Bank Loan Financial Analysis

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Importing Libraries

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Reading File

In [2]:

```
df = pd.read_excel("Bank_Personal_Loan_Modelling.xlsx",1)
df
```

Out[2]:

	ID	Age	Experience	Income	ZIP Code	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	A
0	1	25	1	49	91107	4	1.6	1	0	0	1	
1	2	45	19	34	90089	3	1.5	1	0	0	1	
2	3	39	15	11	94720	1	1.0	1	0	0	0	
3	4	35	9	100	94112	1	2.7	2	0	0	0	
4	5	35	8	45	91330	4	1.0	2	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	
4995	4996	29	3	40	92697	1	1.9	3	0	0	0	
4996	4997	30	4	15	92037	4	0.4	1	85	0	0	
4997	4998	63	39	24	93023	2	0.3	3	0	0	0	
4998	4999	65	40	49	90034	3	0.5	2	0	0	0	
4999	5000	28	4	83	92612	3	0.8	1	0	0	0	

5000 rows × 14 columns

Top 5 Values

In [3]:

```
df.head(5)
```

Out[3]:

	ID	Age	Experience	Income	ZIP Code	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Accoun
0	1	25	1	49	91107	4	1.6	1	0	0	1	0
1	2	45	19	34	90089	3	1.5	1	0	0	1	0
2	3	39	15	11	94720	1	1.0	1	0	0	0	0
3	4	35	9	100	94112	1	2.7	2	0	0	0	0
4	5	35	8	45	91330	4	1.0	2	0	0	0	0

Bottom 5 Values

In [4]:

```
df.tail(5)
```

Out[4]:

	ID	Age	Experience	Income	ZIP Code	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	A
4995	4996	29	3	40	92697	1	1.9	3	0	0	0	
4996	4997	30	4	15	92037	4	0.4	1	85	0	0	
4997	4998	63	39	24	93023	2	0.3	3	0	0	0	
4998	4999	65	40	49	90034	3	0.5	2	0	0	0	
4999	5000	28	4	83	92612	3	0.8	1	0	0	0	

Shape of Data

In [5]:

```
df.shape
```

Out[5]:

```
(5000, 14)
```

Checking Null Values

In [6]:

```
df.isnull().sum()
```

Out[6]:

```
ID                    0
Age                   0
Experience            0
Income                0
ZIP Code              0
Family                0
CCAvg                 0
Education             0
Mortgage              0
Personal Loan         0
Securities Account    0
CD Account            0
Online                0
CreditCard            0
dtype: int64
```

Columns Available

In [7]:

```
df.columns
```

Out[7]:

```
Index(['ID', 'Age', 'Experience', 'Income', 'ZIP Code', 'Family', 'CCAvg',
       'Education', 'Mortgage', 'Personal Loan', 'Securities Account',
       'CD Account', 'Online', 'CreditCard'],
      dtype='object')
```

Dropping Unnecessary Column

In [8]:

```
df.drop(['ID', 'ZIP Code'], axis = 1, inplace = True)
```

In [9]:

```
df.columns
```

Out[9]:

```
Index(['Age', 'Experience', 'Income', 'Family', 'CCAvg', 'Education',
       'Mortgage', 'Personal Loan', 'Securities Account', 'CD Account',
       'Online', 'CreditCard'],
      dtype='object')
```

Data Types

In [10]:

```
df.dtypes
```

Out[10]:

```
Age                    int64
Experience             int64
Income                 int64
Family                 int64
CCAvg                float64
Education              int64
Mortgage               int64
Personal Loan          int64
Securities Account     int64
CD Account             int64
Online                 int64
CreditCard             int64
dtype: object
```

Summary of Data

In [11]:

```
# Generate summary statistics
summary_stats = df[['Age','Experience','Income','Family','Education']].describe()
summary_stats
```

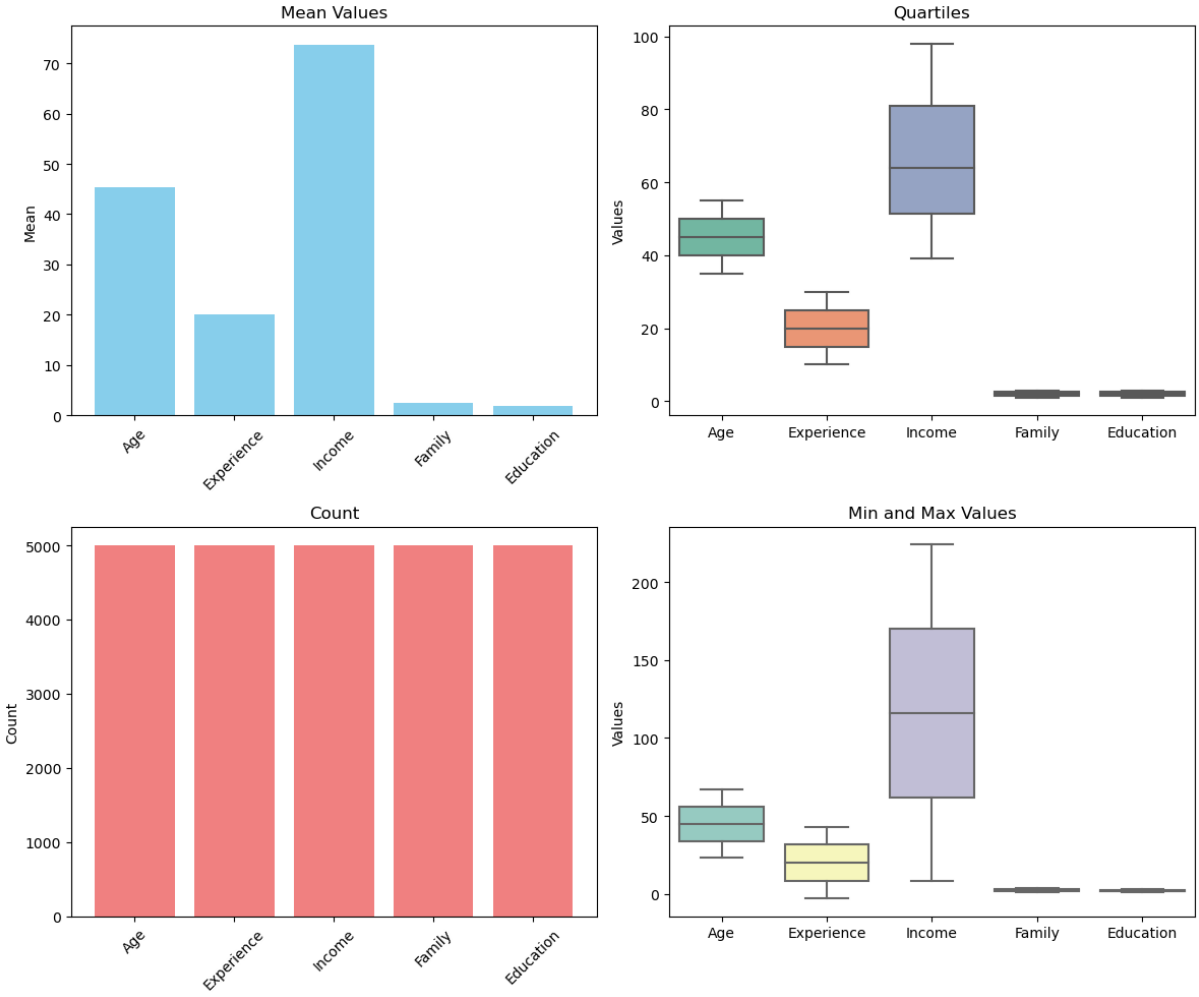
Out[11]:

	Age	Experience	Income	Family	Education
count	5000.000000	5000.000000	5000.000000	5000.000000	5000.000000
mean	45.338400	20.104600	73.774200	2.396400	1.881000
std	11.463166	11.467954	46.033729	1.147663	0.839869
min	23.000000	-3.000000	8.000000	1.000000	1.000000
25%	35.000000	10.000000	39.000000	1.000000	1.000000
50%	45.000000	20.000000	64.000000	2.000000	2.000000
75%	55.000000	30.000000	98.000000	3.000000	3.000000
max	67.000000	43.000000	224.000000	4.000000	3.000000

Subplots of the Summary

In [12]:

```
# Create subplots for multiple visualizations
fig, axes = plt.subplots(nrows=2, ncols=2, figsize=(12, 10))

# Bar plot for mean values
axes[0, 0].bar(summary_stats.columns, summary_stats.loc['mean'], color='skyblue')
axes[0, 0].set_title('Mean Values')
axes[0, 0].set_ylabel('Mean')
axes[0, 0].tick_params(axis='x', rotation=45)

# Box plot for quartiles
sns.boxplot(data=summary_stats.loc[['25%', '50%', '75%']], ax=axes[0, 1], palette='Set2')
axes[0, 1].set_title('Quartiles')
axes[0, 1].set_ylabel('Values')

# Histogram for count
axes[1, 0].bar(summary_stats.columns, summary_stats.loc['count'], color='lightcoral')
axes[1, 0].set_title('Count')
axes[1, 0].set_ylabel('Count')
axes[1, 0].tick_params(axis='x', rotation=45)

# Box plot for min and max
sns.boxplot(data=summary_stats.loc[['min', 'max']], ax=axes[1, 1], palette='Set3')
axes[1, 1].set_title('Min and Max Values')
axes[1, 1].set_ylabel('Values')

# Adjust layout and show plots
plt.tight_layout()
plt.show()
```



Calculating the skewness of numerical columns

In [13]:

```
df.skew()
```

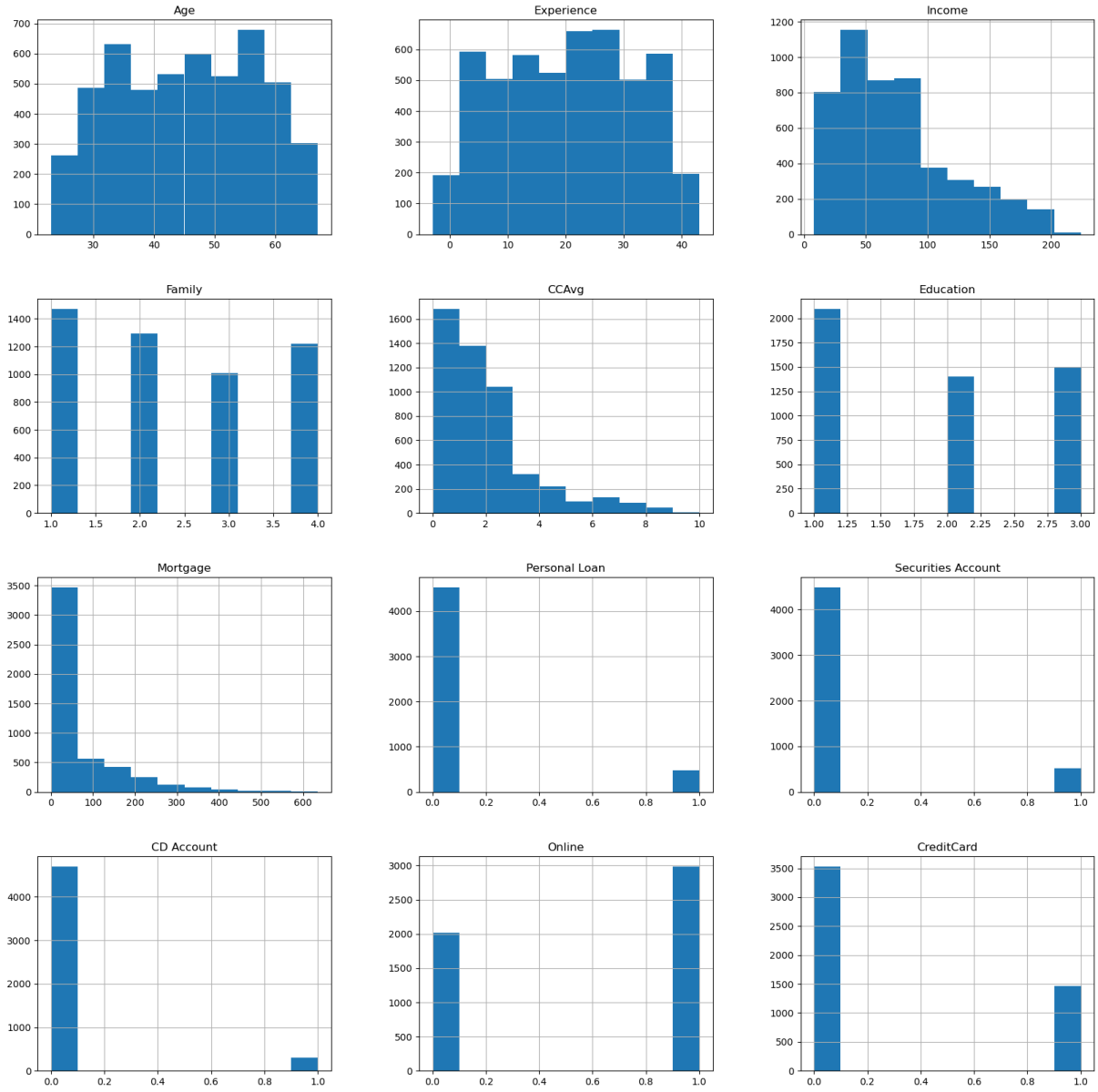
Out[13]:

```
Age                   -0.029341
Experience            -0.026325
Income                 0.841339
Family                 0.155221
CCAvg                  1.598457
Education              0.227093
Mortgage               2.104002
Personal Loan          2.743607
Securities Account     2.588268
CD Account             3.691714
Online                -0.394785
CreditCard             0.904589
dtype: float64
```

Creating histograms for each column

In [14]:

```
df.hist(figsize = (20,20))
plt.show()
```

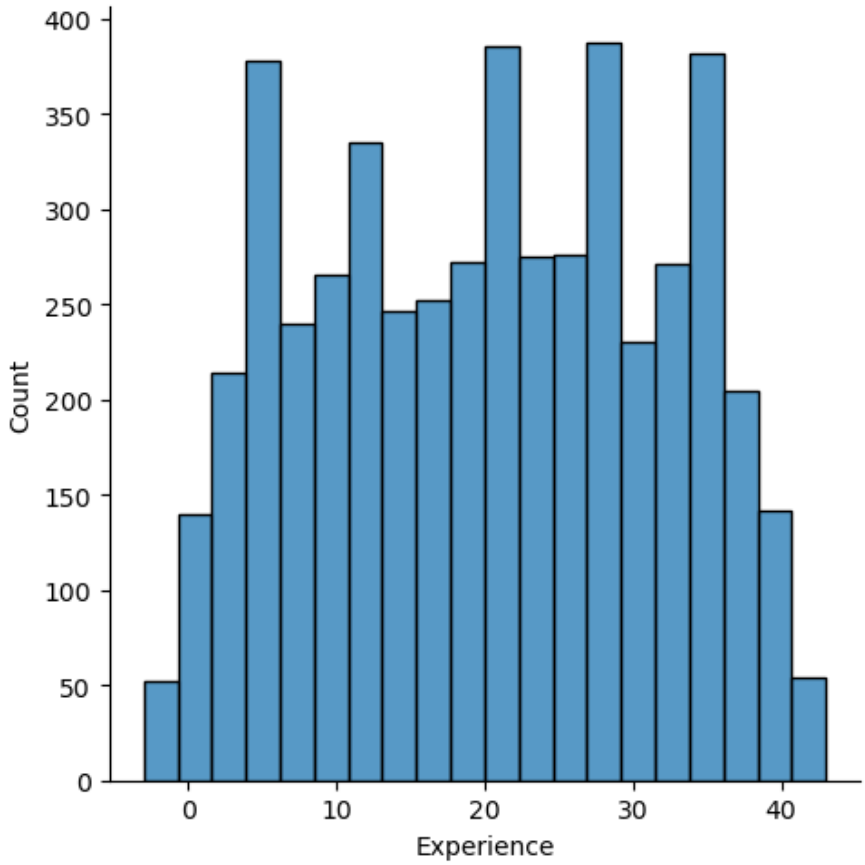


Creating a displot for 'Experience' Column

In [15]:

```
plt.figure(figsize = (16,12))
sns.displot(df['Experience'])
plt.show()
```

```
<Figure size 1600x1200 with 0 Axes>
```



Most data available are of 20 to 30 years old exeperienced person.

We can say that people with 20 to 30 years of experience can take personal loan.

Checking mean of Experience data

In [16]:

```
df['Experience'].mean()
```

Out[16]:

```
20.1046
```

Negative data in Experience Column

In [17]:

```
negative_exp = df[df['Experience']<0]
negative_exp
```

Out[17]:

	Age	Experience	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Onli
89	25	-1	113	4	2.300000	3	0	0	0	0	
226	24	-1	39	2	1.700000	2	0	0	0	0	
315	24	-2	51	3	0.300000	3	0	0	0	0	
451	28	-2	48	2	1.750000	3	89	0	0	0	
524	24	-1	75	4	0.200000	1	0	0	0	0	
536	25	-1	43	3	2.400000	2	176	0	0	0	
540	25	-1	109	4	2.300000	3	314	0	0	0	
576	25	-1	48	3	0.300000	3	0	0	0	0	
583	24	-1	38	2	1.700000	2	0	0	0	0	
597	24	-2	125	2	7.200000	1	0	0	1	0	
649	25	-1	82	4	2.100000	3	0	0	0	0	
670	23	-1	61	4	2.600000	1	239	0	0	0	
686	24	-1	38	4	0.600000	2	0	0	0	0	
793	24	-2	150	2	2.000000	1	0	0	0	0	
889	24	-2	82	2	1.600000	3	0	0	0	0	
909	23	-1	149	1	6.333333	1	305	0	0	0	
1173	24	-1	35	2	1.700000	2	0	0	0	0	
1428	25	-1	21	4	0.400000	1	90	0	0	0	
1522	25	-1	101	4	2.300000	3	256	0	0	0	
1905	25	-1	112	2	2.000000	1	241	0	0	0	
2102	25	-1	81	2	1.600000	3	0	0	0	0	
2430	23	-1	73	4	2.600000	1	0	0	0	0	
2466	24	-2	80	2	1.600000	3	0	0	0	0	
2545	25	-1	39	3	2.400000	2	0	0	0	0	
2618	23	-3	55	3	2.400000	2	145	0	0	0	
2717	23	-2	45	4	0.600000	2	0	0	0	0	
2848	24	-1	78	2	1.800000	2	0	0	0	0	
2876	24	-2	80	2	1.600000	3	238	0	0	0	
2962	23	-2	81	2	1.800000	2	0	0	0	0	
2980	25	-1	53	3	2.400000	2	0	0	0	0	
3076	29	-1	62	2	1.750000	3	0	0	0	0	
3130	23	-2	82	2	1.800000	2	0	0	1	0	
3157	23	-1	13	4	1.000000	1	84	0	0	0	
3279	26	-1	44	1	2.000000	2	0	0	0	0	
3284	25	-1	101	4	2.100000	3	0	0	0	0	
3292	25	-1	13	4	0.400000	1	0	0	1	0	
3394	25	-1	113	4	2.100000	3	0	0	0	0	
3425	23	-1	12	4	1.000000	1	90	0	0	0	
3626	24	-3	28	4	1.000000	3	0	0	0	0	
3796	24	-2	50	3	2.400000	2	0	0	1	0	
3824	23	-1	12	4	1.000000	1	0	0	1	0	

	Age	Experience	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Onli
3887	24	-2	118	2	7.200000	1	0	0	1	0	
3946	25	-1	40	3	2.400000	2	0	0	0	0	
4015	25	-1	139	2	2.000000	1	0	0	0	0	
4088	29	-1	71	2	1.750000	3	0	0	0	0	
4116	24	-2	135	2	7.200000	1	0	0	0	0	
4285	23	-3	149	2	7.200000	1	0	0	0	0	
4411	23	-2	75	2	1.800000	2	0	0	0	0	
4481	25	-2	35	4	1.000000	3	0	0	0	0	
4514	24	-3	41	4	1.000000	3	0	0	0	0	
4582	25	-1	69	3	0.300000	3	0	0	0	0	
4957	29	-1	50	2	1.750000	3	0	0	0	0	

In [18]:

```
negative_exp.head()
```

Out[18]:

	Age	Experience	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online
89	25	-1	113	4	2.30	3	0	0	0	0	0
226	24	-1	39	2	1.70	2	0	0	0	0	0
315	24	-2	51	3	0.30	3	0	0	0	0	1
451	28	-2	48	2	1.75	3	89	0	0	0	1
524	24	-1	75	4	0.20	1	0	0	0	0	1

Total number of negative data

In [19]:

```
negative_exp.shape
```

Out[19]:

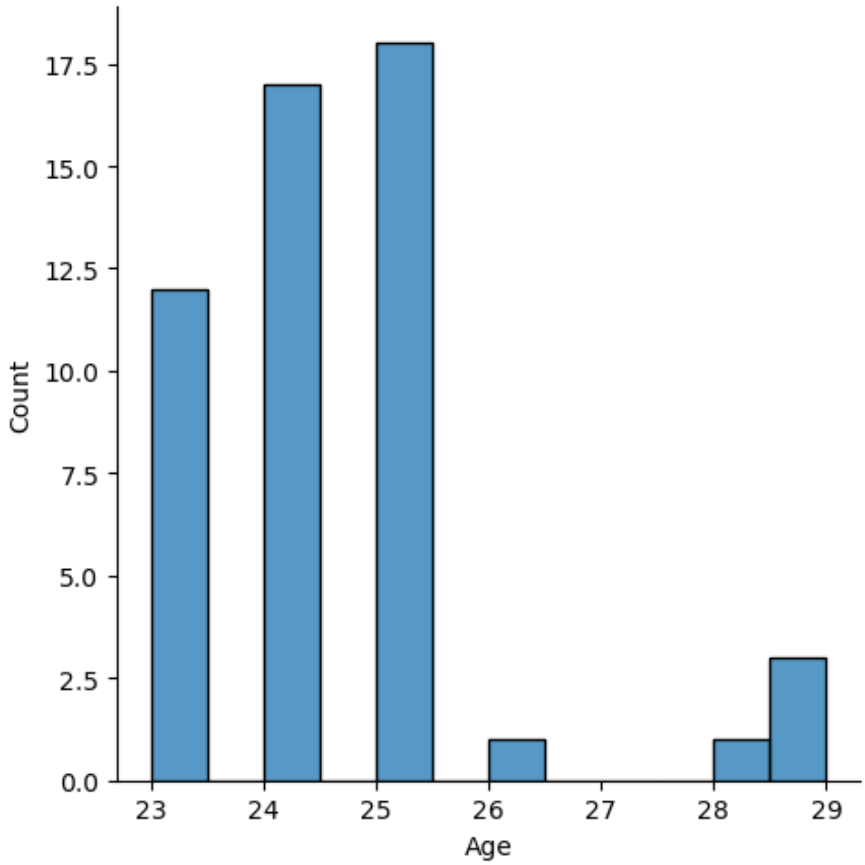
```
(52, 12)
```

Total 52 persons having negative exeperience

Creating a distribution plot (displot) for the 'Age' column

In [20]:

```
sns.displot(negative_exp['Age'])
plt.show()
```



Person belong to 23 to 30 years of age have negative experience

Mean Count of negative experice data

In [22]:

```
negative_exp['Experience'].mean()
```

Out[22]:

-1.4423076923076923

Size of negative experience data

In [23]:

```
negative_exp.size
```

Out[23]:

624

In [24]:

```
print('There are {} records which has negative values for experince, approx {} %'.format(negative_exp
```

```
There are 624 records which has negative values for experince, approx 1.04 %
```

Creating a copy of a DataFrame df and assign it to a new variable data

In [25]:

```
data = df.copy()
data
```

Out[25]:

	Age	Experience	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online
0	25	1	49	4	1.6	1	0	0	1	0	0
1	45	19	34	3	1.5	1	0	0	1	0	0
2	39	15	11	1	1.0	1	0	0	0	0	0
3	35	9	100	1	2.7	2	0	0	0	0	0
4	35	8	45	4	1.0	2	0	0	0	0	0
...	...	...	...	...	...	...	...	...	...	...	...
4995	29	3	40	1	1.9	3	0	0	0	0	1
4996	30	4	15	4	0.4	1	85	0	0	0	1
4997	63	39	24	2	0.3	3	0	0	0	0	0
4998	65	40	49	3	0.5	2	0	0	0	0	1
4999	28	4	83	3	0.8	1	0	0	0	0	1

5000 rows × 12 columns

Shape of dataframe 'data'

In [59]:

```
data.shape
```

Out[59]:

```
(5000, 13)
```

Using NumPy function to replace values in the 'Experience' column of the DataFrame 'data'

with the mean of the 'Experience'

column where the original values are less than 0

In [27]:

```
data['Experience'] = np.where(data['Experience']<0 , data['Experience'].mean(), data['Experience'])
```

Filter rows in the DataFrame 'data' where the 'Experience' column has negative values

In [28]:

```
data[data['Experience']<0]
```

Out[28]:

	Age	Experience	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online	Cı

Calculating the correlation matrix

In [30]:

```
data.corr()
```

Out[30]:

	Age	Experience	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securitie Accou
Age	1.000000	0.977008	-0.055269	-0.046418	-0.052030	0.041334	-0.012539	-0.007726	-0.0004
Experience	0.977008	1.000000	-0.049054	-0.045488	-0.048719	0.018097	-0.013378	-0.014045	-0.0004
Income	-0.055269	-0.049054	1.000000	-0.157501	0.645993	-0.187524	0.206806	0.502462	-0.0026
Family	-0.046418	-0.045488	-0.157501	1.000000	-0.109285	0.064929	-0.020445	0.061367	0.0199
CCAvg	-0.052030	-0.048719	0.645993	-0.109285	1.000000	-0.136138	0.109909	0.366891	0.0150
Education	0.041334	0.018097	-0.187524	0.064929	-0.136138	1.000000	-0.033327	0.136722	-0.0108
Mortgage	-0.012539	-0.013378	0.206806	-0.020445	0.109909	-0.033327	1.000000	0.142095	-0.0054
Personal Loan	-0.007726	-0.014045	0.502462	0.061367	0.366891	0.136722	0.142095	1.000000	0.0219
Securities Account	-0.000436	-0.000462	-0.002616	0.019994	0.015087	-0.010812	-0.005411	0.021954	1.0000
CD Account	0.008043	0.005502	0.169738	0.014110	0.136537	0.013934	0.089311	0.316355	0.3170
Online	0.013702	0.013455	0.014206	0.010354	-0.003620	-0.015004	-0.005995	0.006278	0.0126
CreditCard	0.007681	0.008833	-0.002385	0.011588	-0.006686	-0.011014	-0.007231	0.002802	-0.0150

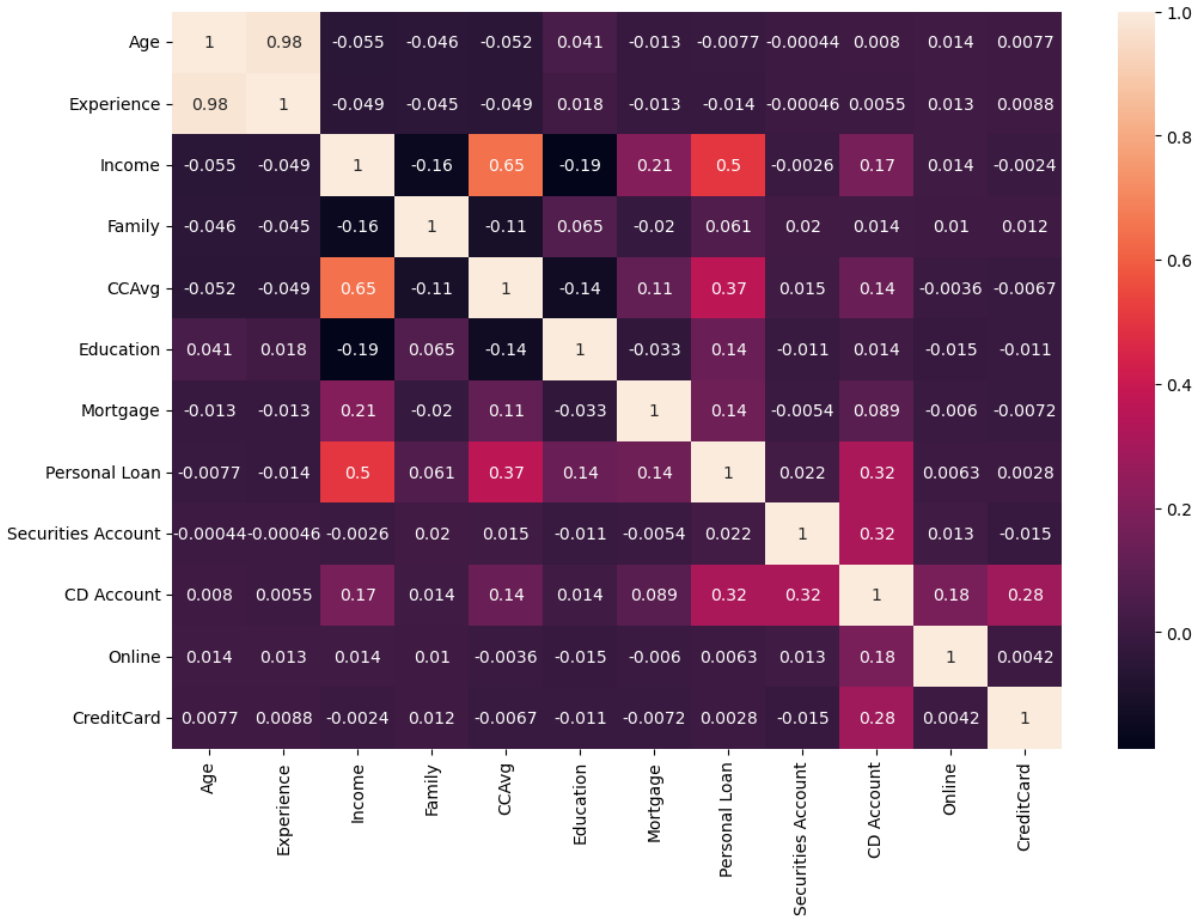
Creating a heatmap of the correlation matrix using Seaborn (sns) and Matplotlib (plt)

In [31]:

```
plt.figure(figsize = (12,8))
sns.heatmap(data.corr(), annot = True)
```

Out[31]:

<Axes: >



The correlation between experience and age is notably strong, indicating a substantial relationship between these two variables. Consequently, it may be prudent to consider removing one of these columns from the dataset to avoid potential multicollinearity issues.

Dropping the 'Experience' column from DataFrame 'data' using the data.drop()

In [33]:

```
data = data.drop(['Experience'], axis=1)
data
```

Out[33]:

	Age	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online	CreditCard
0	25	49	4	1.6	1	0	0	1	0	0	0
1	45	34	3	1.5	1	0	0	1	0	0	0
2	39	11	1	1.0	1	0	0	0	0	0	0
3	35	100	1	2.7	2	0	0	0	0	0	0
4	35	45	4	1.0	2	0	0	0	0	0	1
...	...	...	...	...	...	...	...	...	...	...	...
4995	29	40	1	1.9	3	0	0	0	0	1	0
4996	30	15	4	0.4	1	85	0	0	0	1	0
4997	63	24	2	0.3	3	0	0	0	0	0	0
4998	65	49	3	0.5	2	0	0	0	0	1	0
4999	28	83	3	0.8	1	0	0	0	0	1	1

5000 rows × 11 columns

In [34]:

```
data.head()
```

Out[34]:

	Age	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online	CreditCard
0	25	49	4	1.6	1	0	0	1	0	0	0
1	45	34	3	1.5	1	0	0	1	0	0	0
2	39	11	1	1.0	1	0	0	0	0	0	0
3	35	100	1	2.7	2	0	0	0	0	0	0
4	35	45	4	1.0	2	0	0	0	0	0	1

Checking unique value in Education column

In [35]:

```
data['Education'].unique()
```

Out[35]:

```
array([1, 2, 3], dtype=int64)
```

Defining a Python function called experience(x) that takes an input x

In [37]:

```
def experience(x):
    if x==1:
        return "UnderGraduate"
    if x==2:
        return "Graduate"
    else:
        return "Working Professionals"
```

Apply the 'experience' function to create a new column 'EDU'

In [38]:

```
data['EDU'] = data['Education'].apply(experience)
```

In [39]:

```
data.head()
```

Out[39]:

	Age	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online	CreditCard	
0	25	49	4	1.6	1	0	0	1	0	0	0	U
1	45	34	3	1.5	1	0	0	1	0	0	0	U
2	39	11	1	1.0	1	0	0	0	0	0	0	U
3	35	100	1	2.7	2	0	0	0	0	0	0	
4	35	45	4	1.0	2	0	0	0	0	0	1	

Retrieving the unique values present in the 'EDU' column

In [40]:

```
data['EDU'].unique()
```

Out[40]:

```
array(['UnderGraduate', 'Graduate', 'Working Professionals'], dtype=object)
```

Grouping DataFrame 'data' by the 'EDU' column and then calculating the sum of the 'Age' column within each group

In [41]:

```
education_dis = data.groupby('EDU')['Age'].sum()
education_dis
```

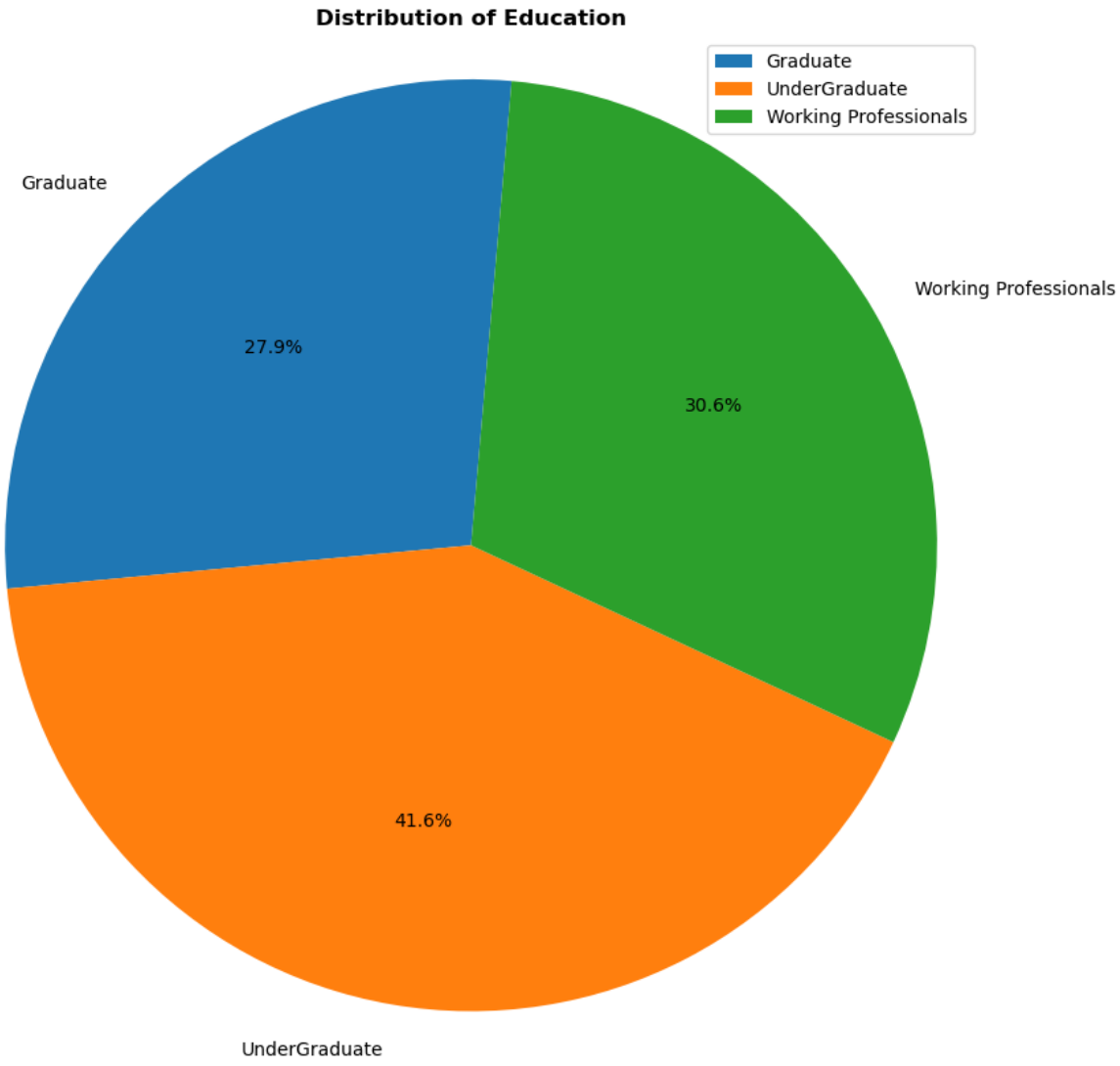
Out[41]:

```
EDU
Graduate                63191
UnderGraduate           94244
Working Professionals    69257
Name: Age, dtype: int64
```

Creating a pie chart to visualize the distribution of education categories based on the 'EDU' column

In [42]:

```
plt.figure(figsize = (10,10))
plt.pie(education_dis, labels = education_dis.index, autopct = '%1.1f%%', startangle = 85)
plt.axis('equal')
plt.title('Distribution of Education', fontweight = 'bold')
plt.legend(education_dis.index, loc='upper right')
plt.show()
```



Retrieving the unique values present in the 'Income' column

In [43]:

```
data['Income'].unique()
```

Out[43]:

```
array([ 49,  34,  11, 100,  45,  29,  72,  22,  81, 180, 105, 114,  40,
       112, 130, 193,  21,  25,  63,  62,  43, 152,  83, 158,  48, 119,
        35,  41,  18,  50, 121,  71, 141,  80,  84,  60, 132, 104,  52,
       194,   8, 131, 190,  44, 139,  93, 188,  39, 125,  32,  20, 115,
        69,  85, 135,  12, 133,  19,  82, 109,  42,  78,  51, 113, 118,
        64, 161,  94,  15,  74,  30,  38,   9,  92,  61,  73,  70, 149,
        98, 128,  31,  58,  54, 124, 163,  24,  79, 134,  23,  13, 138,
       171, 168,  65,  10, 148, 159, 169, 144, 165,  59,  68,  91, 172,
        55, 155,  53,  89,  28,  75, 170, 120,  99, 111,  33, 129, 122,
       150, 195, 110, 101, 191, 140, 153, 173, 174,  90, 179, 145, 200,
       183, 182,  88, 160, 205, 164,  14, 175, 103, 108, 185, 204, 154,
       102, 192, 202, 162, 142,  95, 184, 181, 143, 123, 178, 198, 201,
       203, 189, 151, 199, 224, 218], dtype=int64)
```

Count the occurrences of unique values in the 'Securities Account' column of DataFrame 'data'

In [44]:

```
data['Securities Account'].value_counts()
```

Out[44]:

```
0    4478
1     522
Name: Securities Account, dtype: int64
```

Count the occurrences of unique values in the 'CD Account' column of DataFrame 'data'

In [45]:

```
data['CD Account'].value_counts()
```

Out[45]:

```
0    4698
1     302
Name: CD Account, dtype: int64
```

Defining a Python function called security(y) that takes a DataFrame y as input and categorizes individuals into different groups based on the values of the 'Securities Account' and 'CD Account' columns

In [46]:

```
def security(y):
    if(y['Securities Account'] == 1) & (y['CD Account'] == 1):
        return "Both Security and Deposit Account"
    if(y['Securities Account'] == 0) & (y['CD Account'] == 0):
        return "No Account"
    if(y['Securities Account'] == 1) & (y['CD Account'] == 0):
        return "Only Security Account"
    if(y['Securities Account'] == 0) & (y['CD Account'] == 1):
        return "Only Deposit Account"
```

Applying the security function to DataFrame 'data' using the apply method to create a new column named 'Account_Holder_Category'

In [47]:

```
data['Account_Holder_Category'] = data.apply(security, axis = 1)
```

In [48]:

```
data.head()
```

Out[48]:

	Age	Income	Family	CCAvg	Education	Mortgage	Personal Loan	Securities Account	CD Account	Online	CreditCard	
0	25	49	4	1.6	1	0	0	1	0	0	0	L
1	45	34	3	1.5	1	0	0	1	0	0	0	L
2	39	11	1	1.0	1	0	0	0	0	0	0	L
3	35	100	1	2.7	2	0	0	0	0	0	0	
4	35	45	4	1.0	2	0	0	0	0	0	1	

Count the occurrences of unique values in the 'Account_Holder_Category' column

In [49]:

```
account_values = data['Account_Holder_Category'].value_counts()
account_values
```

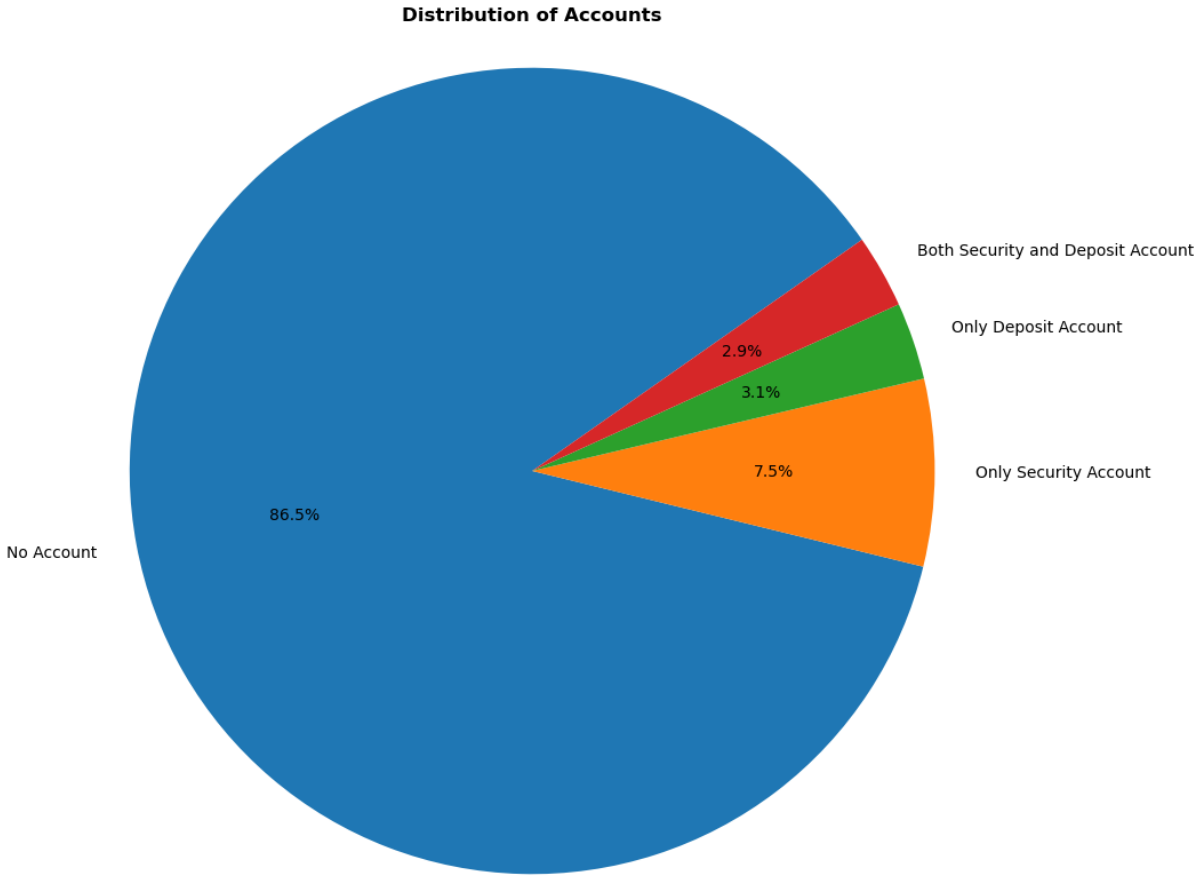
Out[49]:

```
No Account                          4323
Only Security Account                375
Only Deposit Account                 155
Both Security and Deposit Account    147
Name: Account_Holder_Category, dtype: int64
```

Creating a pie chart to visualize the distribution of account holder categories based on the 'Account_Holder_Category' column

In [50]:

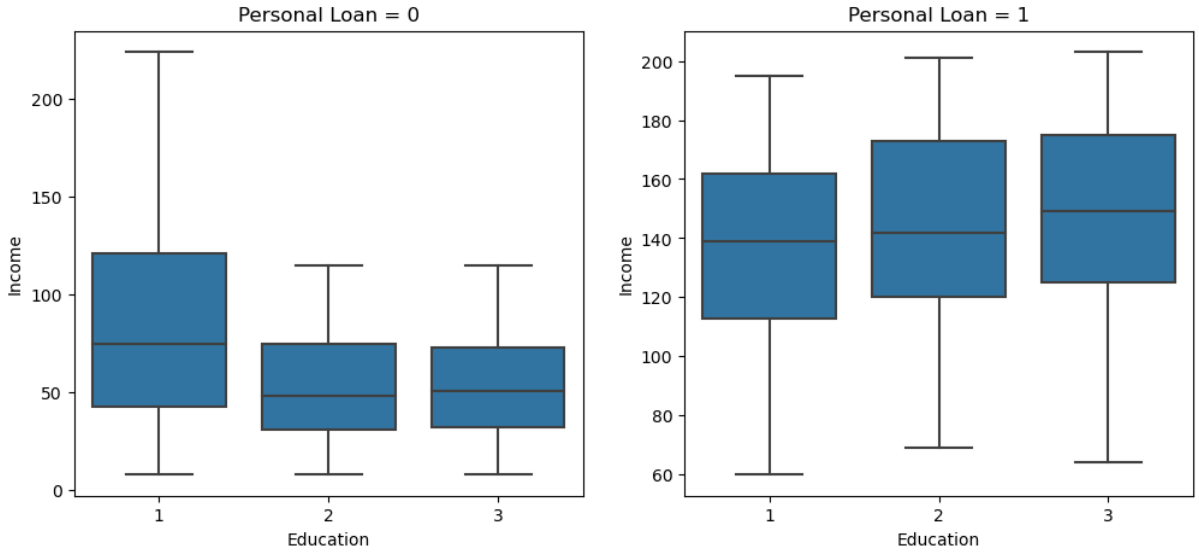
```
plt.figure(figsize = (10,10))
plt.pie(account_values, labels = account_values.index, autopct = '%1.1f%%', startangle = 35)
plt.axis('equal')
plt.title('Distribution of Accounts', fontweight = 'bold')

plt.show()
```



Creating two separate boxplot visualizations based on the 'Personal Loan' column

In [51]:

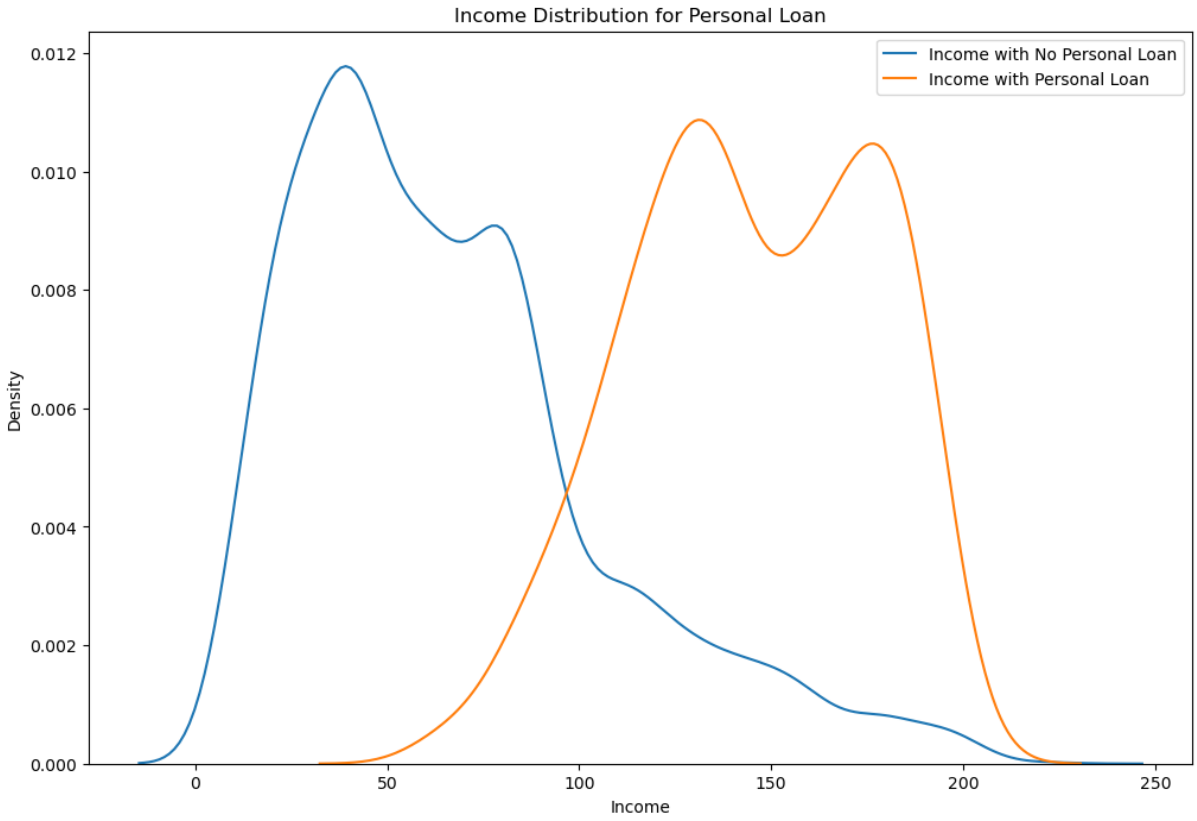
```
# Creating two separate boxplot visualizations based on 'Personal Loan'
fig, axes = plt.subplots(1, 2, figsize=(12, 5))

# First boxplot for 'Personal Loan' = 0
sns.boxplot(data=data[data['Personal Loan'] == 0], x='Education', y='Income', hue='Personal Loan', ax
axes[0].set_title("Personal Loan = 0")
axes[0].legend().set_visible(False)

# Second boxplot for 'Personal Loan' = 1
sns.boxplot(data=data[data['Personal Loan'] == 1], x='Education', y='Income', hue='Personal Loan', ax
axes[1].set_title("Personal Loan = 1")
axes[1].legend().set_visible(False)

# Show the plots
plt.show()
```



Creating a Kernel Density Estimation (KDE) plot to visualize the distribution of income for two groups: individuals with no personal loan ('Personal Loan' equals 0) and individuals with a personal loan ('Personal Loan' equals 1)

In [52]:

```
plt.figure(figsize=(12, 8))
sns.kdeplot(data=data[data['Personal Loan'] == 0]['Income'] ,label='Income with No Personal Loan')
sns.kdeplot(data=data[data['Personal Loan'] == 1]['Income'] ,label='Income with Personal Loan')
plt.title("Income Distribution for Personal Loan")
plt.xlabel("Income")
plt.ylabel("Density")
plt.legend()
plt.show()
```



Individuals with a Personal Loan typically exhibit a salary range spanning from a minimum of 50,000 to a maximum of 200,000. Among those who have opted for a Personal Loan, a noteworthy majority falls within the income bracket of 100,000 to 150,000, indicating a peak in loan applications within this salary range.

Function is designed to create a Kernel Density Estimation (KDE) plot to visualize the distribution of a numerical variable (col1) in a dataset, separated by a binary categorical variable (col2) with two values (0 and 1)

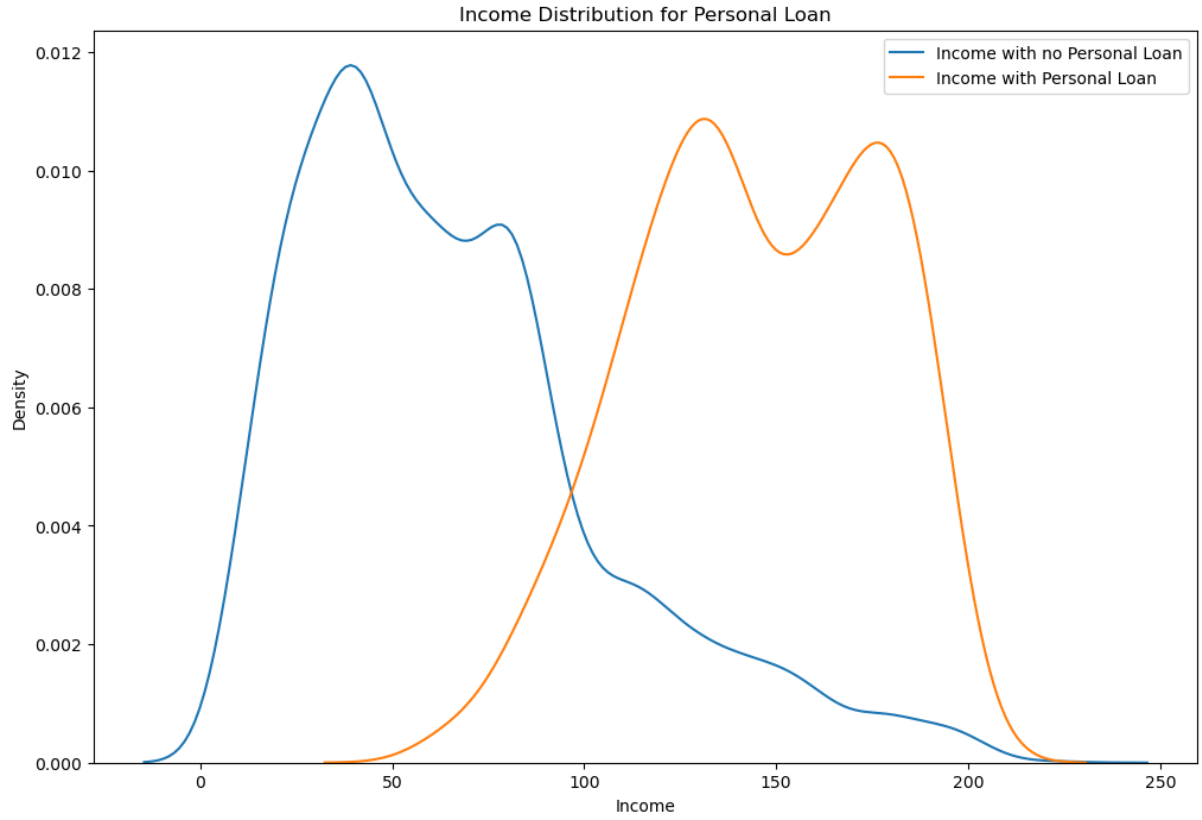
In [54]:

```
def plot(col1, col2, label1, label2, title):
    plt.figure(figsize=(12, 8))

    sns.kdeplot(data=data[data[col2] == 0][col1], label=label1)
    sns.kdeplot(data=data[data[col2] == 1][col1], label=label2)

    plt.legend()
    plt.title(title)
    plt.xlabel(col1)
    plt.ylabel("Density")
    plt.show()
```

Calling the plot function to create a KDE plot that visualizes the distribution of 'Income' based on the presence or absence of a 'Personal Loan'

In [55]:

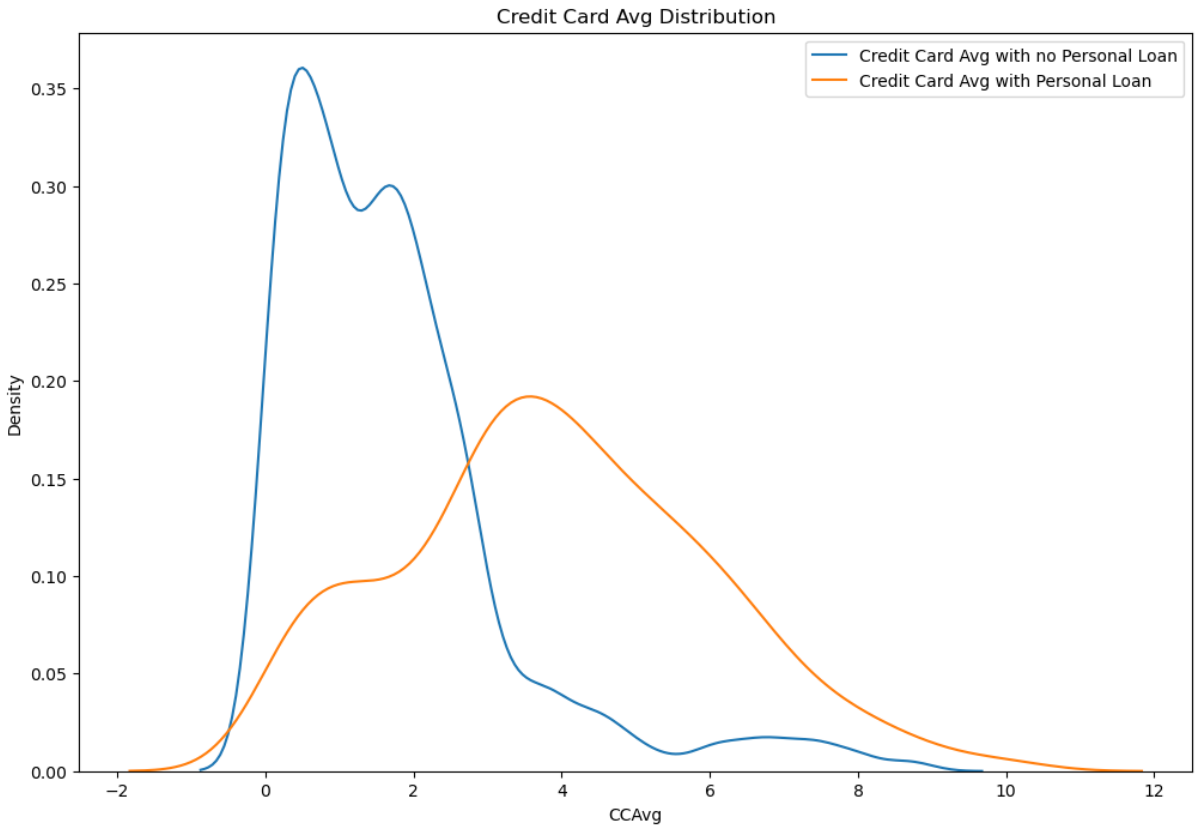
```
, 'Income with no Personal Loan', 'Income with Personal Loan', 'Income Distribution for Personal Loan
```



Calling the plot function to create a KDE plot that visualizes the distribution of 'CCAvg' (Credit Card Average) based on the presence or absence of a 'Personal Loan.'

In [56]:

```
, 'Personal Loan',
 Card Avg with no Personal Loan', 'Credit Card Avg with Personal Loan', 'Credit Card Avg Distribution
```



Defining a list called col containing four column names: 'Securities Account', 'Online', 'Account_Holder_Category', and 'CreditCard'

In [57]:

```
col = ['Securities Account', 'Online', 'Account_Holder_Category', 'CreditCard']
```

Creating count plots for each of the columns listed in the col list, and you're visualizing how the counts vary with respect to the 'Personal Loan' column

In [61]:

```
for i in col:
    plt.figure(figsize = (8, 6))
    sns.countplot(x = i, data = data, hue = 'Personal Loan')
    plt.title(f'Count Plot of {i} by Personal Loan')
    plt.show()
```

In [ ]:

```
```