```
from google.colab import drive
import shutil
import pandas as pd
import seaborn as sns

source_path = "/content/Train.csv"  # change this to your file path


pd.set_option('display.max_columns', None)
sns.set(style="whitegrid")

df = pd.read_csv(source_path)
df.head()

```

	ID	join_date	sex	marital_status	birth_year	branch_code	occupation_code	occupation_category_code	P5DA	RIBP	8NN1	7
0	4WKQSBB	1/2/2019	F	M	1987	1X1H	2A7I	T4MS	0	0	0	
1	CP5S02H	1/6/2019	F	M	1981	UAOD	2A7I	T4MS	0	0	0	
2	2YKDILJ	1/6/2013	M	U	1991	748L	QZYX	90QI	0	0	0	
3	2S9E81J	1/8/2019	M	M	1990	1X1H	BP09	56SI	0	0	0	
4	BHDYVFT	1/8/2019	M	M	1990	748L	NO3L	T4MS	0	0	0	

+ Code + Text

```
print("Shape of data:", df.shape)
```

```
Shape of data: (29132, 29)
```

```
print("\nColumns:", df.columns)

```

```
Columns: Index(['ID', 'join_date', 'sex', 'marital_status', 'birth_year', 'branch_code',
       'occupation_code', 'occupation_category_code', 'P5DA', 'RIBP', '8NN1',
       '7POT', '66FJ', 'GYSR', 'SOP4', 'RVSZ', 'PYUQ', 'LJR9', 'N2MW', 'AHXO',
       'BSTQ', 'FM3X', 'K6QO', 'QBOL', 'JWFN', 'JZ9D', 'J9JW', 'GHYX', 'ECY3'],
      dtype='object')
```

```
print("\nData Types:\n", df.dtypes)
```

```
Data Types:
 ID                         object
join_date                  object
sex                        object
marital_status             object
birth_year                  int64
branch_code                object
occupation_code            object
occupation_category_code   object
P5DA                        int64
RIBP                        int64
8NN1                        int64
7POT                        int64
66FJ                        int64
GYSR                        int64
SOP4                        int64
RVSZ                        int64
PYUQ                        int64
LJR9                        int64
N2MW                        int64
AHXO                        int64
BSTQ                        int64
FM3X                        int64
K6QO                        int64
QBOL                        int64
JWFN                        int64
JZ9D                        int64
J9JW                        int64
GHYX                        int64
ECY3                        int64
dtype: object
```

```

print("\nMissing Values:\n", df.isnull().sum())

```

```
Missing Values:
```

```
ID                          0
join_date                   2
sex                         0
marital_status              0
birth_year                  0
branch_code                 0
occupation_code             0
occupation_category_code    0
P5DA                        0
RIBP                        0
8NN1                        0
7POT                        0
66FJ                        0
GYSR                        0
SOP4                        0
RVSZ                        0
PYUQ                        0
LJR9                        0
N2MW                        0
AHXO                        0
BSTQ                        0
FM3X                        0
K6QO                        0
QBOL                        0
JWFN                        0
JZ9D                        0
J9JW                        0
GHYX                        0
ECY3                        0
dtype: int64
```

```
df.info()
```

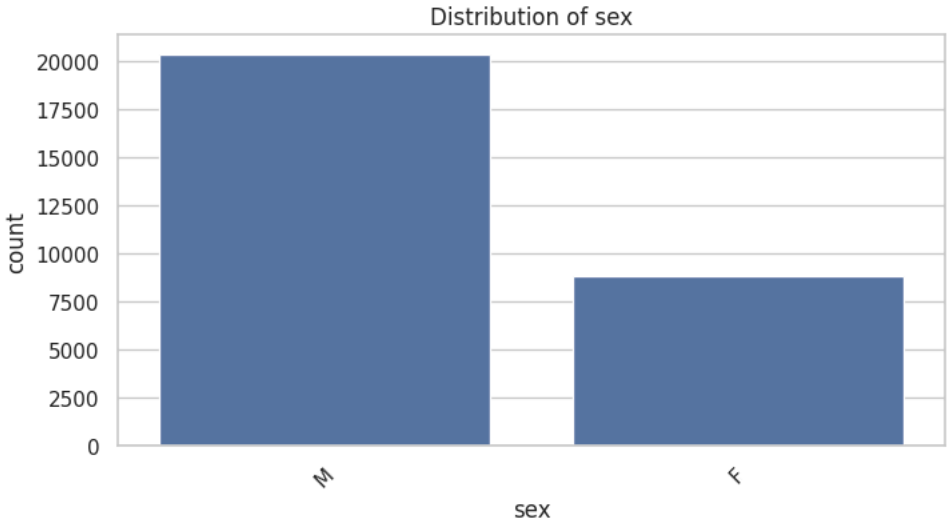
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 29132 entries, 0 to 29131
Data columns (total 29 columns):
 #   Column                    Non-Null Count  Dtype 
---  ------                    --------------  ----- 
 0   ID                        29132 non-null  object
 1   join_date                 29130 non-null  object
 2   sex                       29132 non-null  object
 3   marital_status            29132 non-null  object
 4   birth_year                29132 non-null  int64 
 5   branch_code               29132 non-null  object
 6   occupation_code           29132 non-null  object
 7   occupation_category_code  29132 non-null  object
 8   P5DA                      29132 non-null  int64 
 9   RIBP                      29132 non-null  int64 
 10  8NN1                      29132 non-null  int64 
 11  7POT                      29132 non-null  int64 
 12  66FJ                      29132 non-null  int64 
 13  GYSR                      29132 non-null  int64 
 14  SOP4                      29132 non-null  int64 
 15  RVSZ                      29132 non-null  int64 
 16  PYUQ                      29132 non-null  int64 
 17  LJR9                      29132 non-null  int64 
 18  N2MW                      29132 non-null  int64 
 19  AHXO                      29132 non-null  int64 
 20  BSTQ                      29132 non-null  int64 
 21  FM3X                      29132 non-null  int64 
 22  K6QO                      29132 non-null  int64 
 23  QBOL                      29132 non-null  int64 
 24  JWFN                      29132 non-null  int64 
 25  JZ9D                      29132 non-null  int64 
 26  J9JW                      29132 non-null  int64 
 27  GHYX                      29132 non-null  int64 
 28  ECY3                      29132 non-null  int64 
dtypes: int64(22), object(7)
memory usage: 6.4+ MB
```

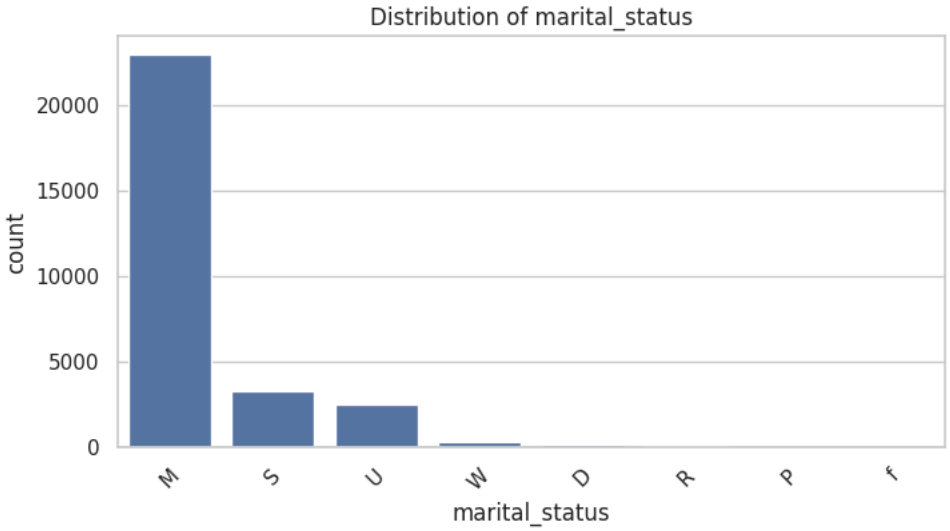
```
df.dropna(inplace=True)
```

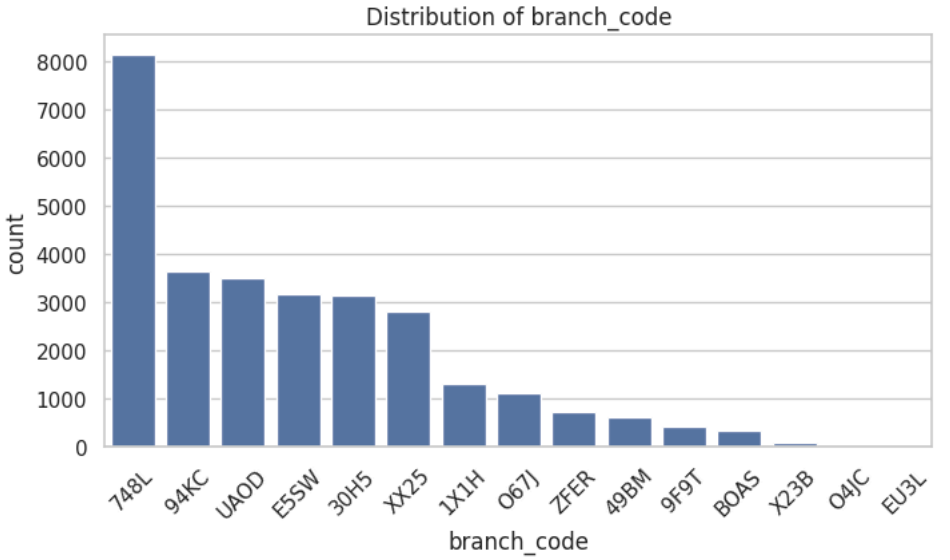
```
categorical_cols = df.select_dtypes(include=['object']).columns
for col in categorical_cols:
    if df[col].nunique() <= 20:  # Skip high-cardinality columns
        plt.figure(figsize=(8, 4))
        sns.countplot(x=col, data=df, order=df[col].value_counts().index)
        plt.title(f"Distribution of {col}")
        plt.xticks(rotation=45)
        plt.show()
    else:
        print(f"Skipping {col} (too many unique values: {df[col].nunique()})")

```

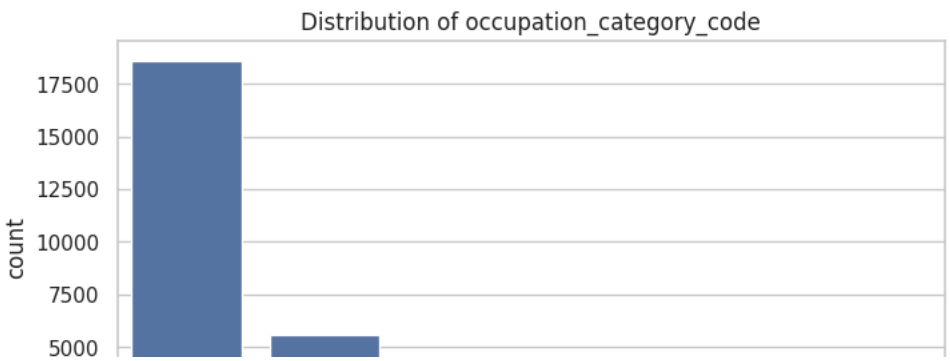
```
Skipping ID (too many unique values: 29130)
Skipping join_date (too many unique values: 132)
```



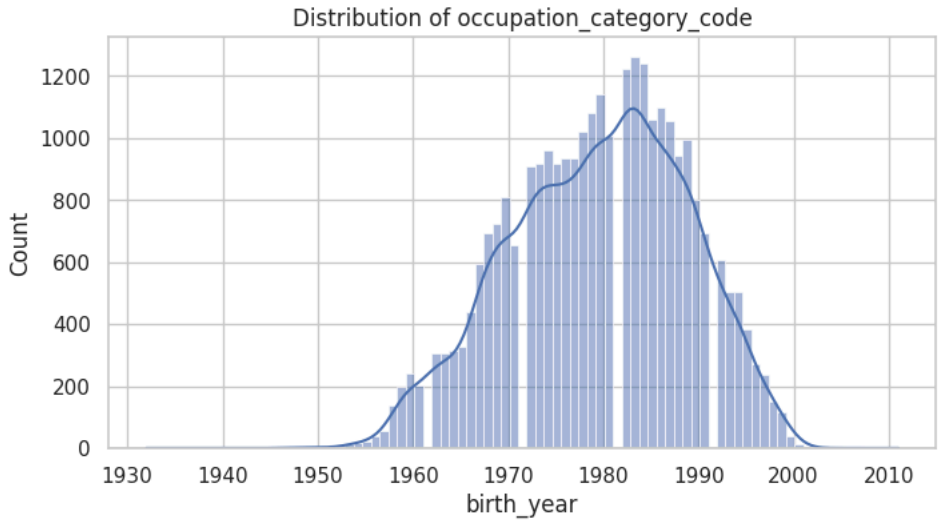




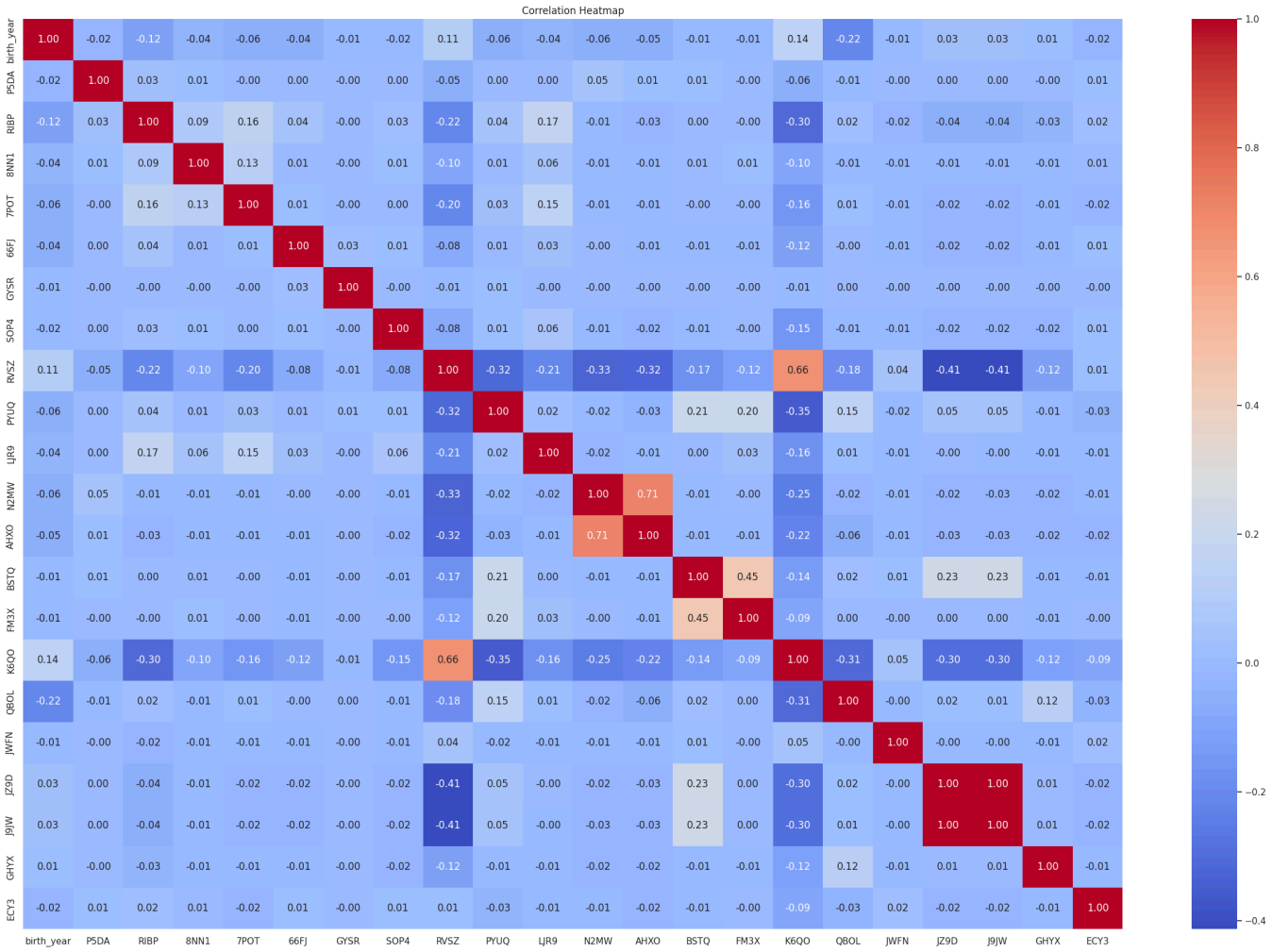

```
Skipping occupation_code (too many unique values: 233)
```




```
1 plt.figure(figsize=(8,4))
2 sns.histplot(df['birth_year'].dropna(), kde=True)
3 plt.title(f"Distribution of {col}")
4 plt.show()
```




```
1 numeric_cols = df.select_dtypes(include=np.number).columns
2 plt.figure(figsize=(30,20))
3 corr = df[numeric_cols].corr()
4 sns.heatmap(corr, annot=True, cmap='coolwarm', fmt='0.2f')
5 plt.title("Correlation Heatmap")
6 plt.show()
```




```
for col in numeric_cols:
    Q1 = df[col].quantile(0.25)
    Q3 = df[col].quantile(0.75)
    IQR = Q3 - Q1
    outliers = df[(df[col] < Q1 - 1.5*IQR) | (df[col] > Q3 + 1.5*IQR)]
    print(f"{col}: {len(outliers)} outliers")
```

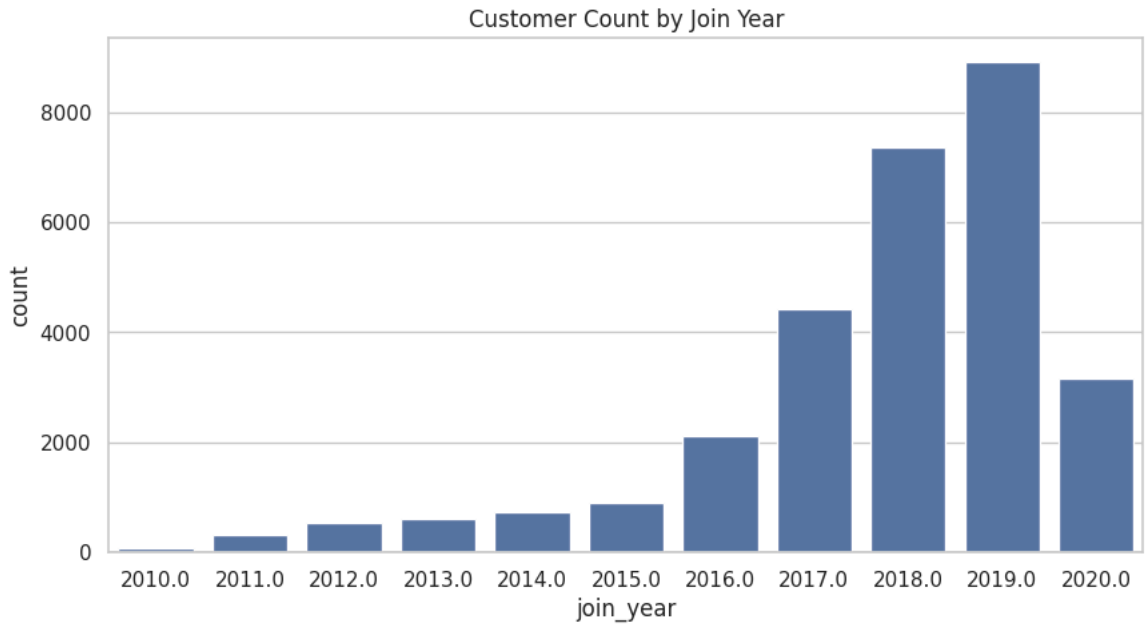
```
birth_year: 17 outliers
P5DA: 40 outliers
RIBP: 1779 outliers
8NN1: 157 outliers
7POT: 316 outliers
66FJ: 339 outliers
GYSR: 4 outliers
```

```
SOP4: 431 outliers
RVSZ: 3803 outliers
PYUQ: 2173 outliers
LJR9: 354 outliers
N2MW: 838 outliers
AHXO: 539 outliers
BSTQ: 324 outliers
FM3X: 110 outliers
K6QO: 0 outliers
QBOL: 6832 outliers
JWFN: 310 outliers
JZ9D: 1425 outliers
J9JW: 1418 outliers
GHYX: 902 outliers
ECY3: 1100 outliers
```

```python
if 'join_date' in df.columns:
    df['join_date'] = pd.to_datetime(df['join_date'], errors='coerce')
    df['join_year'] = df['join_date'].dt.year
    df['join_month'] = df['join_date'].dt.month

    plt.figure(figsize=(10, 5))
    sns.countplot(x='join_year', data=df)
    plt.title("Customer Count by Join Year")
    plt.show()

```




```python
if {'sex', 'marital_status', 'birth_year'}.issubset(df.columns):
    # Age calculation (assuming current year = 2025)
    df['age'] = 2025 - df['birth_year']

    # Age distribution
    plt.figure(figsize=(8, 4))
    sns.histplot(df['age'], bins=20, kde=True)
    plt.title("Customer Age Distribution")
    plt.show()

    # Segmentation by Gender & Marital Status
    plt.figure(figsize=(8, 4))
    sns.countplot(x='sex', hue='marital_status', data=df)
    plt.title("Customer Segmentation by Gender & Marital Status")
    plt.show()

    # Average Age by Gender
    plt.figure(figsize=(8, 4))
    sns.barplot(x='sex', y='age', data=df)
    plt.title("Average Age by Gender")
    plt.show()

```