Activity 6: Working with the Adult Income Dataset (UCI)

1. Load the necessary libraries.
2. Read the adult income dataset from the following URL: https://github.com/TrainingByPackt/Data-Wrangling-with-Python/blob/master/Chapter04/Activity06/.
3. Create a script that will read a text file line by line.
4. Add a name of Income for the response variable to the dataset.
5. Find the missing values.
6. Create a DataFrame with only age, education, and occupation by using subsetting.
7. Plot a histogram of age with a bin size of 20.
8. Create a function to strip the whitespace characters.
9. Use the apply method to apply this function to all the columns with string values, create a new column, copy the values from this new column to the old column, and drop the new column.
10. Find the number of people who are aged between 30 and 50.
11. Group the records based on age and education to find how the mean age is distributed.
12. Group by occupation and show the summary statistics of age. Find which profession has the oldest workers on average and which profession has its largest share of the workforce above the 75th percentile.
13. Use subset and groupby to find outliers.
14. Plot the values on a bar chart.
15. Merge the data using common keys.

In [1]:
```
# 1. Load libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [14]:
```
# 2. Read the adult income dataset
adult_income_data = "adult_income_data.csv"
adult_income_data=pd.read_csv(file)
adult_income_data.head()
```

Out[14]:

	39	State-gov	77516	Bachelors	13	Never-married	Adm-clerical	Not-in-family	Male	2174	0	40	United State
0	50	Self-emp-not-inc	83311	Bachelors	13	Married-civ-spouse	Exec-managerial	Husband	Male	0	0	13	United State
1	38	Private	215646	HS-grad	9	Divorced	Handlers-cleaners	Not-in-family	Male	0	0	40	United State
2	53	Private	234721	11th	7	Married-civ-spouse	Handlers-cleaners	Husband	Male	0	0	40	United State
3	28	Private	338409	Bachelors	13	Married-civ-spouse	Prof-specialty	Wife	Female	0	0	40	Cub
4	37	Private	284582	Masters	14	Married-civ-spouse	Exec-managerial	Wife	Female	0	0	40	United State

In [15]:
```
# 3. Create a script that will read a text file line by line.
colNames = []
with open('adult_income_names.txt','r') as f:
    for line in f:
        f.readline()
        colName=line.split(":")[0]
        colNames.append(colName)
colNames
```

Out[15]:
```
['age',
 'workclass',
 'fnlwgt',
 'education',
 'education-num',
 'marital-status',
 'occupation',
 'relationship',
 'sex',
 'capital-gain',
 'capital-loss',
 'hours-per-week',
 'native-country']
```

In [16]:
```
# 4. Add a name of Income for the response variable to the dataset.
colNames.append('Income')
# Reread the file with new columns names
adult_income_data=pd.read_csv(file,names=colNames)
adult_income_data.head()
```

Out[16]:

	age	workclass	fnlwgt	education	education-num	marital-status	occupation	relationship	sex	cap
0	39	State-gov	77516	Bachelors	13	Never-married	Adm-clerical	Not-in-family	Male	2
1	50	Self-emp-not-inc	83311	Bachelors	13	Married-civ-spouse	Exec-managerial	Husband	Male	
2	38	Private	215646	HS-grad	9	Divorced	Handlers-cleaners	Not-in-family	Male	
3	53	Private	234721	11th	7	Married-civ-spouse	Handlers-cleaners	Husband	Male	
4	28	Private	338409	Bachelors	13	Married-civ-spouse	Prof-specialty	Wife	Female	

In [17]:
```
# 5. Find the missing values.
adult_income_data.isnull().sum()
# There are no missing values in the dataset
```

Out[17]:
```
age               0
workclass         0
fnlwgt            0
education         0
education-num     0
marital-status    0
occupation        0
relationship      0
sex               0
capital-gain      0
capital-loss      0
hours-per-week    0
native-country    0
Income            0
dtype: int64
```

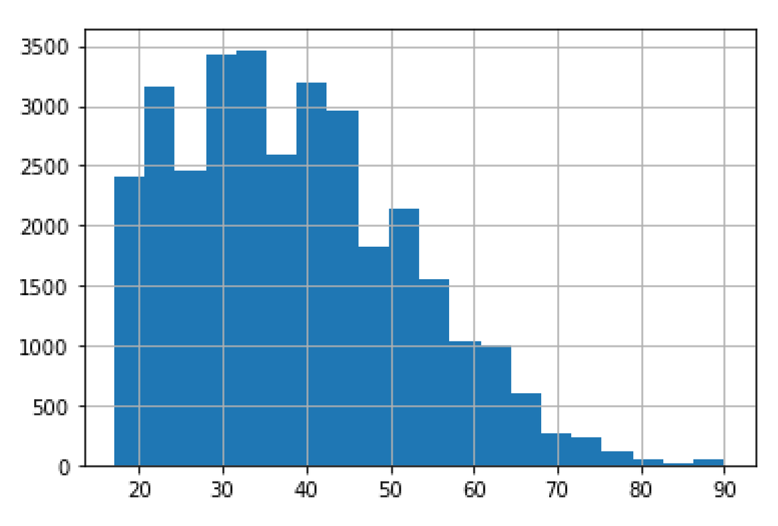
In [19]:
```
# 6. Create a DataFrame with only age, education, and occupation by usin
g subsetting.
columns = ['age','education','occupation']
newDataFrame = adult_income_data[columns]
newDataFrame.head()
```

Out[19]:

	age	education	occupation
0	39	Bachelors	Adm-clerical
1	50	Bachelors	Exec-managerial
2	38	HS-grad	Handlers-cleaners
3	53	11th	Handlers-cleaners
4	28	Bachelors	Prof-specialty

In [20]:
```
# 7. Plot a histogram of age with a bin size of 20.
newDataFrame['age'].hist(bins=20)
```

Out[20]: <matplotlib.axes._subplots.AxesSubplot at 0x116088d0>



In [27]:
```
# 8. Create a function to strip the whitespace characters.
def stripWhiteSpace(text):
    return(text.strip())
#TEST
text = "  masters degree  "
text = stripWhiteSpace(text)
print(text)
```

masters degree

In [33]:
```
# 9. Use the apply method to apply this function to all the columns with
string values, create a new column,
# copy the values from this new column to the old column, and drop the n
ew column.
newDataFrame['tmpEducation'] = newDataFrame['education'].apply(stripWhit
eSpace)
newDataFrame['education'] = newDataFrame['tmpEducation']
# Removes column and inplace
newDataFrame.drop(labels=['tmpEducation'],axis=1,inplace=True)

newDataFrame['tmpOccupation'] = newDataFrame['occupation'].apply(stripWh
iteSpace)
newDataFrame['occupation'] = newDataFrame['tmpOccupation']
# Removes column and inplace
newDataFrame.drop(labels=['tmpOccupation'],axis=1,inplace=True)

newDataFrame
```

```
c:\users\safar\documents\github\safarie1103\bellevue university\courses
\dsc540\week3and4\venv\lib\site-packages\ipykernel_launcher.py:3: Settin
gWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-d
ocs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  This is separate from the ipykernel package so we can avoid doing impo
rts until
c:\users\safar\documents\github\safarie1103\bellevue university\courses
\dsc540\week3and4\venv\lib\site-packages\ipykernel_launcher.py:4: Settin
gWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-d
ocs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  after removing the cwd from sys.path.
c:\users\safar\documents\github\safarie1103\bellevue university\courses
\dsc540\week3and4\venv\lib\site-packages\ipykernel_launcher.py:8: Settin
gWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-d
ocs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

c:\users\safar\documents\github\safarie1103\bellevue university\courses
\dsc540\week3and4\venv\lib\site-packages\ipykernel_launcher.py:9: Settin
gWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-d
ocs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  if __name__ == '__main__':
```

Out[33]:

	age	education	occupation
0	39	Bachelors	Adm-clerical
1	50	Bachelors	Exec-managerial
2	38	HS-grad	Handlers-cleaners
3	53	11th	Handlers-cleaners
4	28	Bachelors	Prof-specialty
...	...	...	...
32556	27	Assoc-acdm	Tech-support
32557	40	HS-grad	Machine-op-inspct
32558	58	HS-grad	Adm-clerical
32559	22	HS-grad	Adm-clerical
32560	52	HS-grad	Exec-managerial

32561 rows × 3 columns

In [35]:
```
# 10. Find the number of people who are aged between 30 and 50.
AgeBetween30and50 = newDataFrame[(newDataFrame.age >= 30) & (newDataFram
e.age <= 50) ]
AgeBetween30and50
```

Out[35]:

	age	education	occupation
0	39	Bachelors	Adm-clerical
1	50	Bachelors	Exec-managerial
2	38	HS-grad	Handlers-cleaners
5	37	Masters	Exec-managerial
6	49	9th	Other-service
...	...	...	...
32550	43	Some-college	Craft-repair
32551	32	10th	Handlers-cleaners
32552	43	Assoc-voc	Sales
32553	32	Masters	Tech-support
32557	40	HS-grad	Machine-op-inspct

16390 rows × 3 columns

In [44]:
```
# 11. Group the records based on age and education to find how the mean
 age is distributed.
# NOTE: age is numeric, so I grouped by sex
adult_income_data[['sex','age','education','capital-gain','capital-loss'
,'hours-per-week']].groupby(['sex','education']).mean()
```

Out[44]:

		age	capital-gain	capital-loss	hours-per-week
sex	education				
Female	10th	35.447458	174.901695	69.132203	32.111864
	11th	30.546296	128.108796	21.578704	29.821759
	12th	29.756944	174.729167	11.951389	31.791667
	1st-4th	48.521739	44.826087	34.826087	31.978261
	5th-6th	44.369048	53.833333	53.190476	36.047619
	7th-8th	49.693750	94.318750	54.775000	36.200000
	9th	42.131944	780.937500	16.277778	33.916667
	Assoc-acdm	36.361045	715.724466	68.472684	37.358670
	Assoc-voc	37.872000	455.078000	57.258000	37.830000
	Bachelors	35.635578	1051.970970	75.046943	39.329216
	Doctorate	45.325581	3346.779070	309.511628	47.302326
	HS-grad	38.678171	385.584661	53.585251	36.577286
	Masters	43.074627	1508.660448	140.595149	41.113806
	Preschool	41.750000	281.750000	0.000000	31.875000
	Prof-school	40.195652	3257.413043	157.413043	44.793478
	Some-college	33.740556	326.562010	47.529223	34.574840
Male	10th	38.346395	510.771160	51.164577	39.336991
	11th	33.407806	265.675639	66.650067	36.312248
	12th	33.117647	338.577855	42.494810	37.768166
	1st-4th	45.245902	156.434426	53.418033	40.622951
	5th-6th	42.385542	217.240964	73.333333	39.859438
	7th-8th	48.034979	279.905350	69.255144	40.409465
	9th	40.643243	171.294595	33.948649	39.651351
	Assoc-acdm	38.046440	591.309598	109.676471	42.554180
	Assoc-voc	38.939909	862.428571	81.539683	43.753968
	Bachelors	40.321734	2061.521146	137.115899	44.037473
	Doctorate	48.327217	5144.486239	250.571865	46.886850
	HS-grad	39.115736	667.957531	78.514414	42.481367
	Masters	44.490312	3038.462511	178.516428	45.065712
	Preschool	43.228571	1180.285714	96.885714	38.828571
	Prof-school	45.611570	11774.838843	245.229339	47.925620
	Some-college	37.017391	769.162542	86.719955	41.528428

In [55]:
```
# 12. Group by occupation and show the summary statistics of age.
# Find which profession has the oldest workers on average and which prof
ession has its largest share of the workforce
# above the 75th percentile.
stats = adult_income_data.groupby(['occupation']).describe()['age']
# Ignoring '?', there are many occupations with the oldes worker at age
 of 90 years old thiscould bean outlier.
# and largest share of work force above 75% is farming-fishing at 52%.
stats
```

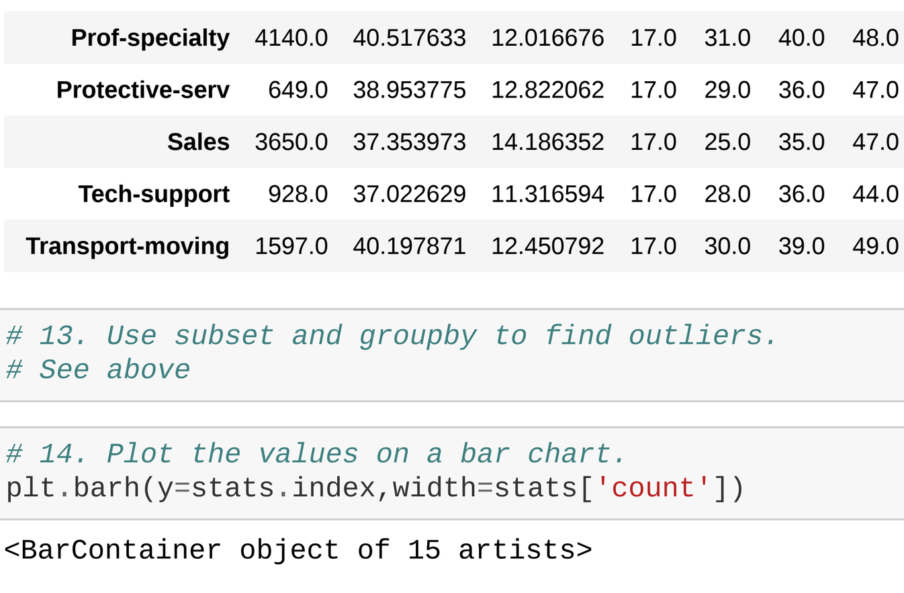
Out[55]:

	count	mean	std	min	25%	50%	75%	max
occupation								
?	1843.0	40.882800	20.336350	17.0	21.0	35.0	61.0	90.0
Adm-clerical	3770.0	36.964456	13.362998	17.0	26.0	35.0	46.0	90.0
Armed-Forces	9.0	30.222222	8.089774	23.0	24.0	29.0	34.0	46.0
Craft-repair	4099.0	39.031471	11.606436	17.0	30.0	38.0	47.0	90.0
Exec-managerial	4066.0	42.169208	11.974548	17.0	33.0	41.0	50.0	90.0
Farming-fishing	994.0	41.211268	15.070283	17.0	29.0	39.0	52.0	90.0
Handlers-cleaners	1370.0	32.165693	12.372635	17.0	23.0	29.0	39.0	90.0
Machine-op-inspct	2002.0	37.715285	12.068266	17.0	28.0	36.0	46.0	90.0
Other-service	3295.0	34.949621	14.521508	17.0	22.0	32.0	45.0	90.0
Priv-house-serv	149.0	41.724832	18.633688	17.0	24.0	40.0	57.0	81.0
Prof-specialty	4140.0	40.517633	12.016676	17.0	31.0	40.0	48.0	90.0
Protective-serv	649.0	38.953775	12.822062	17.0	29.0	36.0	47.0	90.0
Sales	3650.0	37.353973	14.186352	17.0	25.0	35.0	47.0	90.0
Tech-support	928.0	37.022629	11.316594	17.0	28.0	36.0	44.0	73.0
Transport-moving	1597.0	40.197871	12.450792	17.0	30.0	39.0	49.0	90.0

In [53]:
```
# 13. Use subset and groupby to find outliers.
# See above
```

In [52]:
```
# 14. Plot the values on a bar chart.
plt.barh(y=stats.index,width=stats['count'])
```

Out[52]: <BarContainer object of 15 artists>



In [65]:
```
# 15. Merge the data using common keys.
df1 = adult_income_data[['sex','age','education']].sample(n=100,replace=
True, random_state=10)
df2 = adult_income_data[['sex','hours-per-week']].sample(n=100,replace=T
rue, random_state=20)
Merged = pd.merge(df1,df2,on='sex',how='inner').drop_duplicates()
Merged
```

Out[65]: