Title: Exploratory Data Analysis of Bank Customer Churn

1. Introduction

- **Objective:** The goal of this analysis is to explore the factors contributing to customer churn at the bank and identify patterns that can help in improving customer retention strategies.
- **Dataset Description:** The dataset includes customer information with features such as age, balance, tenure, and churn status. It consists of 10,000 records with 12 columns.

2. Data Overview

- **Summary Statistics:**

	count	mean	std	min	25%	50%	75%	max
customer_id	10000.0	15690940.57	71936.19	15565701.00	15628528.25	15690738.00	15753233.75	15815690.00
credit_score	10000.0	650.53	96.65	350.00	584.00	652.00	718.00	850.00
age	10000.0	38.92	10.49	18.00	32.00	37.00	44.00	92.00
tenure	10000.0	5.01	2.89	0.00	3.00	5.00	7.00	10.00
balance	10000.0	76485.89	62397.41	0.00	0.00	97198.54	127644.24	250898.09
products_number	10000.0	1.53	0.58	1.00	1.00	1.00	2.00	4.00
credit_card	10000.0	0.71	0.46	0.00	0.00	1.00	1.00	1.00
active_member	10000.0	0.52	0.50	0.00	0.00	1.00	1.00	1.00
estimated_salary	10000.0	100090.24	57510.49	11.58	51002.11	100193.92	149388.25	199992.48
churn	10000.0	0.20	0.40	0.00	0.00	0.00	0.00	1.00

- **Data Types:**
  - Categorical: Gender, Geographical Region.
  - Numerical: Customer id, Age, Balance, Tenure, Credit Score, Products Number, Credit Card, Active Member, Estimated Salary, Churn.
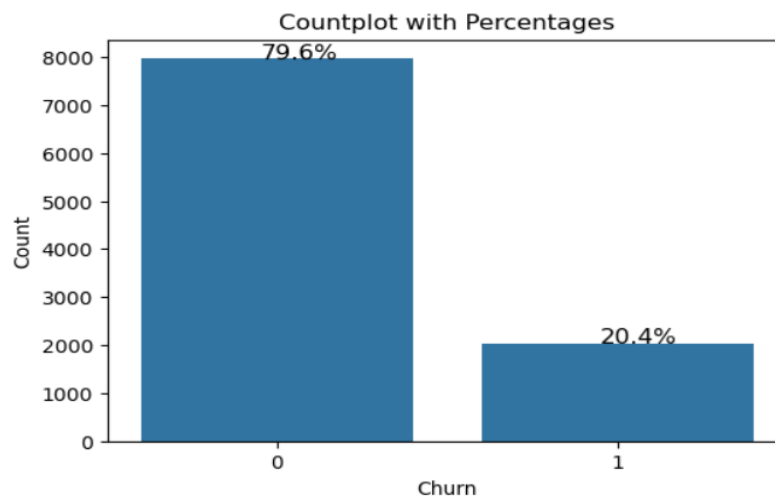
3. Data Cleaning

- **Missing Values:**
  - No missing values found in the dataset.

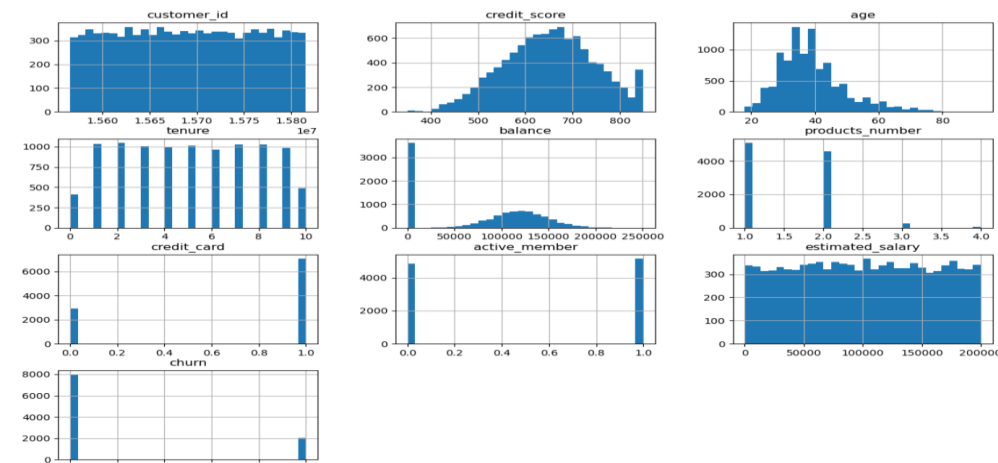## 4. Univariate Analysis

- **Distribution of Churn:**
  - Churned Customers: 20.4%
  - Non-Churned Customers: 79.6%


- **Feature Analysis:**
  - **Credit Score:** The majority of customers have a credit score ranging from 600 to 800.
  - **Age**: The age distribution is fairly even, with a slight peak observed in the 30-40 age range.
  - **Number of Products**: Most customers have 1 or 2 products.
  - **Estimated Salary:** Salaries are evenly spread out, indicating no specific dominant salary range.
  - **Active Membership**: Most customers are active members.
  - **Credit Card Ownership**: The majority of customers have a credit card.
  - **Churn:** The churn rate is relatively balanced, with a slight majority of customers not churning.

5. Bivariate Analysis

- **Correlation Analysis:**
    - moderate positive correlation between age and churn (0.29).
    - negative correlation between being an active member and churn (-0.16).
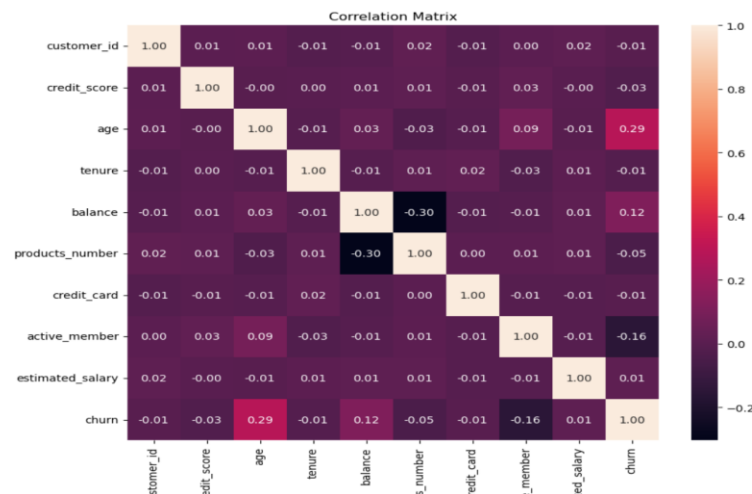
6. Visualization

- **Histograms:**
    - Age distribution showing a peak in the 30-40 age range.
- **Bar Charts:**
    - Churn rate by Gender: Slightly higher churn in female customers.
    - Churn rate by Geographical Region: Higher churn in Germany regions.
- **Heatmaps:**
    - moderate positive correlation between age and churn (0.29).
    - negative correlation between being an active member and churn.

7. Insights

- **Key Findings:**
    - Females have a higher churn rate than males in all three countries.
    - The churn rate varies by country, with Germany showing the highest churn rates for both genders.
    - There is a moderate positive correlation between age and churn, suggesting that older customers are more likely to churn.
    - A negative correlation between being an active member and churn suggests that active members are less likely to churn.

- **Patterns and Trends:**
    - The consistent higher churn rate among females across all countries suggests a pattern that could be due to specific needs or preferences not being met.
    - The variation in churn rates by country, especially the high rates in Germany, indicates that regional factors significantly impact customer retention.
    - The trend of older customers having a higher likelihood of churning suggests that age-specific factors, such as changing life stages or preferences, play a role in churn
    - The trend of older customers having a higher likelihood of churning suggests that age-specific factors, such as changing life stages or preferences, play a role in churn.
    - The negative correlation between active membership and churn underscores the importance of keeping customers engaged to reduce churn rates.

8. Conclusion

- **Summary:**
    - The analysis reveals that balance and tenure are critical factors influencing customer churn.
- **Recommendations:**
    - Enhance customer engagement and offer tailored financial products to customers with lower balances.
    - Develop retention programs for short-tenure customers.