(https://skills.network/?utm_medium=Exinfluencer&utm_source=Exinfluencer&utm_content=000026UJ&utm_term=10006555&utm_id=NA-SkillsNetwork-Channel-SkillsNetworkCoursesIBMDA0321ENSkillsNetwork21426264-2022-01-01)

Exploratory Data Analysis Lab

Estimated time needed: **30** minutes

In this module you get to work with the cleaned dataset from the previous module.

In this assignment you will perform the task of exploratory data analysis. You will find out the distribution of data, presence of outliers and also determine the correlation between different columns in the dataset.

Objectives

In this lab you will perform the following:

- Identify the distribution of data in the dataset.
- Identify outliers in the dataset.
- Remove outliers from the dataset.
- Identify correlation between features in the dataset.

Hands on Lab

Import the pandas module.

In [1]:
```
import pandas as pd
```

Load the dataset into a dataframe.

In [2]:
```
df = pd.read_csv("https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DA0321EN-SkillsNetwork/LargeData/m2_surv
```

Distribution

Determine how the data is distributed

The column `ConvertedComp` contains Salary converted to annual USD salaries using the exchange rate on 2019-02-01.

This assumes 12 working months and 50 working weeks.

Plot the distribution curve for the column `ConvertedComp` .

In [3]:
```
# your code goes here
# your code goes here
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
%matplotlib inline
```

In [4]:
```
df.dropna(subset=["ConvertedComp"], axis=0, inplace=True)
df['ConvertedComp'].value_counts().head(20)
```

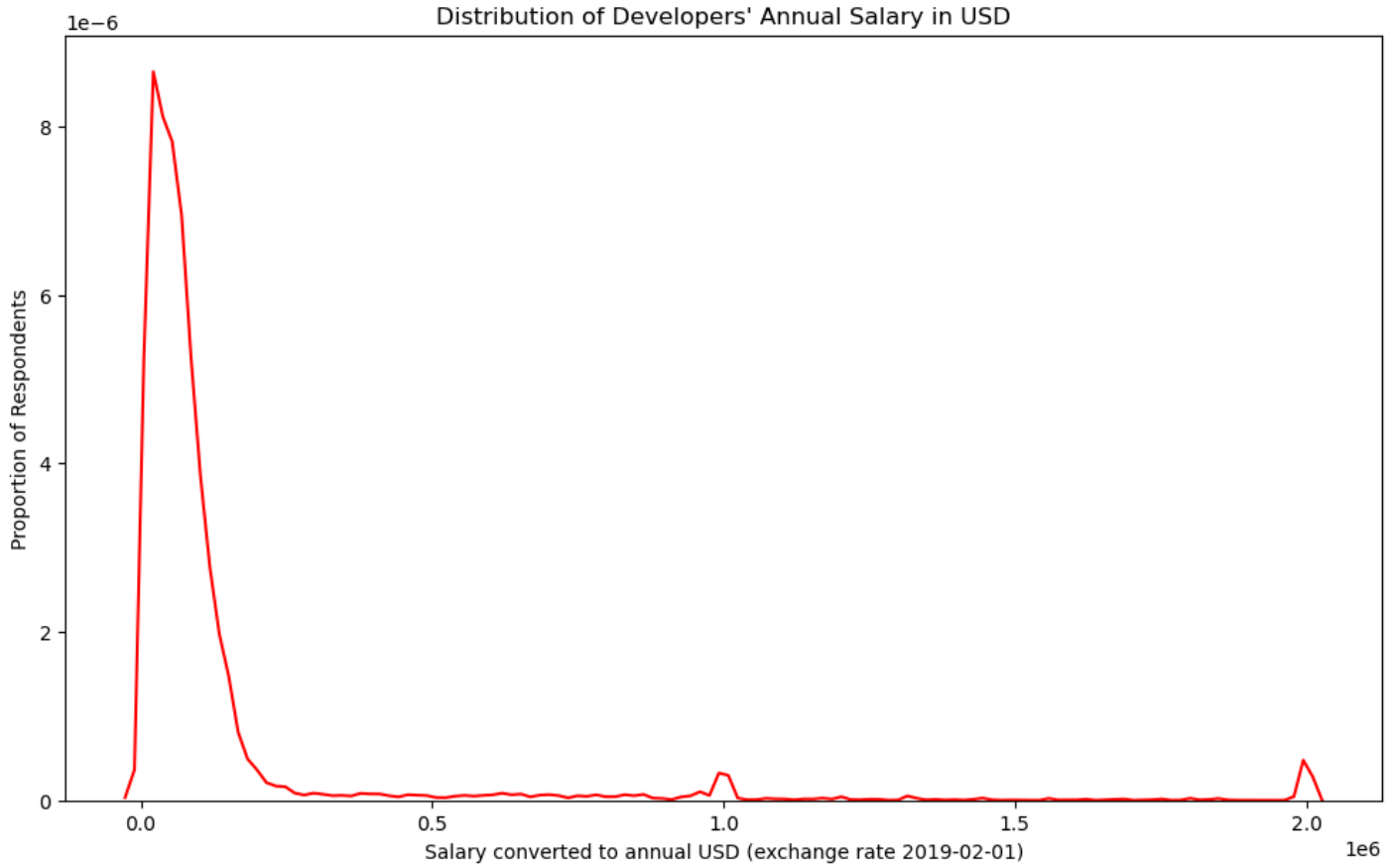
Out[4]:
```
2000000.0    138
1000000.0    105
100000.0      99
150000.0      92
120000.0      86
110000.0      83
70000.0       81
130000.0      77
90000.0       77
80000.0       73
68745.0       71
140000.0      68
57287.0       68
85000.0       67
125000.0      65
60000.0       64
54996.0       62
105000.0      58
95000.0       58
45830.0       55
Name: ConvertedComp, dtype: int64
```

In [5]:
```
plt.figure(figsize=(12, 7))

sns.distplot(df['ConvertedComp'], hist=False, color="r")

plt.title('Distribution of Developers\' Annual Salary in USD')
plt.xlabel('Salary converted to annual USD (exchange rate 2019-02-01)')
plt.ylabel('Proportion of Respondents')

plt.show()
plt.close()
```



Plot the histogram for the column `ConvertedComp`.

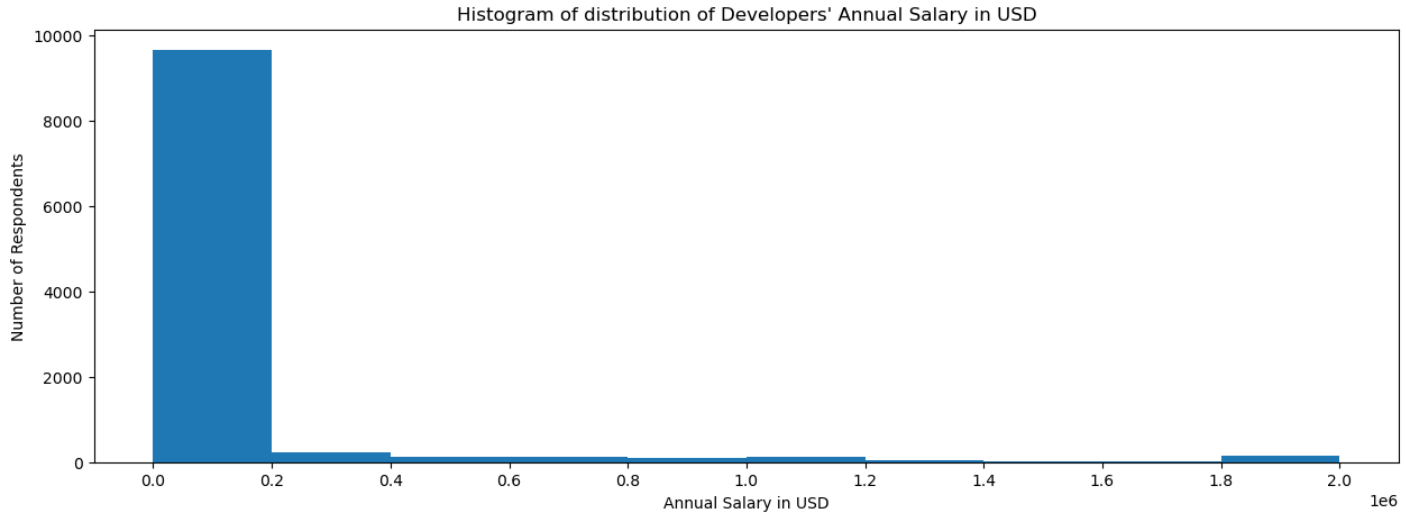
In [7]:
```
# your code goes here
count, bin_edges = np.histogram(df['ConvertedComp'])

print(count) # frequency count
print(bin_edges) # bin ranges, default = 10 bins
df['ConvertedComp'].plot(kind='hist', figsize=(15, 5), xticks=bin_edges)

plt.title('Histogram of distribution of Developers\' Annual Salary in USD') # add a title to the histogram
plt.ylabel('Number of Respondents') # add y-label
plt.xlabel('Annual Salary in USD') # add x-label

plt.show()
```

```
[9659  238  115  125   99  131   34   15   15  151]
[      0.  200000.  400000.  600000.  800000. 1000000. 1200000. 1400000.
 1600000. 1800000. 2000000.]
```



What is the median of the column `ConvertedComp` ?

In [8]:
```
# your code goes here
df['ConvertedComp'].median()
```

Out[8]: 57745.0

How many responders identified themselves only as a **Man**?

In [9]:
```
# your code goes here
# your code goes here
df[df['Gender'] == 'Man'].shape[0]
```

Out[9]: 9725

Find out the median ConvertedComp of responders identified themselves only as a **Woman**?

In [10]:
```
# your code goes here
df['ConvertedComp'][df['Gender'] == 'Woman'].median()
```

Out[10]: 57708.0

Give the five number summary for the column `Age` ?

Double click here for hint.

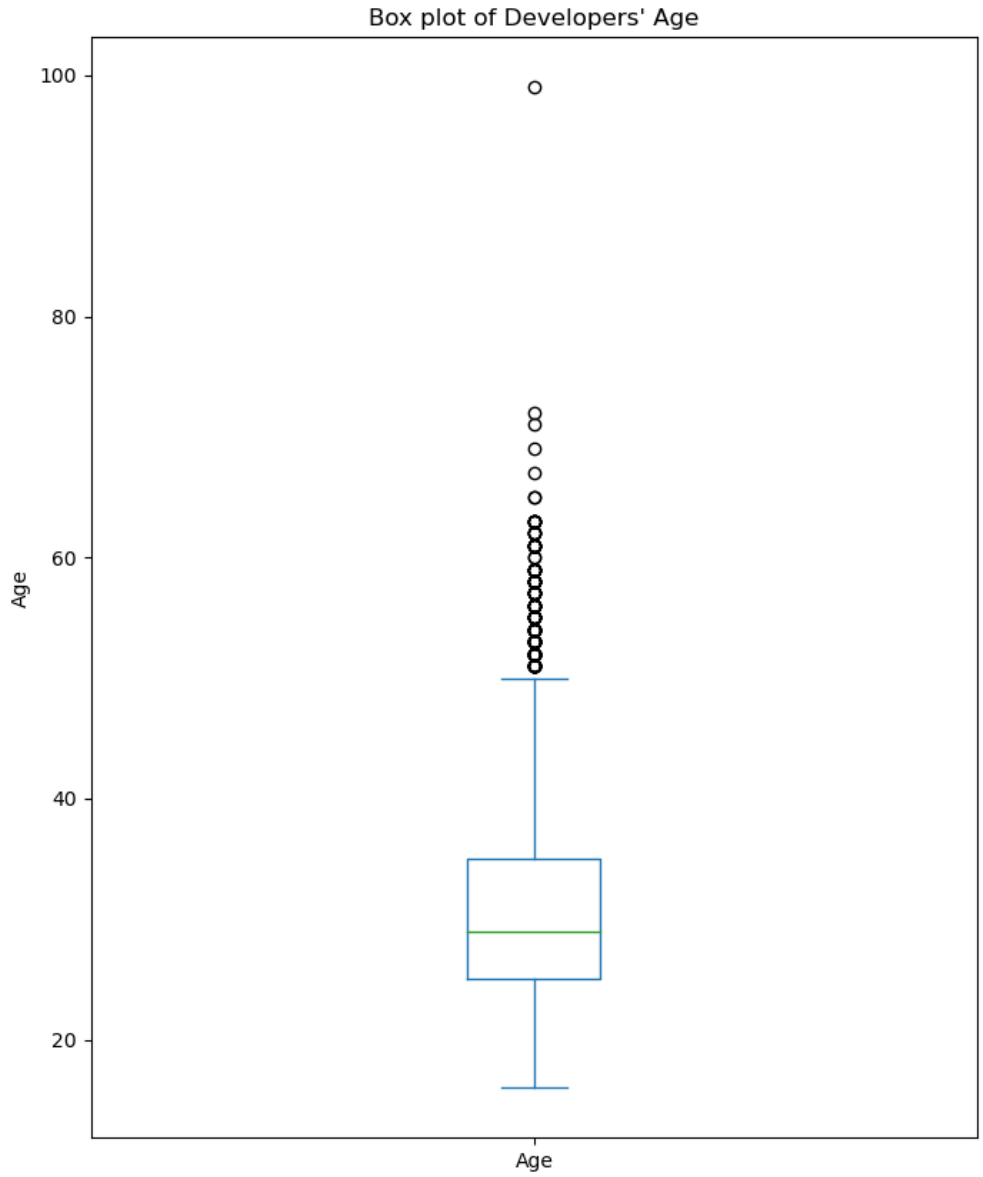
In [11]:
```
# your code goes here
df.dropna(subset=["Age"], axis=0, inplace=True)
df['Age'].describe()
```

Out[11]:
```
count    10354.000000
mean        30.833040
std          7.389983
min         16.000000
25%         25.000000
50%         29.000000
75%         35.000000
max         99.000000
Name: Age, dtype: float64
```

In [28]:
```
df['Age'].plot(kind='box', figsize=(8, 10))

plt.title('Box plot of Developers\' Age')
plt.ylabel('Age')

plt.show()
```



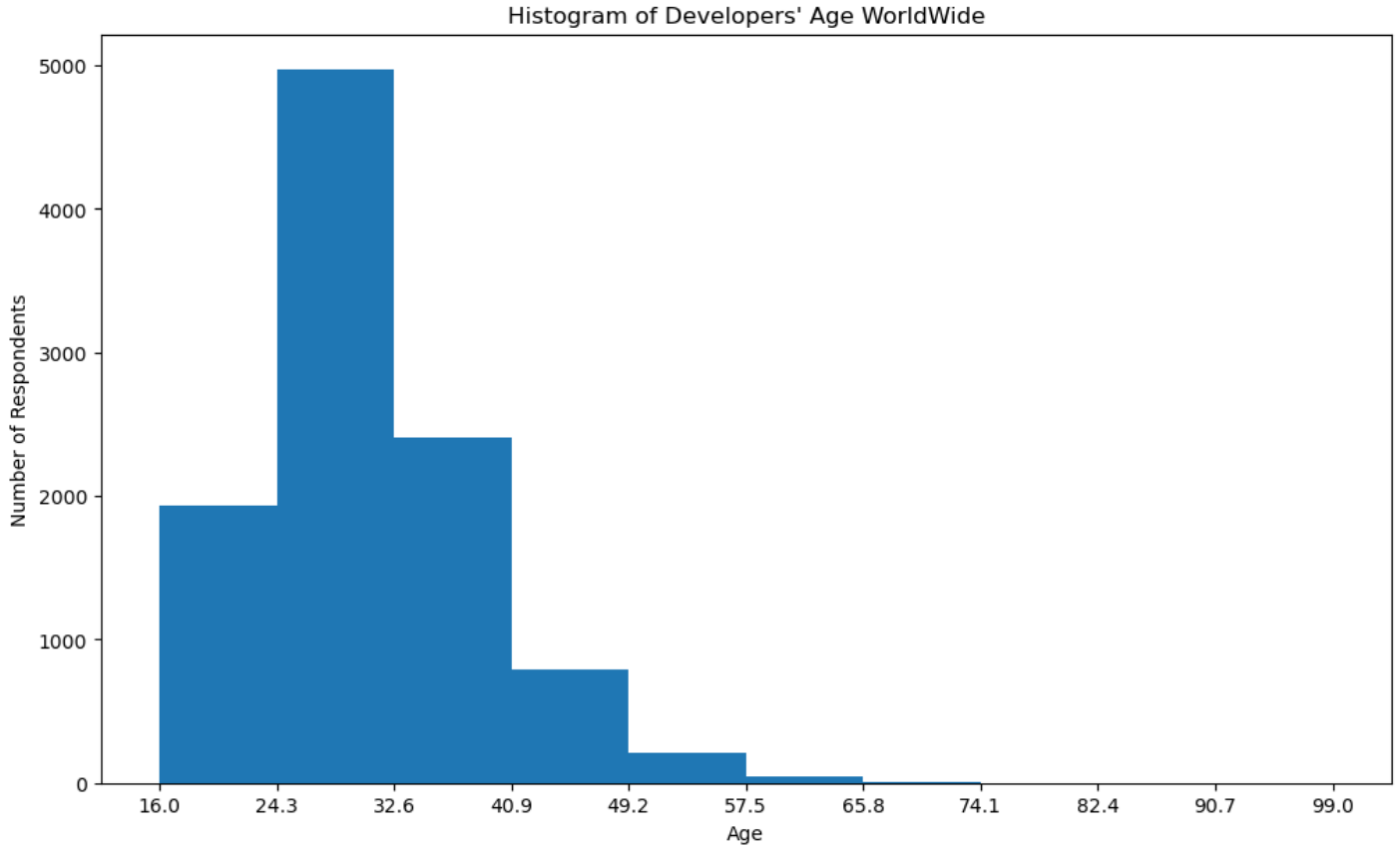
Plot a histogram of the column `Age`.

In [12]:

```
# your code goes here
count, bin_edges = np.histogram(df['Age'])
print(count)
print(bin_edges)
df['Age'].plot(kind='hist', figsize=(12,7), xticks=bin_edges)
plt.title("Histogram of Developers\' Age WorldWide")
plt.ylabel("Number of Respondents")
plt.xlabel("Age")

plt.show()
```

```
[1929 4968 2406  788  210   48    4    0    0    1]
[16.  24.3 32.6 40.9 49.2 57.5 65.8 74.1 82.4 90.7 99. ]
```



Outliers

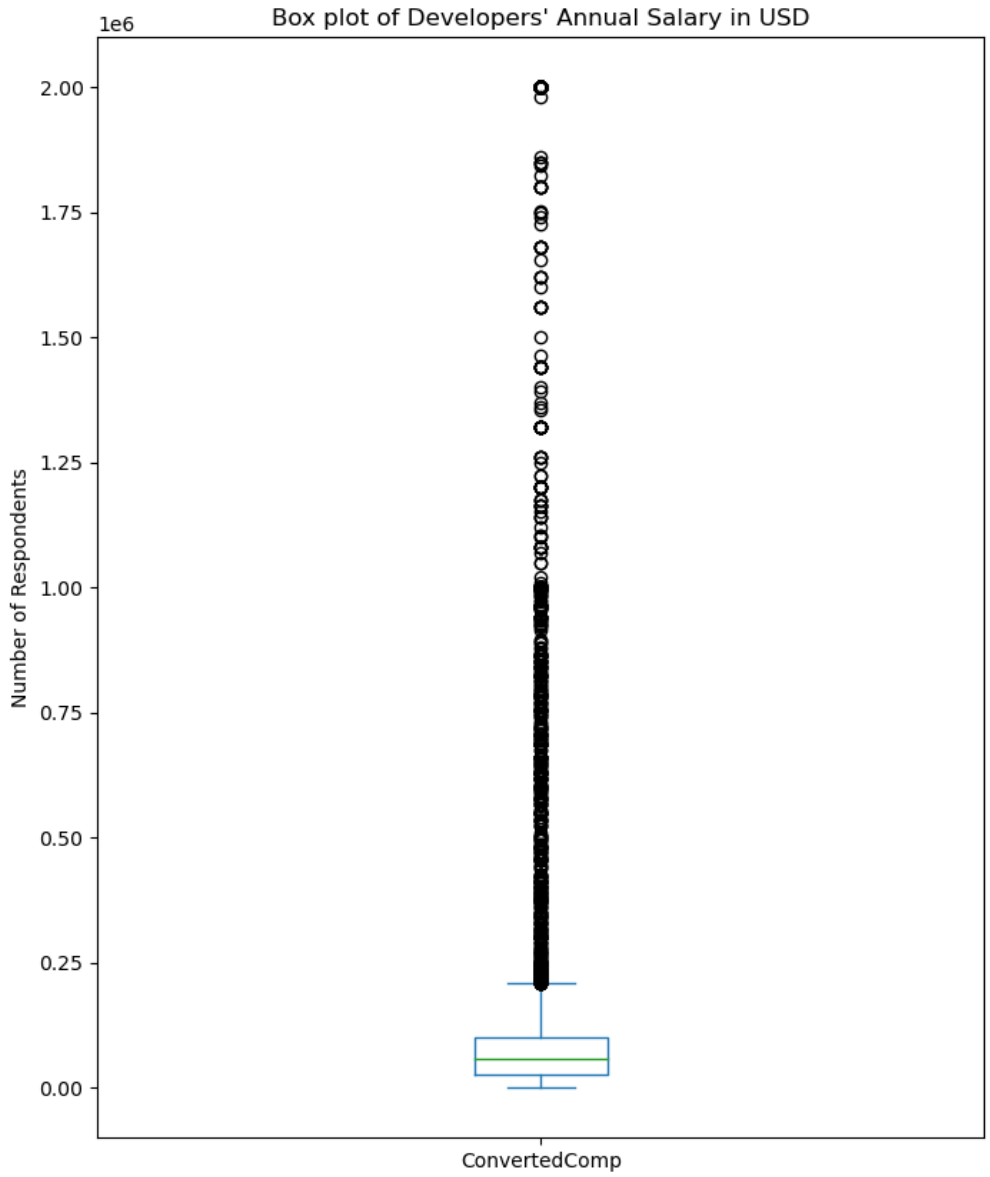
Finding outliers

Find out if outliers exist in the column `ConvertedComp` using a box plot?

In [13]:
```
# your code goes here
df['ConvertedComp'].plot(kind='box', figsize=(8, 10))

plt.title('Box plot of Developers\' Annual Salary in USD')
plt.ylabel('Number of Respondents')

plt.show()
```



Find out the Inter Quartile Range for the column `ConvertedComp`.

In [14]:
```
# your code goes here
df['ConvertedComp'].describe()
#Q1(25%) = 2.683450e+04
#Q3(75%) = 1.000000e+05
#IQR = Q3 - Q1 = 1.000000e+05 - 2.683450e+04 = 73,165.5
```

```
  File "/tmp/ipykernel_69/1465284764.py", line 3
    Q1(25%) = 2.683450e+04
            ^
SyntaxError: invalid syntax
```

In [15]:
```
IQR = df['ConvertedComp'].describe()[6] - df['ConvertedComp'].describe()[4]
IQR
```

Out[15]: 73165.5

In [16]:
```
IQR_V = 1.5 * IQR
IQR_V
```

Out[16]: 109748.25

In [ ]:
```
```

Find out the upper and lower bounds.

In [18]:
```
# your code goes here
lower = df['ConvertedComp'].describe()[4] - IQR_V
upper = df['ConvertedComp'].describe()[6] + IQR_V

print("The Lower bound is:" , lower)
print("The Upper bound is:" , upper)
```

```
The Lower bound is: -82913.75
The Upper bound is: 209748.25
```

Identify how many outliers are there in the `ConvertedComp` column.

In [ ]:
```
# your code goes here
# Base on the definition of outlier, any value that is greater than Q3 by 1.5 times or lower than Q1 1.5 times IQR will be flagge
# Outlier > 1.000000e+05 + (1.5 * 73,165.5)
# Outlier > 209,748.25
```

In [19]:
```
df[(df['ConvertedComp'] > upper) | (df['ConvertedComp'] < lower)].shape[0]
```

Out[19]:
```
861
```

Create a new dataframe by removing the outliers from the `ConvertedComp` column.

In [25]:
```
# your code goes here
df1 = df[df['ConvertedComp'] <= upper]
# df_new.drop(['level_0', 'index'], axis=1, inplace=True)
print(df1.median())
```

```
Respondent       12590.0
CompTotal        62500.0
ConvertedComp    52356.0
WorkWeekHrs         40.0
CodeRevHrs           4.0
Age                 29.0
dtype: float64

/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages/ipykernel_launcher.py:4: FutureWarning: Dropping of nuisance colu
mns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select onl
y valid columns before calling the reduction.
  after removing the cwd from sys.path.
```

In [26]:
```
print(df1.mean())
```

```
Respondent        12519.288844
CompTotal        732163.544190
ConvertedComp     59740.170441
WorkWeekHrs          41.895104
CodeRevHrs            4.717439
Age                  30.695860
dtype: float64

/home/jupyterlab/conda/envs/python/lib/python3.7/site-packages/ipykernel_launcher.py:1: FutureWarning: Dropping of nuisance colu
mns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select onl
y valid columns before calling the reduction.
  """Entry point for launching an IPython kernel.
```

Correlation

Finding correlation

Find the correlation between `Age` and all other numerical columns.

In [27]:
```
# your code goes here
df1.corr()
```

Out[27]:

	Respondent	CompTotal	ConvertedComp	WorkWeekHrs	CodeRevHrs	Age
Respondent	1.000000	-0.019281	0.010916	-0.017491	0.004692	0.002180
CompTotal	-0.019281	1.000000	-0.063574	0.004667	0.015992	0.006337
ConvertedComp	0.010916	-0.063574	1.000000	0.033110	-0.086527	0.401821
WorkWeekHrs	-0.017491	0.004667	0.033110	1.000000	0.038948	0.032032
CodeRevHrs	0.004692	0.015992	-0.086527	0.038948	1.000000	-0.012878
Age	0.002180	0.006337	0.401821	0.032032	-0.012878	1.000000

Authors

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Change Log

Date (YYYY-MM-DD)	Version	Changed By	Change Description
2020-10-17	0.1	Ramesh Sannareddy	Created initial version of the lab