Title: European Bank's Customer Churn Analysis & Prediction

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Introduction & Executive Summary

What is Churn?
Churn is a term that refers to the number of customers that a company(bank) loses over a specific time period either by closing their account.

Cost of Customer Acquisition
5-25 times more expensive than retaining existing customers

Profit from Customer Retention (5%)
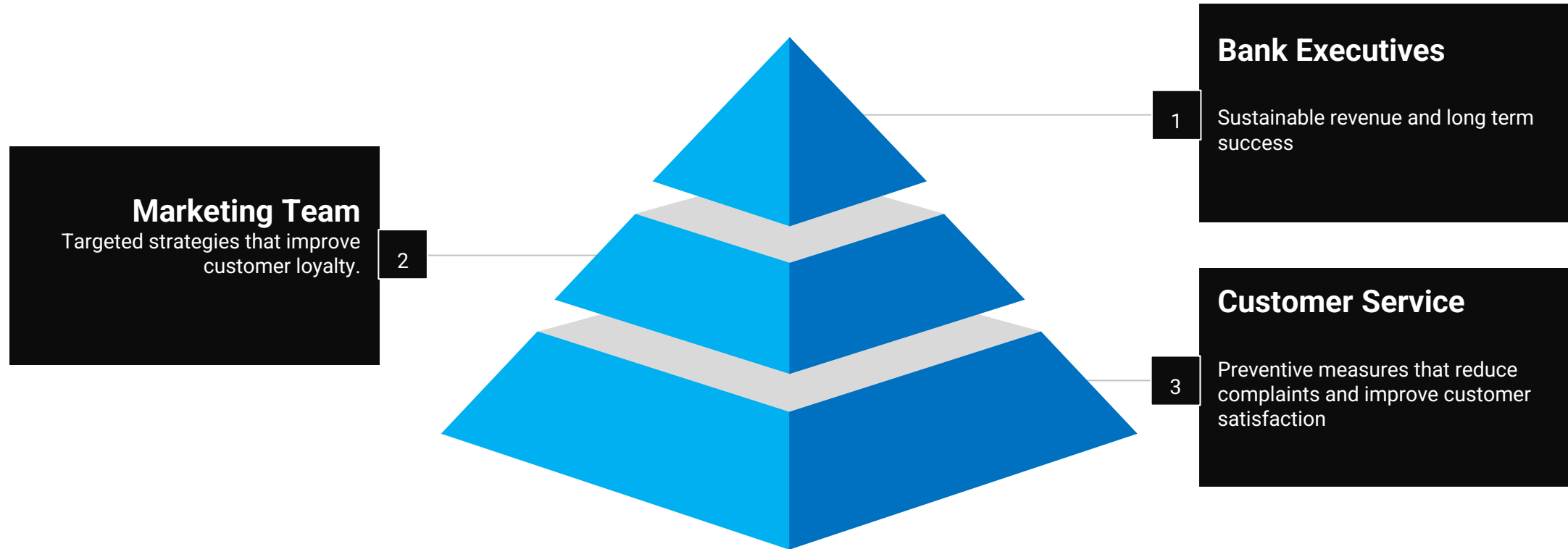25-95 % profit increase

Problem Statement:
Customer churn is a critical issue for businesses in a competitive markets. Understanding and predicting churn can help bank to strategize proactive measures on customer retention, improve customer satisfaction and service, and therefore increasing revenue.

Oliver Wyman. (2021, March). *Banking-as-a-Service enables up to 95 percent cost saving in acquiring customers*. Retrieved from https://www.oliverwyman.com/media-center/2021/mar/banking-as-a-service-enables-up-to-95-percent-cost-saving-in-acquiring-customers.html

Rajendran, S., Devarajan, R., & Elangovan, G. (2023, January). Customer churn prediction using machine learning approaches. *2023 International Conference on Engineering, Technology, and Applied Science (ICECONF)*. https://doi.org/10.1109/ICECONF57129.2023.10083813

Comprehensive Consulting Solutions for Small Businesses. (n.d.). *Customer Acquisition Costs Five Times More than Customer Retention*. Retrieved June 30, 2024, from https://www.comprehensiveconsultingsolutionsforsmallbusiness.com/customer-acquisition-costs-five-times-more-than-customer-retention/

Stakeholders & Goals

Bank Executives

1

Sustainable revenue and long term success

Marketing Team
Targeted strategies that improve customer loyalty.

2

Customer Service

3

Preventive measures that reduce complaints and improve customer satisfaction

Goals:
To improve customer retention
Develop ML models to predict churn
Provide actionable insights for bank management

1

IDENTIFY

The Data

2

TRAIN

The models

3

DEVELOP

Strategies

4

DEPLOYMENT

Of the Model
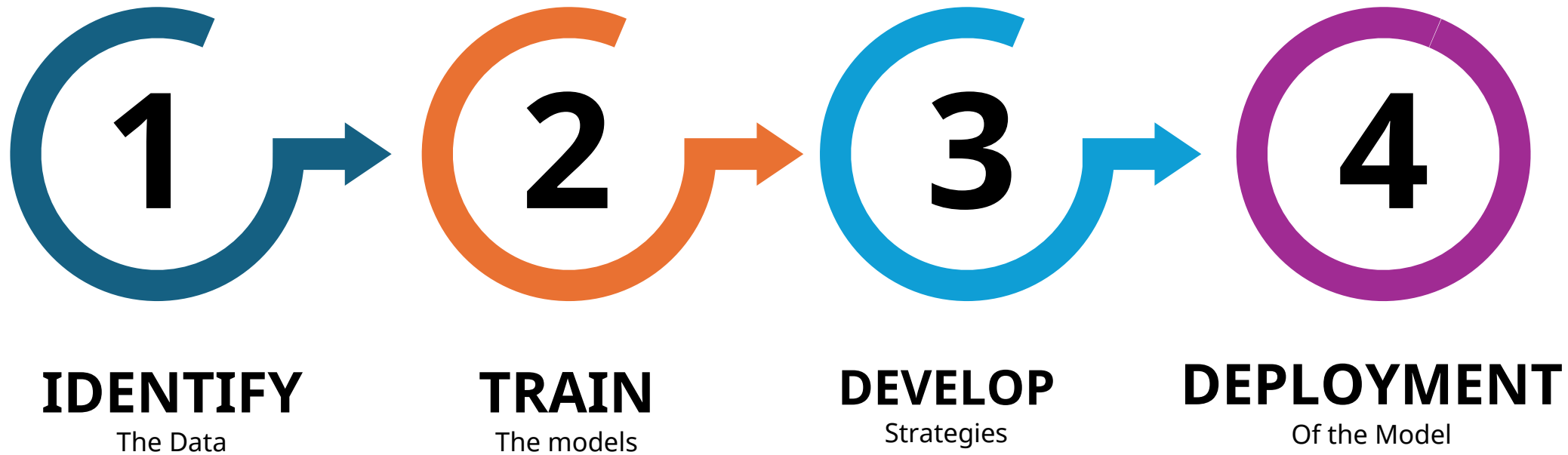
Identify Data
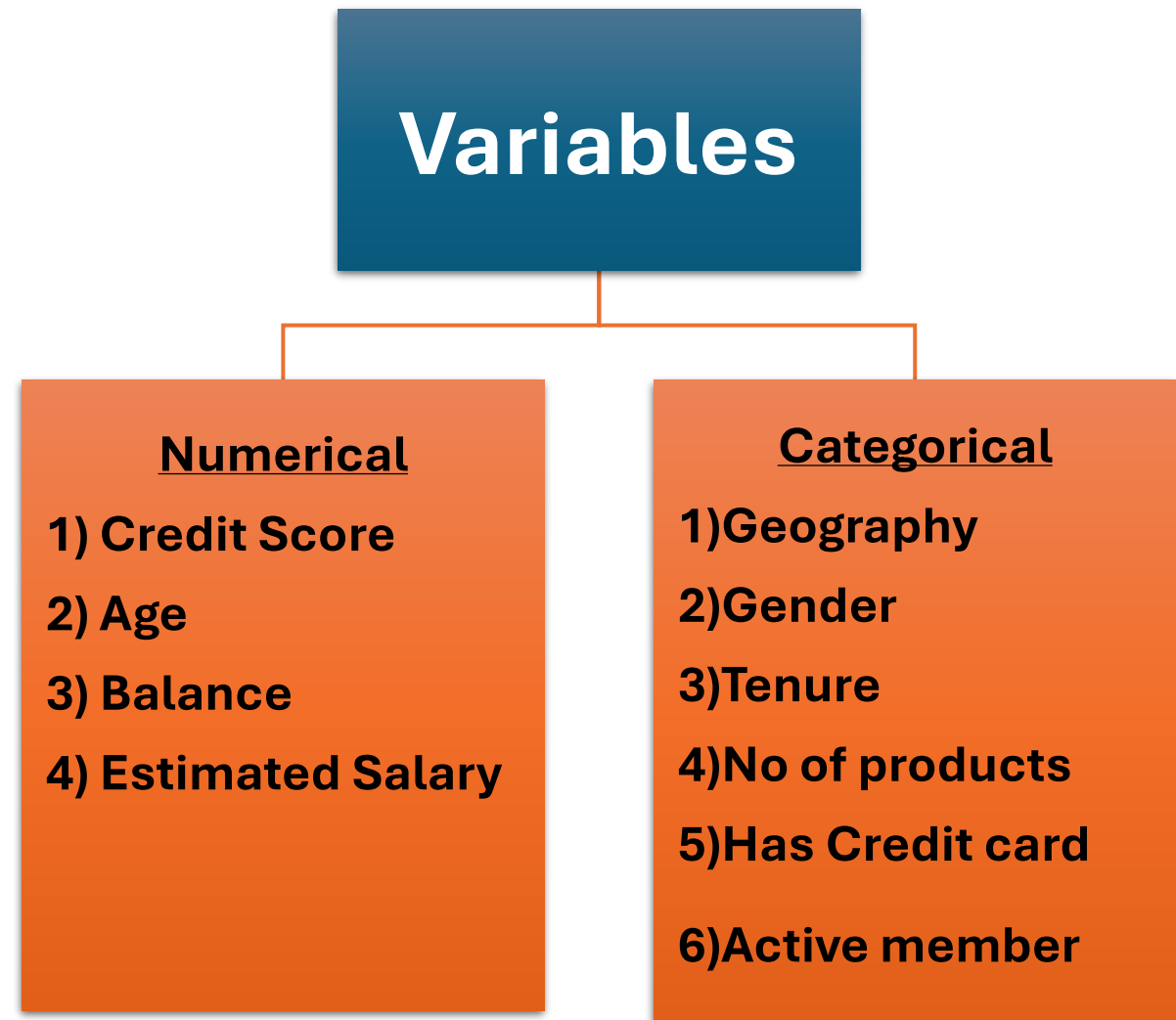
Dataset: 10,000 rows x 14 columns

Missing Data: Steps to handle missing data. (Geography & gender)

Encoding Categorical Features:

- Label Encoding for binary categorical features (Gender).
- One-Hot Encoding for multi-class categorical features (Geography).

Drop: Row number, Customer ID, Surname

Responding Variable: Exited

Variables

Numerical
1) Credit Score
2) Age
3) Balance
4) Estimated Salary

Categorical
1) Geography
2) Gender
3) Tenure
4) No of products
5) Has Credit card
6) Active member

Exploratory Data Analysis Findings

Customer Churn Rate

Total Customer: 18, 869
Customer Churn Rate: 34.3%

	Count	Percentage
Stayed	12, 427	65.7%
Exited	6,442	34.3%

Customer Churn Distribution
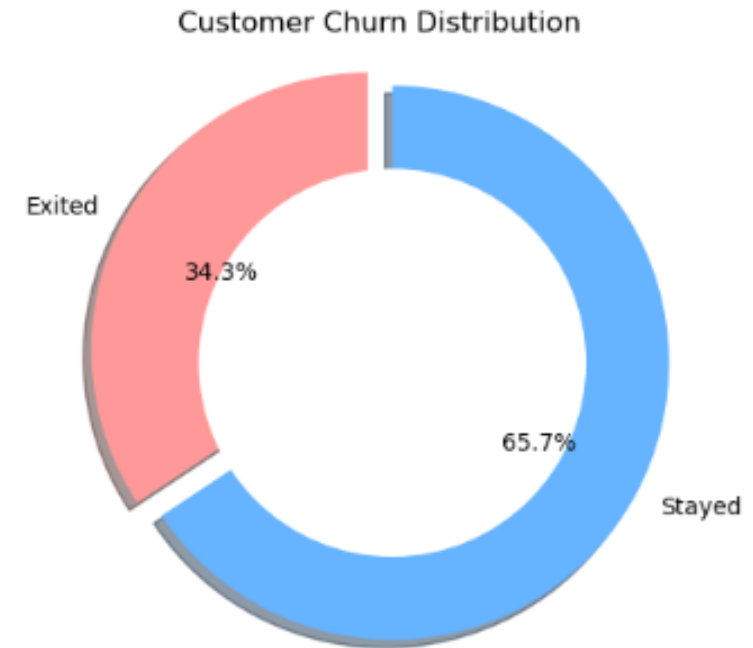
Customer Churn Rate by Country

Customer Churn Distribution by Country
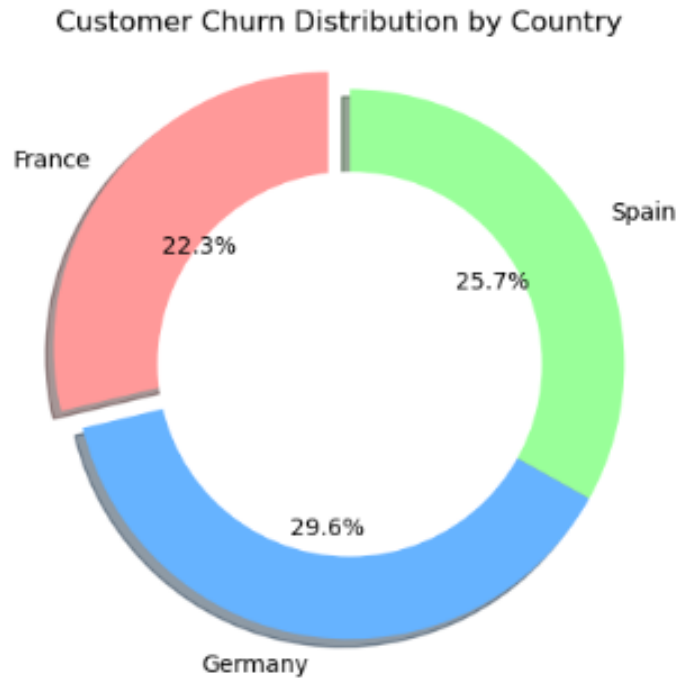
	Count	Churn Count	Percentage
France	10.352	2.304	22.3%
Germany	**7,635**	**2,257**	**29.6%**
Spain	7,324	1,881	25.7%
Total	18,869	6,442	100%

Geography: Higher exits in Germany, lowest in France.

Customer Churn Distribution by Gender

Female 51.8% | Male 48.2%
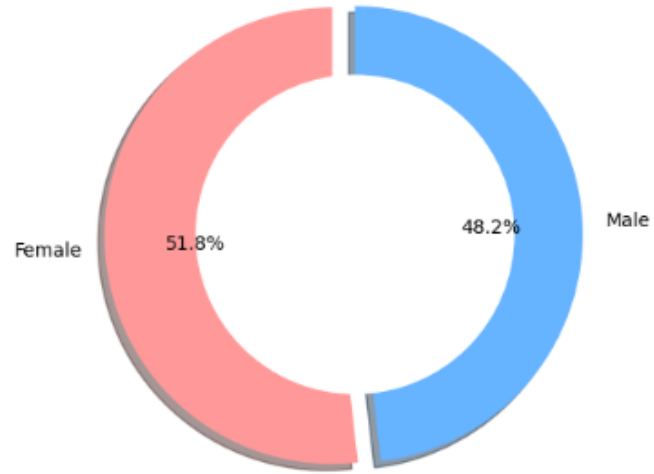
Customer Churn Distribution by Active Member

Active 53.9% | Not Active 46.1%
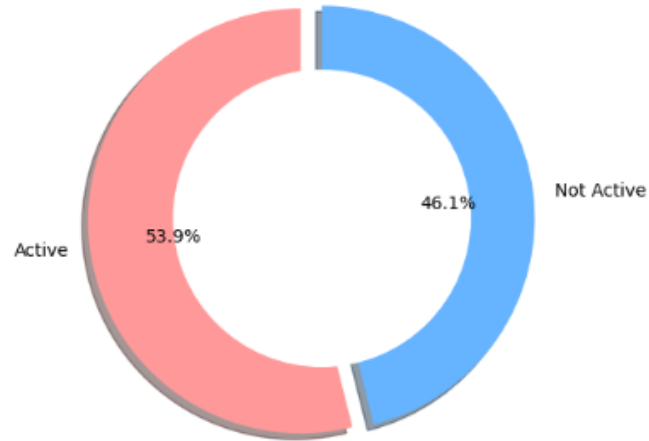
Customer Churn Distribution by Has CrCard

with CC 55.7% | Without CC 44.3%
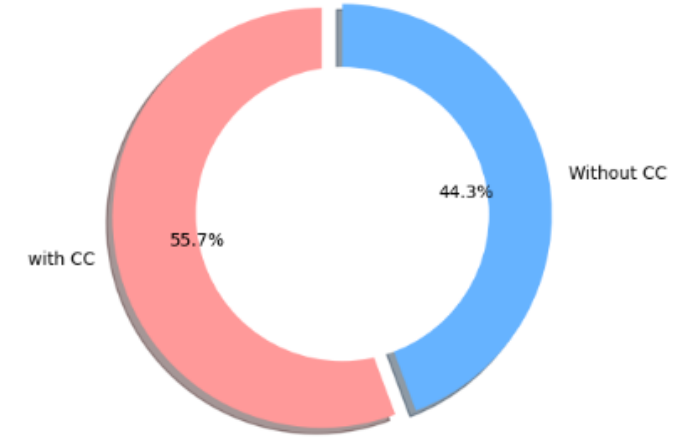
	Count	Percentage
Female	**3,336**	**51.8%**
Male	3,105	48.2%

Gender: Higher exit proportion for females.

	Count	Percentage
Active	3,475	53.9%
Not Active	**2,967**	**46.1%**

Is Active Member: Higher exit proportion for not active members.

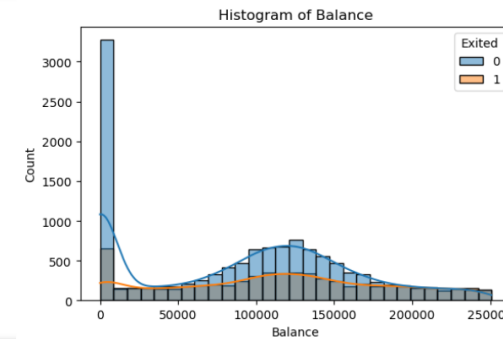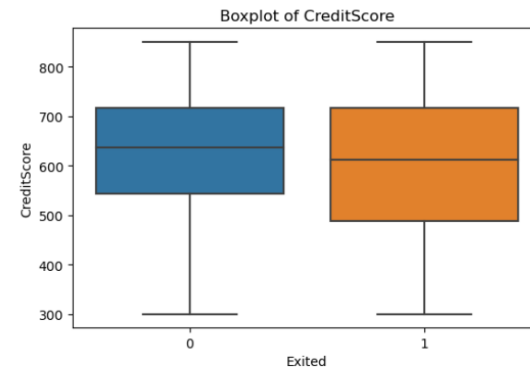|	Count	Percentage
With CC	**3,589**	**55.7%**
Without CC	2,853	44.3%

CrCard: Higher exit proportion with CC

Continuous Numerical Variables
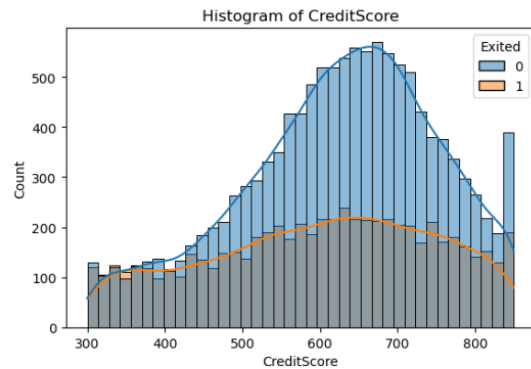
Credit Score: Slightly lower median for exited customers. **Median credit score for customers who exited: 611.0** compared to 637.0 for those who did not exit.

Balance: Higher median balance for exited customers. Range of balance for customers who exited: 0 to $250,898.09$ with a **median balance of $116,760.60**
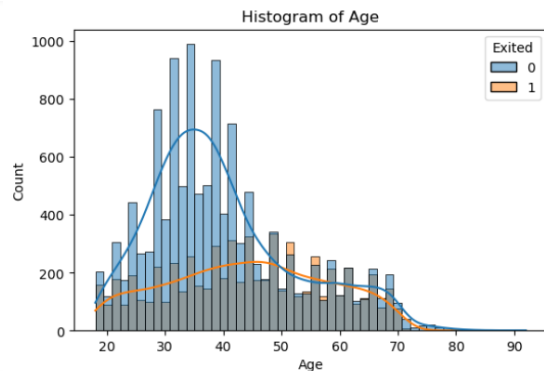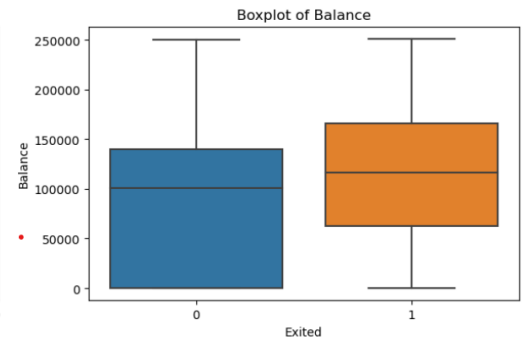
Age: Older customers are more likely to exit. **Mean age of customers who exited is 44** compared to **39 for those who did not exit**.
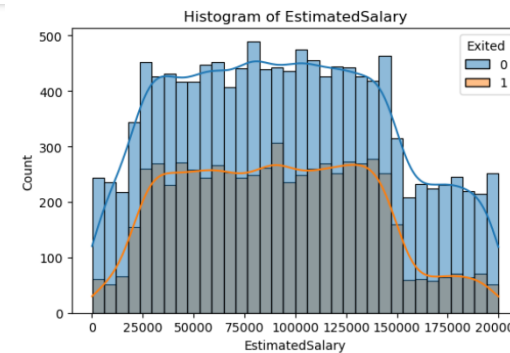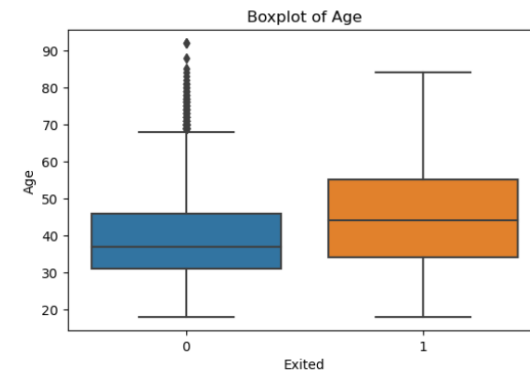
Estimated Salary: Similar distributions, suggesting it might not be a significant factor for churn.
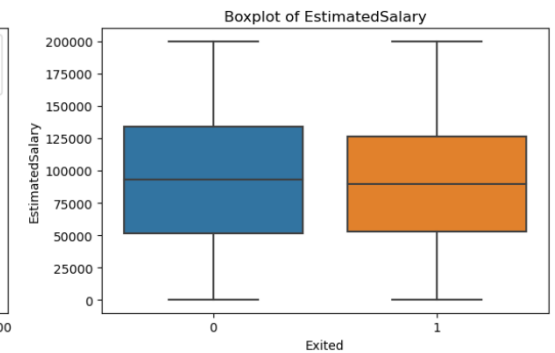
Summary of EDA

Customers who are more likely to churn are:

- 1) High balance customers

- 2) Older Customers

- 3) Customer with Fewer products

- 4) Non active customers

- 5) Customers in Germany

Approach

| Data Collection & Preprocessing | Exploratory Data Analysis (EDA) | Develop ML Model |

Data Preprocessing
• Handling Missing Values: Mode values for 'Geography', 'Gender'
• Encoding: Label Encoding, One-Hot Encoding
• Class Imbalance: SMOTE
• Scaling: StandardScaler

Exploratory Data Analysis
• Histograms, Boxplots, donut chart

Model Training
• Data Splitting: Training, Testing sets
• Algorithms: Logistic Regression, Random Forest, Gradient Boosting, AdaBoost, KNN

Model Tuning
• Hyperparameter Tuning: Random Forest, Gradient Boosting

Model Evaluation
• Performance Metrics: Accuracy, Precision, Recall, AUC

Model Performance

```
Model Performance:
                    Accuracy   Precision    Recall       AUC
Logistic Regression 0.644136   0.641945   0.633849   0.694120
Random Forest       0.775498   0.740157   0.841334   0.871649
Gradient Boosting   0.743311   0.713357   0.803906   0.836956
AdaBoost            0.696641   0.682412   0.722945   0.762206
K-Nearest Neighbors 0.728023   0.693899   0.805126   0.803041
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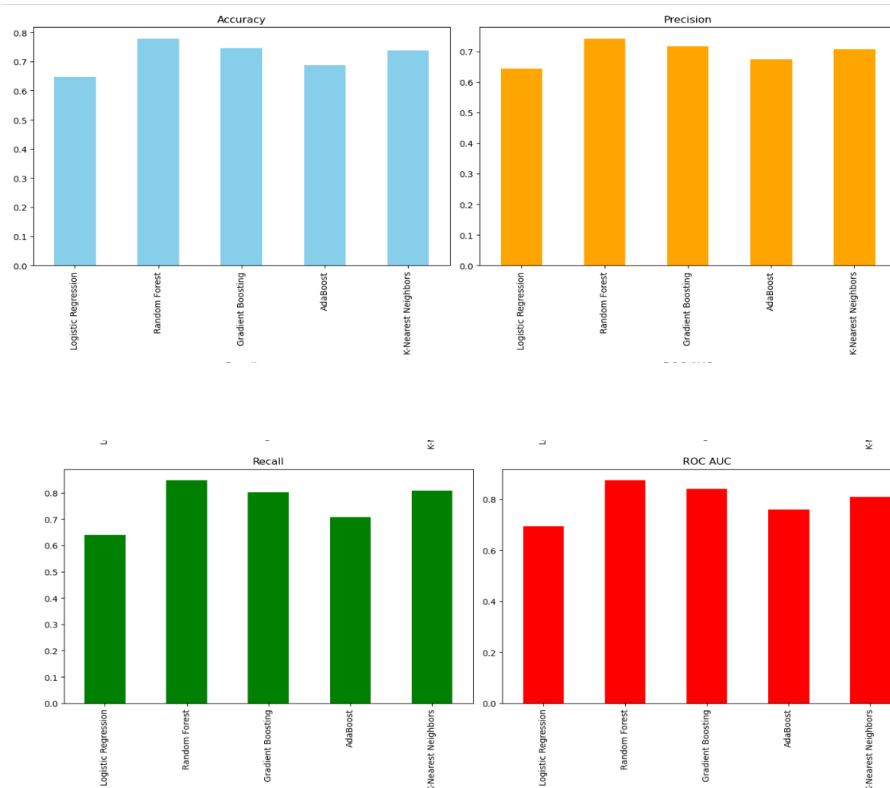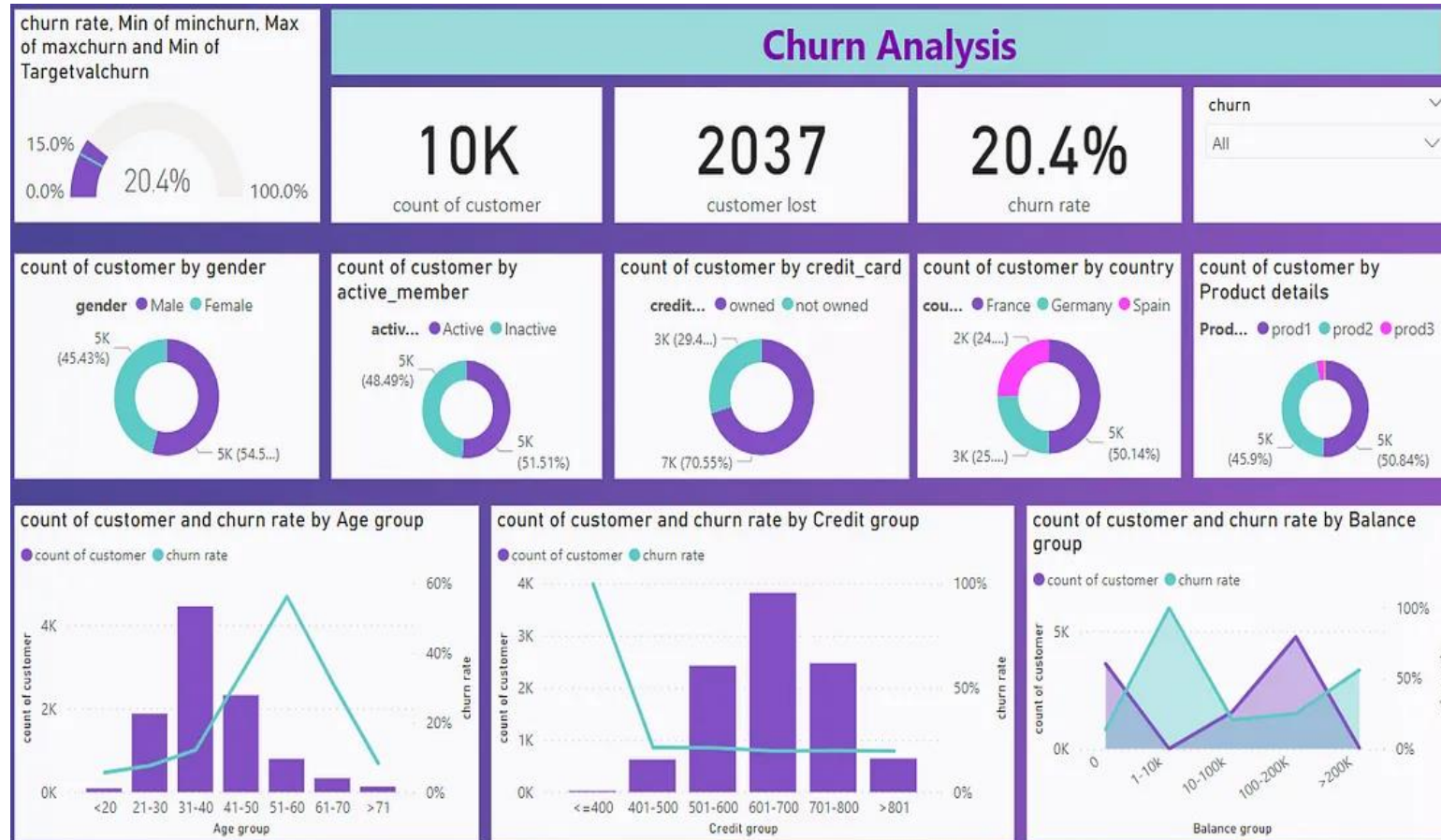

Evaluation Results:

Random Forest: Best performance in
Accuracy (77.5%),
Precision (74.0%),
Recall (84.1%),
AUC (0.872).

Gradient Boosting: Strong alternative.

Conclusion:

The analysis **highlights the critical factors influencing customer churn** and **identify effective machine learning model in predicting churn**.

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Recommendation on Future Work: Deployment

Dashboard with the machine learning model developed

Objective: Real-time monitoring of customer behavior and churn rate.

Review the analysis in Biweekly management meeting

Make sure strategies aligns with the data pattern reflection on customer behaviour.

Features:

Live (Churn rate, customer count, customer lost)

Donut charts for:

- customers and churn rate by gender, activity status, credit card status, country, churn rate, no of products.

Line bar charts for:

- customers and churn rate by age group, credit score, balance.

Actionable Insights for Customer Retention Strategies:

Customers who are more likely to Churn	Retention Strategies
High balance customers	**Personalized Services**: Assign dedicated relationship managers. **Exclusive Benefits**: Offer premium banking services and rewards. (Low interest loan, insurance, credit card with special benefits. **Reward Programs**: Implement loyalty programs.
Older Customers	**Financial Planning Services**: Provide retirement planning and investment advice. **Long-Term Relationship Building**: Focus on trust and personalized interactions. **Health and Wellness Programs**: Offer health-related financial services.
Customers with Fewer Products	**Cross-Selling Campaigns**: Encourage adoption of additional products. **Bundling Discounts**: Offer incentives for product bundling. **Product Education**: Educate on benefits of additional services.
Non-Active Customers	**Reactivation Campaigns**: Launch targeted campaigns with incentives. **Digital Engagement**: Enhance digital platforms for convenience. **Exclusive Benefits:** Offer premium banking services and rewards. (Low interest loan, insurance, credit card with special benefits
Germany Customers	**Localized Offerings**: Customize marketing and products. **Community Engagement**: Participate in local initiatives.

Thank you

References:

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