Seaborn Exercises - Solutions

Imports

Run the cell below to import the libraries

```
import numpy as np
import pandas as pd
import seaborn as sns

import matplotlib.pyplot as plt
```

The Data

DATA SOURCE: https://www.kaggle.com/rikdifos/credit-card-approval-prediction

Data Information:

Credit score cards are a common risk control method in the financial industry. It uses personal information and data submitted by credit card applicants to predict the probability of future defaults and credit card borrowings. The bank is able to decide whether to issue a credit card to the applicant. Credit scores can objectively quantify the magnitude of risk.

Feature Information:

```
df = pd.read_csv('application_record.csv')
```

```
df.head()
```

```
        ID CODE_GENDER FLAG_OWN_CAR FLAG_OWN_REALTY  CNT_CHILDREN  \
0  5008804           M            Y               Y             0
1  5008805           M            Y               Y             0
2  5008806           M            Y               Y             0
3  5008808           F            N               Y             0
4  5008809           F            N               Y             0

   AMT_INCOME_TOTAL      NAME_INCOME_TYPE
NAME_EDUCATION_TYPE  \
0          427500.0               Working               Higher
education
1          427500.0               Working               Higher
education
2          112500.0               Working  Secondary / secondary
special
3          270000.0  Commercial associate  Secondary / secondary
```

```
special
4          270000.0  Commercial associate  Secondary / secondary
special

     NAME_FAMILY_STATUS  NAME_HOUSING_TYPE  DAYS_BIRTH  DAYS_EMPLOYED
\
0        Civil marriage   Rented apartment      -12005          -4542

1        Civil marriage   Rented apartment      -12005          -4542

2               Married  House / apartment      -21474          -1134

3  Single / not married  House / apartment      -19110          -3051

4  Single / not married  House / apartment      -19110          -3051


   FLAG_MOBIL  FLAG_WORK_PHONE  FLAG_PHONE  FLAG_EMAIL OCCUPATION_TYPE
\
0           1                1           0           0             NaN

1           1                1           0           0             NaN

2           1                0           0           0  Security staff

3           1                0           1           1     Sales staff

4           1                0           1           1     Sales staff


   CNT_FAM_MEMBERS
0              2.0
1              2.0
2              2.0
3              1.0
4              1.0

df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 438557 entries, 0 to 438556
Data columns (total 18 columns):
 #   Column               Non-Null Count   Dtype
---  ------               --------------   -----
 0   ID                   438557 non-null  int64
 1   CODE_GENDER          438557 non-null  object
 2   FLAG_OWN_CAR         438557 non-null  object
 3   FLAG_OWN_REALTY      438557 non-null  object
 4   CNT_CHILDREN         438557 non-null  int64
```

```
 5   AMT_INCOME_TOTAL     438557 non-null  float64
 6   NAME_INCOME_TYPE     438557 non-null  object
 7   NAME_EDUCATION_TYPE  438557 non-null  object
 8   NAME_FAMILY_STATUS   438557 non-null  object
 9   NAME_HOUSING_TYPE    438557 non-null  object
 10  DAYS_BIRTH           438557 non-null  int64
 11  DAYS_EMPLOYED        438557 non-null  int64
 12  FLAG_MOBIL           438557 non-null  int64
 13  FLAG_WORK_PHONE      438557 non-null  int64
 14  FLAG_PHONE           438557 non-null  int64
 15  FLAG_EMAIL           438557 non-null  int64
 16  OCCUPATION_TYPE      304354 non-null  object
 17  CNT_FAM_MEMBERS      438557 non-null  float64
dtypes: float64(2), int64(8), object(8)
memory usage: 60.2+ MB
```

TASKS

Recreate the plots shown in the markdown image cells. Each plot also contains a brief description of what it is trying to convey. Note, these are meant to be quite challenging. Start by first replicating the most basic form of the plot, then attempt to adjust its styling and parameters to match the given image.

In general do not worry about coloring,styling, or sizing matching up exactly. Instead focus on the content of the plot itself. Our goal is not to test you on recognizing figsize=(10,8) , its to test your understanding of being able to see a requested plot, and reproducing it.

NOTE: You may need to perform extra calculations on the pandas dataframe before calling seaborn to create the plot.

TASK: Recreate the Scatter Plot shown below

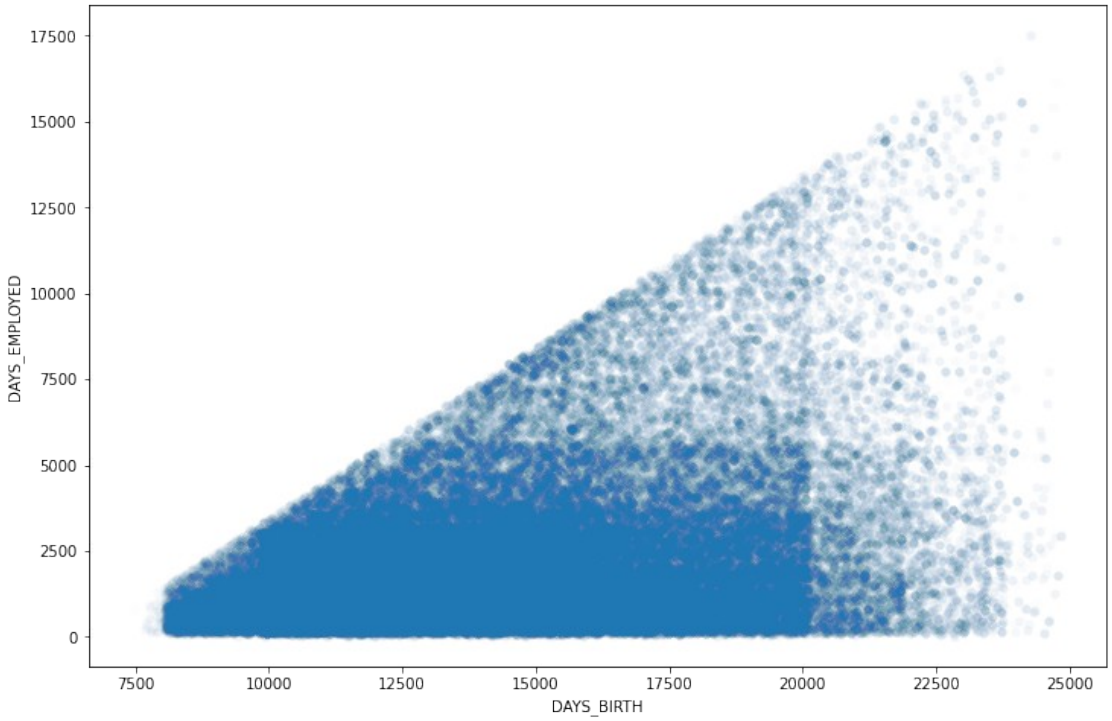
The scatterplot attempts to show the relationship between the days employed versus the age of the person (DAYS_BIRTH) for people who were not unemployed. Note, to reproduce this chart you must remove unemployed people from the dataset first. Also note the sign of the axis, they are both transformed to be positive. Finally, feel free to adjust the *alpha* and *linewidth* parameters in the scatterplot since there are so many points stacked on top of each other.

```
# CODE HERE TO RECREATE THE PLOT SHOWN ABOVE
```

```
import warnings
```

```
warnings.simplefilter('ignore')
```

```
plt.figure(figsize=(12,8))

# REMOVE UNEMPLOYED PEOPLE
employed = df[df['DAYS_EMPLOYED']<0]

# MAKE BOTH POSITIVE
employed['DAYS_EMPLOYED'] = -1*employed['DAYS_EMPLOYED']
employed['DAYS_BIRTH'] = -1*employed['DAYS_BIRTH']

# With so many points, alpha is tiny, might be an indicated that a
# scatterplot may not be the right choice!
sns.scatterplot(y='DAYS_EMPLOYED',x='DAYS_BIRTH',data=employed,
                alpha=0.01,linewidth=0)

plt.savefig('task_one.jpg')
```

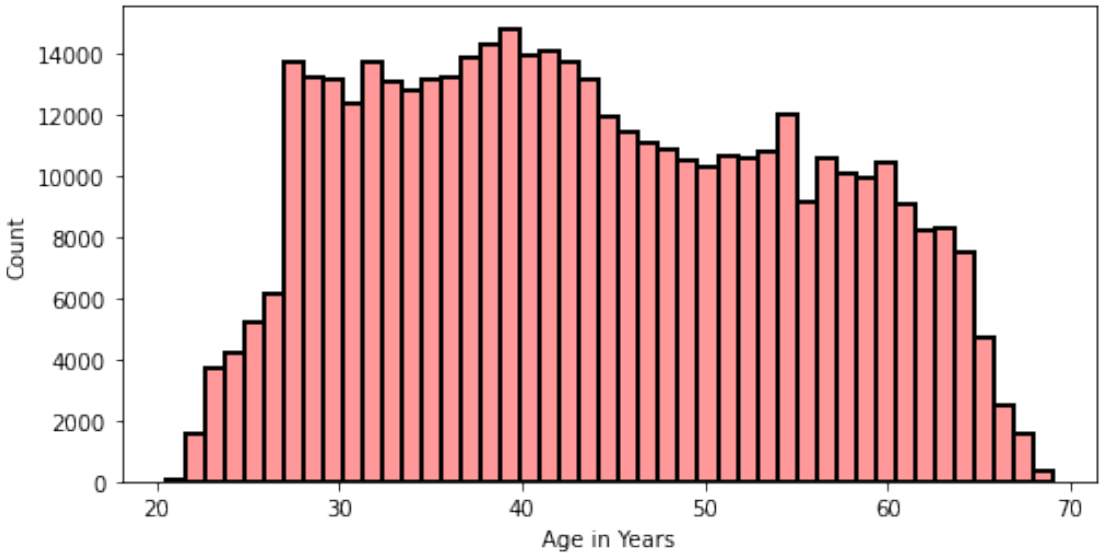


TASK: Recreate the Distribution Plot shown below:

Note, you will need to figure out how to calculate "Age in Years" from one of the columns in the DF. Think carefully about this. Don't worry too much if you are unable to replicate the styling exactly.

```
# CODE HERE TO RECREATE THE PLOT SHOWN ABOVE

plt.figure(figsize=(8,4))
```

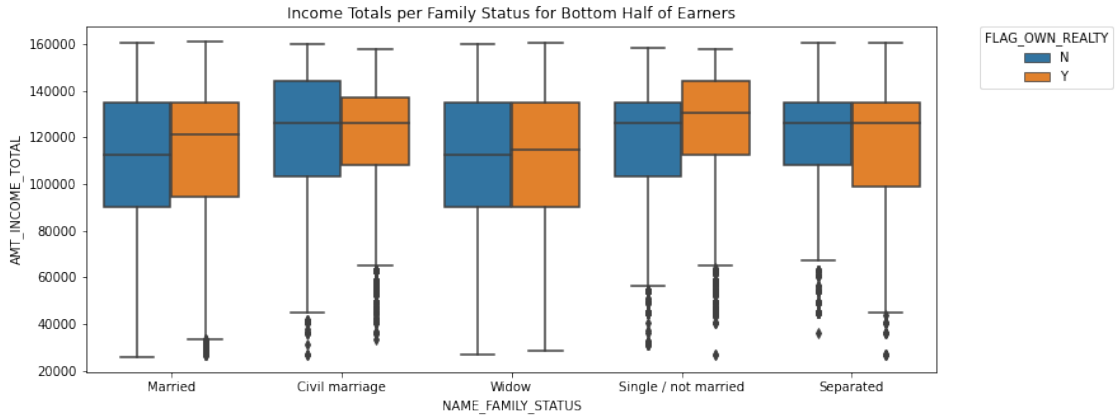
```
df['YEARS'] = -1*df['DAYS_BIRTH']/365
sns.histplot(data=df,x='YEARS',linewidth=2,edgecolor='black',
             color='red',bins=45,alpha=0.4)
plt.xlabel("Age in Years")
plt.savefig('DistPlot_solution.png')
```



TASK: Recreate the Categorical Plot shown below:

This plot shows information only for the *bottom half* of income earners in the data set. It shows the boxplots for each category of NAME_FAMILY_STATUS column for displaying their distribution of their total income. The hue is the "FLAG_OWN_REALTY" column. Note: You will need to adjust or only take part of the dataframe *before* recreating this plot.

```
# CODE HERE

plt.figure(figsize=(12,5))

bottom_half_income =
df.nsmallest(n=int(0.5*len(df)),columns='AMT_INCOME_TOTAL')
sns.boxplot(x='NAME_FAMILY_STATUS',y='AMT_INCOME_TOTAL',data=bottom_ha
lf_income,hue='FLAG_OWN_REALTY')
plt.legend(bbox_to_anchor=(1.05, 1), loc=2,
borderaxespad=0.,title='FLAG_OWN_REALTY')
plt.title('Income Totals per Family Status for Bottom Half of
Earners')

Text(0.5, 1.0, 'Income Totals per Family Status for Bottom Half of
Earners')
```



TASK: Recreate the Heat Map shown below:

This heatmap shows the correlation between the columns in the dataframe. You can get correlation with .corr() , also note that the FLAG_MOBIL column has NaN correlation with every other column, so you should drop it before calling .corr().

```
df.corr()
```

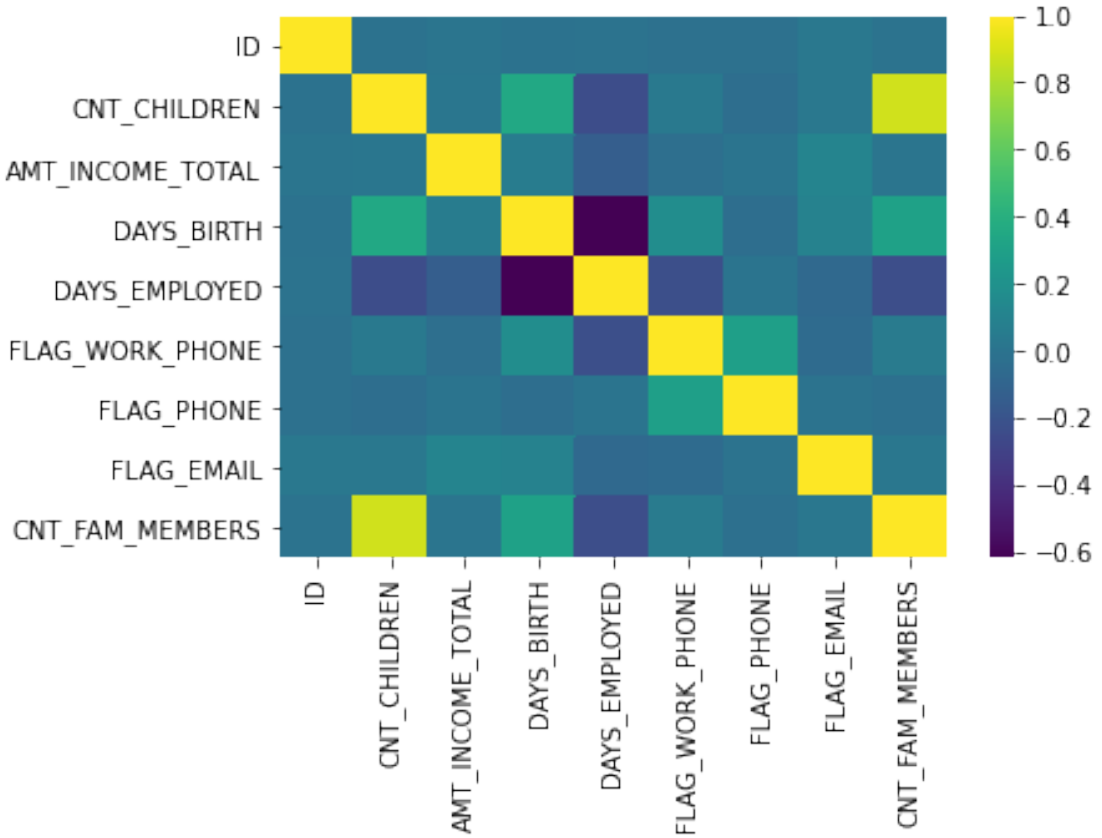
```
                      ID  CNT_CHILDREN  AMT_INCOME_TOTAL  DAYS_BIRTH
\
ID                1.000000     -0.005178          0.011179   -0.004994

CNT_CHILDREN     -0.005178      1.000000          0.019177    0.349088

AMT_INCOME_TOTAL  0.011179      0.019177          1.000000    0.053775

DAYS_BIRTH       -0.004994      0.349088          0.053775    1.000000

DAYS_EMPLOYED    -0.002467     -0.241535         -0.141291   -0.617908

FLAG_MOBIL             NaN           NaN               NaN         NaN

FLAG_WORK_PHONE  -0.023319      0.038418         -0.033635    0.171829

FLAG_PHONE       -0.018992     -0.038266          0.004444   -0.037984

FLAG_EMAIL        0.032875      0.028457          0.112139    0.096752

CNT_FAM_MEMBERS  -0.001862      0.884781          0.011454    0.306179


                  DAYS_EMPLOYED  FLAG_MOBIL  FLAG_WORK_PHONE
FLAG_PHONE  \
ID                    -0.002467         NaN        -0.023319   -
```

```
0.018992
CNT_CHILDREN          -0.241535         NaN         0.038418   -
0.038266
AMT_INCOME_TOTAL      -0.141291         NaN        -0.033635
0.004444
DAYS_BIRTH            -0.617908         NaN         0.171829   -
0.037984
DAYS_EMPLOYED          1.000000         NaN        -0.232208
0.004868
FLAG_MOBIL                  NaN         NaN              NaN
NaN
FLAG_WORK_PHONE       -0.232208         NaN         1.000000
0.290066
FLAG_PHONE             0.004868         NaN         0.290066
1.000000
FLAG_EMAIL            -0.074372         NaN        -0.060915   -
0.001170
CNT_FAM_MEMBERS       -0.234373         NaN         0.049777   -
0.024213
```

```
                  FLAG_EMAIL  CNT_FAM_MEMBERS
ID                  0.032875        -0.001862
CNT_CHILDREN        0.028457         0.884781
AMT_INCOME_TOTAL    0.112139         0.011454
DAYS_BIRTH          0.096752         0.306179
DAYS_EMPLOYED      -0.074372        -0.234373
FLAG_MOBIL               NaN              NaN
FLAG_WORK_PHONE    -0.060915         0.049777
FLAG_PHONE         -0.001170        -0.024213
FLAG_EMAIL          1.000000         0.022054
CNT_FAM_MEMBERS     0.022054         1.000000
```

```
sns.heatmap(df.drop('FLAG_MOBIL',axis=1).corr(),cmap="viridis")
```

```
<AxesSubplot:>
```


ID
CNT_CHILDREN
AMT_INCOME_TOTAL
DAYS_BIRTH
DAYS_EMPLOYED
FLAG_WORK_PHONE
FLAG_PHONE
FLAG_EMAIL
CNT_FAM_MEMBERS
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6