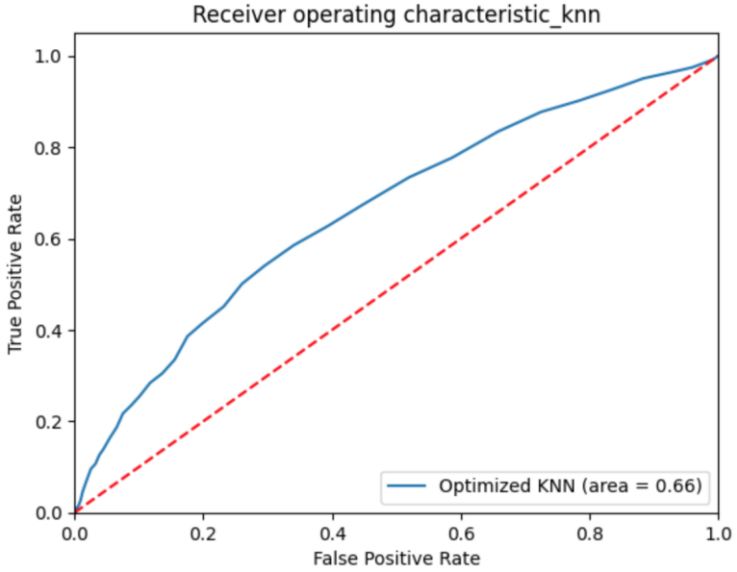
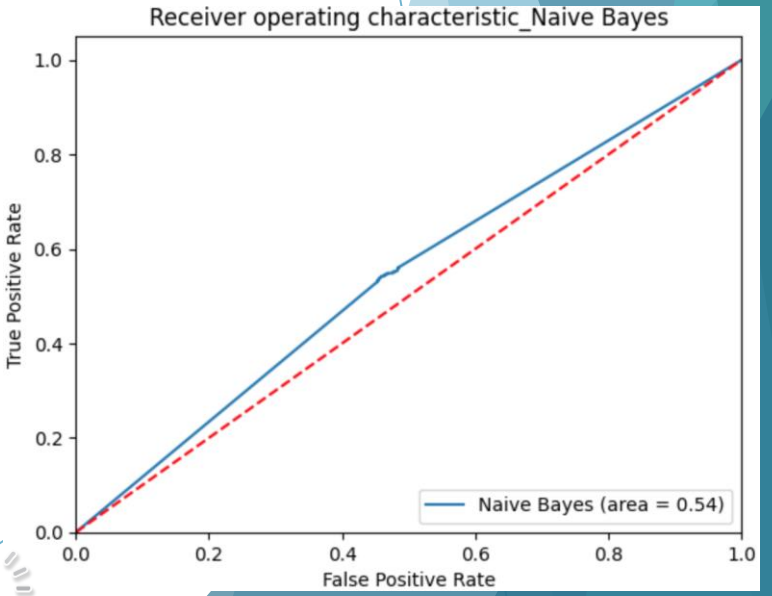






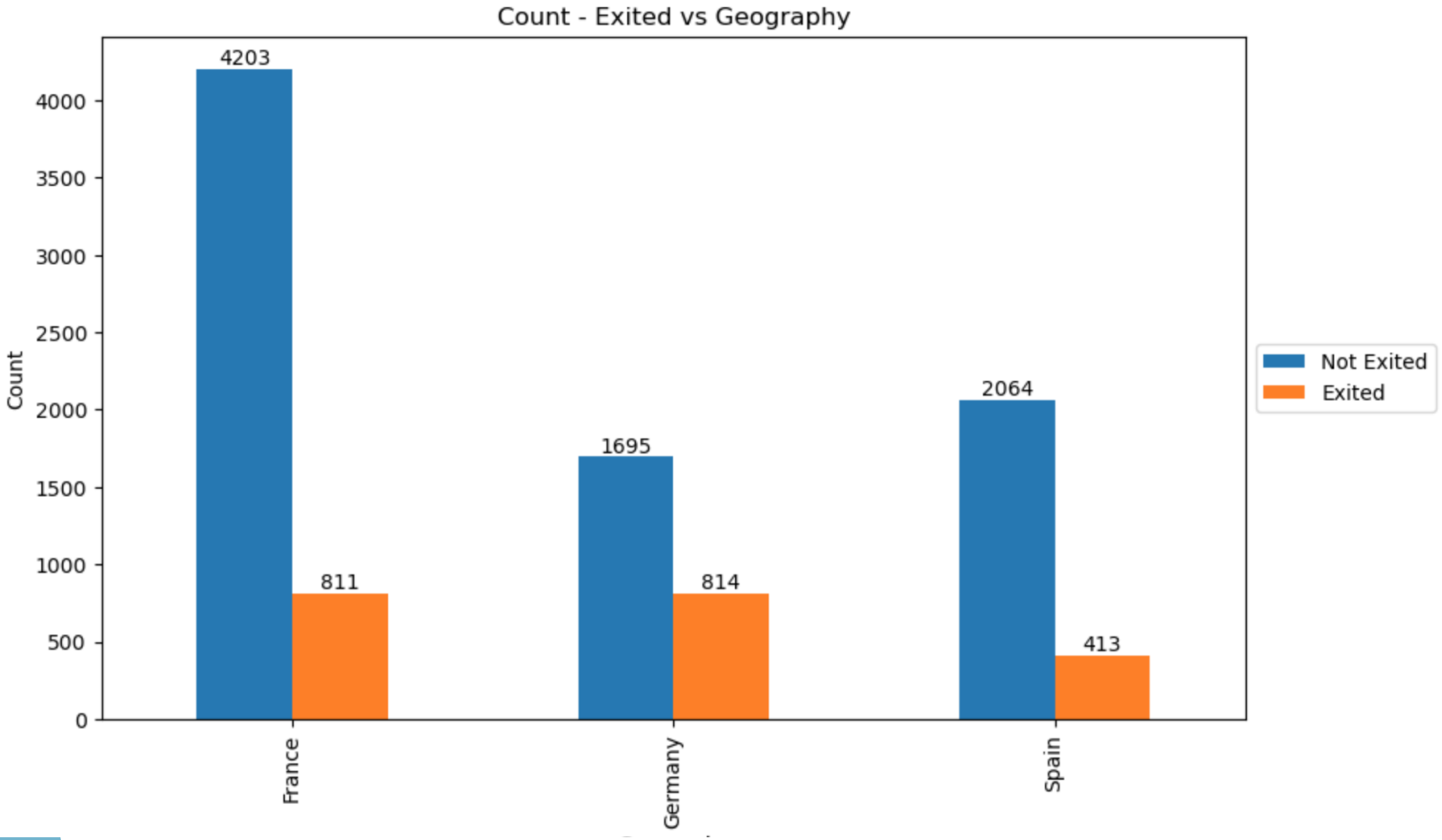






Data Visualizations and Insights of Key Predictors

Customer Churn based on Geography



Key Points

- France has the least churn rate.
- Germany has the highest churn rate.

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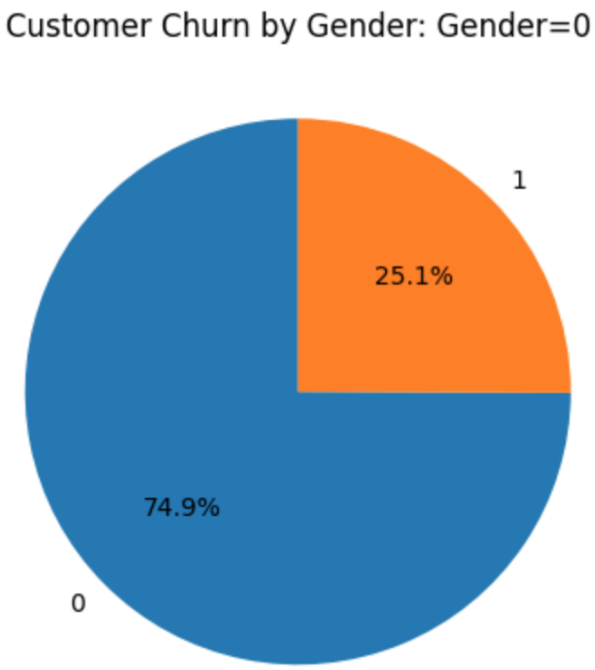
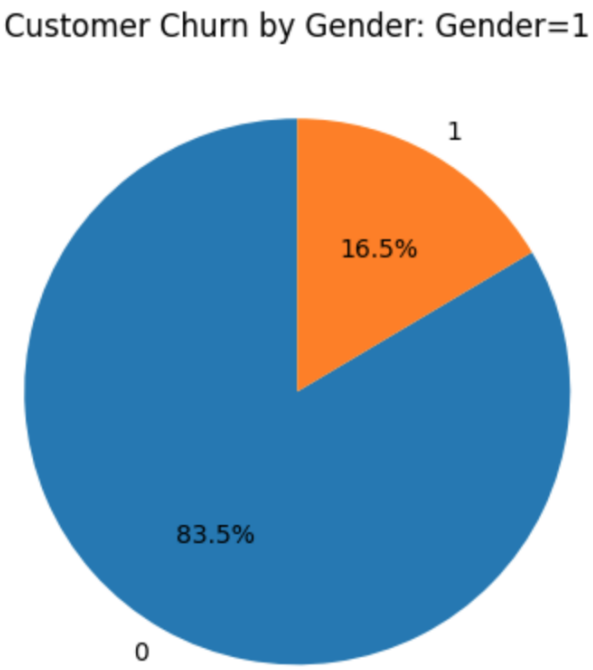
Data Visualizations and Insights of Key Predictors

Customer Churn based on Gender

Ratio of Churn for Females:



Ratio of Churn for Males:



Key Points

- Female customers churn their bank account more.
- Male customers are more loyal.

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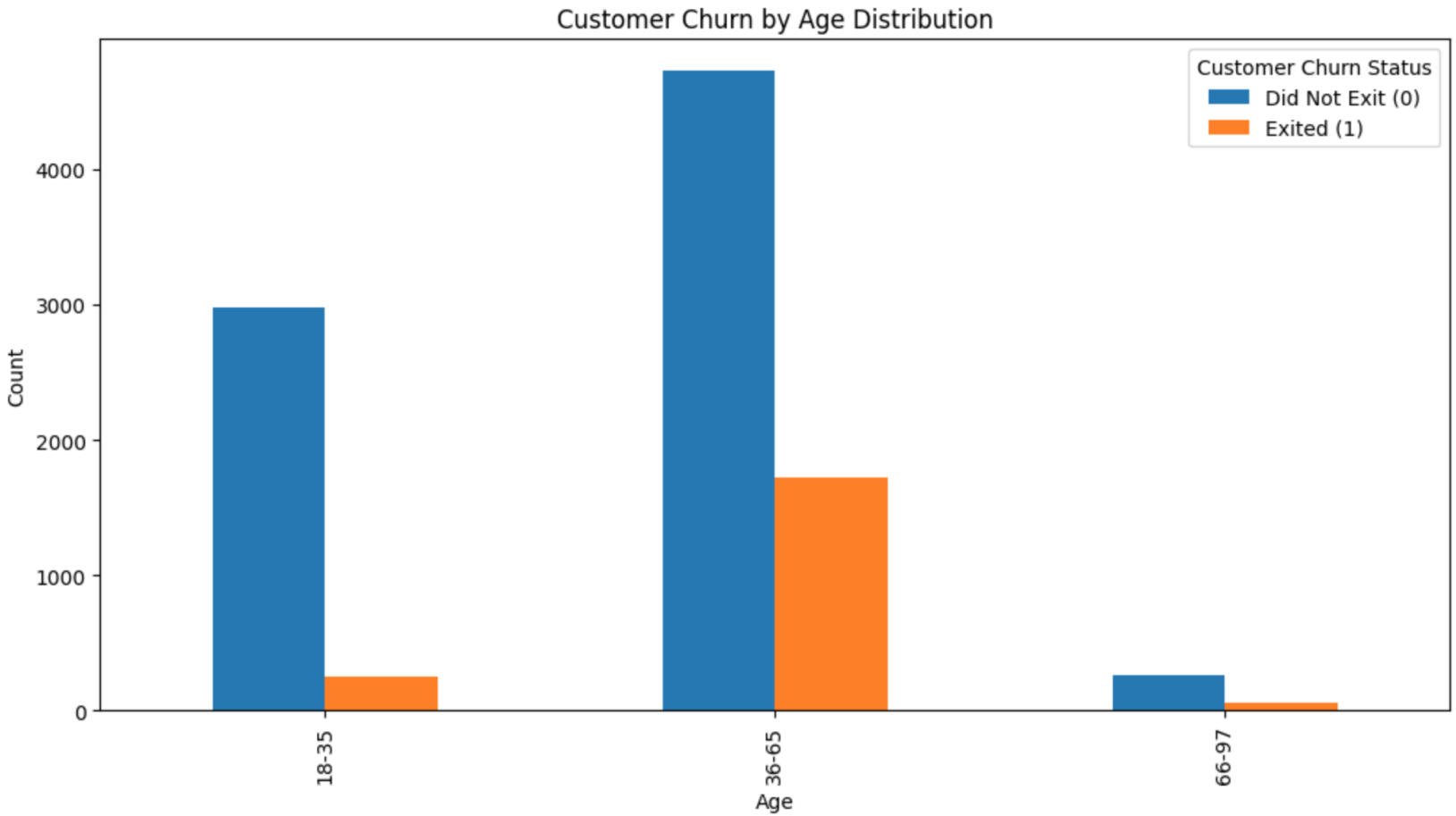
Data Visualizations and Insights of Key Predictors

Customer Churn based on Age Distribution



Key Points

- Customers 35yrs or younger churn less.
- Customers older than 35yrs tend to churn bank account more.

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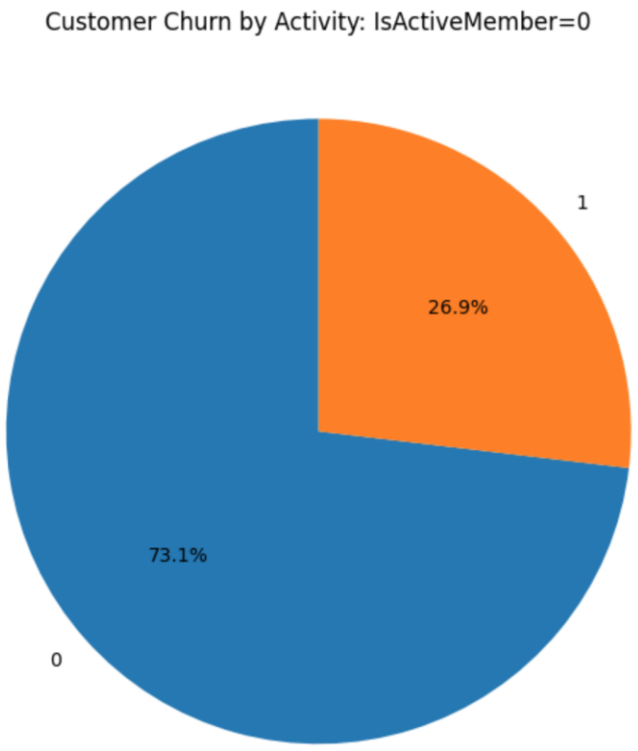
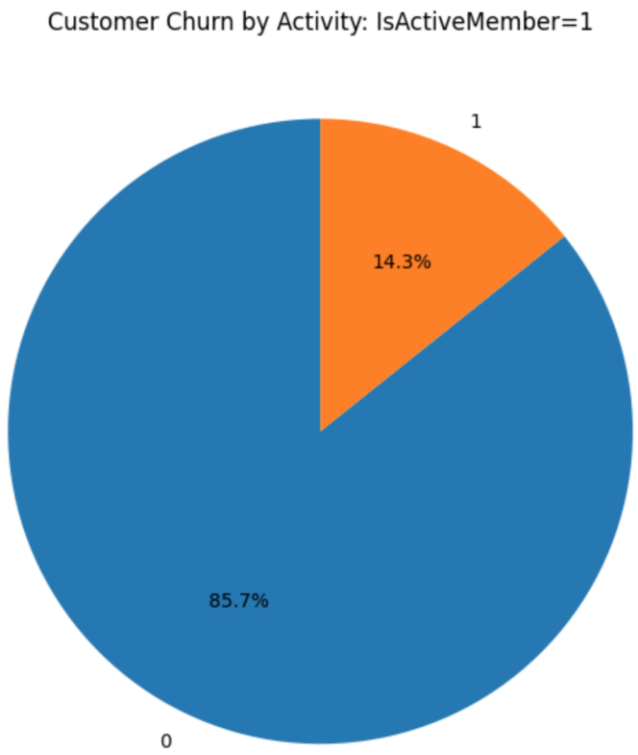
Data Visualizations and Insights of Key Predictors

Customer Churn based on Activity Status

Ratio of Churn for Inactive Members:



Ratio of Churn for Active Members:



Key Points

- Inactive Customers tend to churn more.
- Active members tend to churn less.

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Next Steps

Identify churning among customers → **Focus on the customer that are most likely to churn and understand the reason why.**

Understand Reasons for churn → **Identify why customers are churning by pinpointing the main issues**

Create an action plan to reduce churn → **Create a marketing strategy that would reduce bringing in possible churning members and reduce churn among existing members**

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Business Recommendations: Utilize Key Predictors

Geography	Implement attractive marketing strategies to Bank customers belonging to **Germany** to retain more.
Gender	Introduce strategies to continue engaging **Female** Bank Customers.
Age Distribution	Marketing strategies like saving offers, partnering with relevant businesses might retain matured customers over 35 years.
Activity Status	Introduce new banking products or saving offers to keep engaging Customers and maintain their activity.