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

df = pd.read_csv("educ_inc.csv")
df
```

```
             Year        Age  Gender          Educational
Attainment  \
0     1/1/08 0:00   00 to 17    Male  College, less than 4-yr degree

1     1/1/08 0:00   00 to 17  Female  College, less than 4-yr degree

2     1/1/08 0:00  65 to 80+    Male  College, less than 4-yr degree

3     1/1/08 0:00  65 to 80+  Female          No high school diploma

4     1/1/08 0:00   00 to 17  Female          No high school diploma

...           ...        ...     ...                             ...

1021  1/1/14 0:00   18 to 64  Female       High school or equivalent

1022  1/1/14 0:00   18 to 64    Male     Bachelor's degree or higher

1023  1/1/14 0:00   18 to 64  Female          No high school diploma

1024  1/1/14 0:00   18 to 64  Female     Bachelor's degree or higher

1025  1/1/14 0:00   18 to 64    Male     Bachelor's degree or higher


          Personal Income  Population Count
0     C: 10,000 to 14,999              1304
1       B: 5,000 to 9,999              1565
2           A: 0 to 4,999              1923
3      H: 75,000 and over              1981
4     D: 15,000 to 24,999              2009
...                   ...               ...
1021        A: 0 to 4,999            670294
1022  G: 50,000 to 74,999            682425
1023        A: 0 to 4,999            723208
1024   H: 75,000 and over            953282
1025   H: 75,000 and over           1628605

[1026 rows x 6 columns]
```

```
df['Year']=pd.to_datetime(df['Year'])
df
```

```
C:\Users\vigne\AppData\Local\Temp\ipykernel_10228\2618838963.py:1:
UserWarning: Could not infer format, so each element will be parsed
individually, falling back to `dateutil`. To ensure parsing is
consistent and as-expected, please specify a format.
  df['Year']=pd.to_datetime(df['Year'])

           Year        Age  Gender          Educational Attainment  \
0    2008-01-01   00 to 17    Male  College, less than 4-yr degree
1    2008-01-01   00 to 17  Female  College, less than 4-yr degree
2    2008-01-01  65 to 80+    Male  College, less than 4-yr degree
3    2008-01-01  65 to 80+  Female          No high school diploma
4    2008-01-01   00 to 17  Female          No high school diploma
...         ...        ...     ...                             ...
1021 2014-01-01   18 to 64  Female       High school or equivalent
1022 2014-01-01   18 to 64    Male     Bachelor's degree or higher
1023 2014-01-01   18 to 64  Female          No high school diploma
1024 2014-01-01   18 to 64  Female     Bachelor's degree or higher
1025 2014-01-01   18 to 64    Male     Bachelor's degree or higher

          Personal Income  Population Count
0     C: 10,000 to 14,999              1304
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1025   H: 75,000 and over           1628605

[1026 rows x 6 columns]
```

```
d = df[df['Year'].dt.year==2014]
d
```

```
           Year       Age  Gender          Educational Attainment  \
881  2014-01-01  00 to 17  Female  College, less than 4-yr degree
882  2014-01-01  00 to 17  Female       High school or equivalent
883  2014-01-01  00 to 17    Male  College, less than 4-yr degree
884  2014-01-01  00 to 17    Male       High school or equivalent
885  2014-01-01  18 to 64  Female          No high school diploma
...         ...       ...     ...                             ...
1021 2014-01-01  18 to 64  Female       High school or equivalent
1022 2014-01-01  18 to 64    Male     Bachelor's degree or higher
1023 2014-01-01  18 to 64  Female          No high school diploma
1024 2014-01-01  18 to 64  Female     Bachelor's degree or higher
1025 2014-01-01  18 to 64    Male     Bachelor's degree or higher
```

```
          Personal Income  Population Count
881      B: 5,000 to 9,999              1356
882      B: 5,000 to 9,999              1583
883    D: 15,000 to 24,999              1664
884      B: 5,000 to 9,999              2048
885     H: 75,000 and over              2058
...                    ...               ...
1021         A: 0 to 4,999            670294
1022   G: 50,000 to 74,999            682425
1023         A: 0 to 4,999            723208
1024    H: 75,000 and over            953282
1025    H: 75,000 and over           1628605

[145 rows x 6 columns]
```

1. Group the table by Educational Attainment and sum the Population Count in each category.

```
df.groupby("Educational Attainment")['Population Count'].sum()

Educational Attainment
Bachelor's degree or higher       54617676
College, less than 4-yr degree    52137494
High school or equivalent         42942926
No high school diploma            40668871
Name: Population Count, dtype: int64
```

1. Analyse the percentage distribution of educational attainment among adult Californians.

```
df[(df["Age"] != "00 to 17")].groupby("Educational Attainment")
[["Population Count"]].sum()/df.groupby("Educational Attainment")
[["Population Count"]].sum()*100

                                Population Count
Educational Attainment
Bachelor's degree or higher            99.973135
College, less than 4-yr degree         99.824422
High school or equivalent              99.732480
No high school diploma                 76.477038
```

1. Using pivot , get a contingency table (a table of counts) of adult Californians cross-classified by Educational Attainment and Personal Income.

```
contigencyTable = pd.pivot_table(df,index='Educational
Attainment',columns='Personal Income',aggfunc=len,fill_value=0)
contigencyTable

                                          Age                     \
Personal Income                 A: 0 to 4,999 B: 5,000 to 9,999
Educational Attainment
Bachelor's degree or higher                30                28
```

```
College, less than 4-yr degree            36                35
High school or equivalent                 35                36
No high school diploma                    42                42


\
Personal Income                C: 10,000 to 14,999 D: 15,000 to 24,999

Educational Attainment

Bachelor's degree or higher                     29                  30

College, less than 4-yr degree                  34                  36

High school or equivalent                       33                  32

No high school diploma                          42                  39



\
Personal Income                E: 25,000 to 34,999 F: 35,000 to 49,999

Educational Attainment

Bachelor's degree or higher                     29                  28

College, less than 4-yr degree                  30                  29

High school or equivalent                       30                  28

No high school diploma                          33                  33



\
Personal Income                G: 50,000 to 74,999 H: 75,000 and over

Educational Attainment

Bachelor's degree or higher                     28                 29

College, less than 4-yr degree                  29                 29

High school or equivalent                       28                 28

No high school diploma                          30                 26


                                      Gender                    ...  \
Personal Income                A: 0 to 4,999 B: 5,000 to 9,999  ...
```

```
Educational Attainment                                          ...
Bachelor's degree or higher               30                28  ...
College, less than 4-yr degree            36                35  ...
High school or equivalent                 35                36  ...
No high school diploma                    42                42  ...

                                  Population Count
\
Personal Income                G: 50,000 to 74,999 H: 75,000 and over

Educational Attainment

Bachelor's degree or higher                     28                 29

College, less than 4-yr degree                  29                 29

High school or equivalent                       28                 28

No high school diploma                          30                 26


                                        Year                    \
Personal Income                A: 0 to 4,999 B: 5,000 to 9,999
Educational Attainment
Bachelor's degree or higher               30                28
College, less than 4-yr degree            36                35
High school or equivalent                 35                36
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\
Personal Income                C: 10,000 to 14,999 D: 15,000 to 24,999

Educational Attainment

Bachelor's degree or higher                     29                  30

College, less than 4-yr degree                  34                  36

High school or equivalent                       33                  32

No high school diploma                          42                  39



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Personal Income                E: 25,000 to 34,999 F: 35,000 to 49,999

Educational Attainment

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College, less than 4-yr degree                  30                  29
High school or equivalent                       30                  28
No high school diploma                          33                  33


Personal Income                G: 50,000 to 74,999 H: 75,000 and over
Educational Attainment
Bachelor's degree or higher                     28                 29
College, less than 4-yr degree                  29                 29
High school or equivalent                       28                 28
No high school diploma                          30                 26

[4 rows x 32 columns]
```

```
df.columns
```

```
Index(['Year', 'Age', 'Gender', 'Educational Attainment', 'Personal Income',
       'Population Count'],
      dtype='object')
```

```
df
```

```
           Year        Age  Gender          Educational Attainment  \
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1    2008-01-01   00 to 17  Female  College, less than 4-yr degree
2    2008-01-01  65 to 80+    Male  College, less than 4-yr degree
3    2008-01-01  65 to 80+  Female          No high school diploma
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...         ...        ...     ...                             ...
1021 2014-01-01   18 to 64  Female       High school or equivalent
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```
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[1026 rows x 6 columns]
```

1. Draw a bar chart to compare the personal income distributions of adult Californians who have no high diploma with those who have completed a Bachelor's degree or higher. (The difference in the distributions would be striking. There is a clear positive association between educational attainment and personal income).

```
no_dip = df[df['Educational Attainment']=="No high school diploma"]
no_dip = no_dip.groupby(by="Personal Income")["Population
Count"].sum()

bach = df[df["Educational Attainment"]=="Bachelor's degree or higher"]
bach = bach.groupby(by="Personal Income")["Population Count"].sum()

x1 = no_dip.index.to_numpy()
x2 = bach.index.to_numpy()

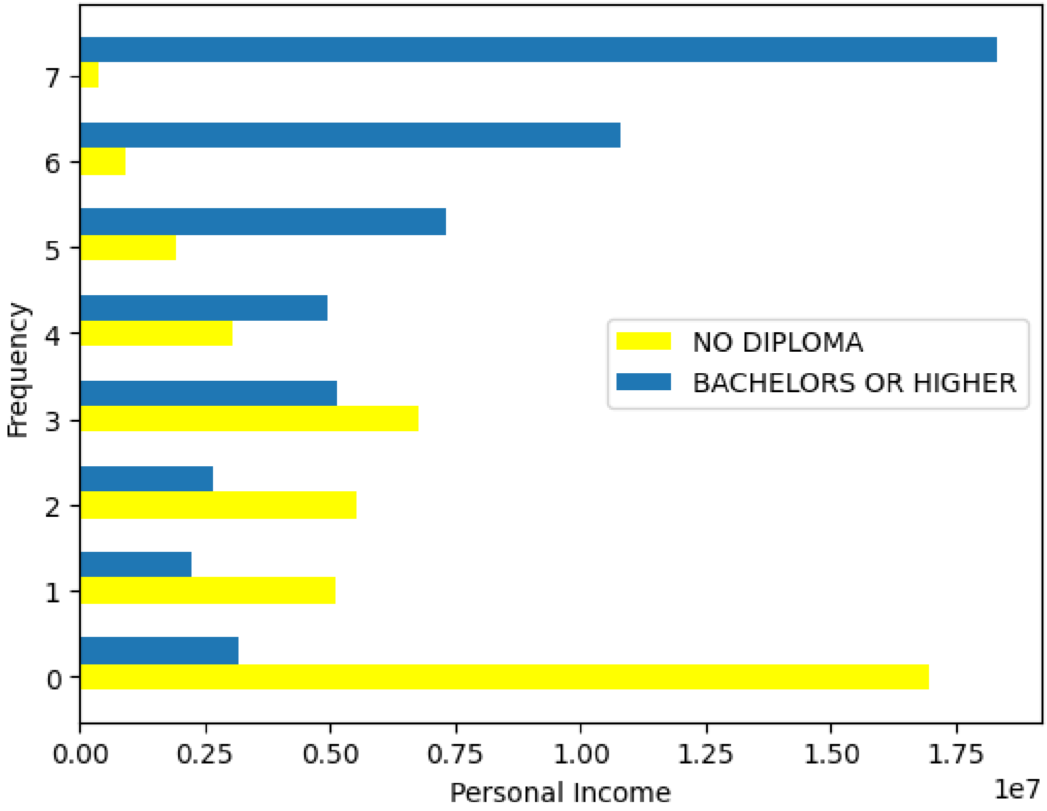
y1=no_dip.values
y2=bach.values

x=np.arange(len(x1))

width=0.3

plt.barh(x,y1,width,color='yellow',label="NO DIPLOMA")
plt.barh(x+width,y2,width,label="BACHELORS OR HIGHER")
# plt.legend()
plt.yticks=(x,x1)
plt.ylabel("Frequency")
plt.xlabel("Personal Income")
plt.legend()

<matplotlib.legend.Legend at 0x1f090b67350>
```



7
6
5
4
3
2
1
0
Frequency
NO DIPLOMA
BACHELORS OR HIGHER
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
Personal Income
1e7