```
# IMPORTANT: RUN THIS CELL IN ORDER TO IMPORT YOUR KAGGLE DATA SOURCES
# TO THE CORRECT LOCATION (/kaggle/input) IN YOUR NOTEBOOK,
# THEN FEEL FREE TO DELETE THIS CELL.
# NOTE: THIS NOTEBOOK ENVIRONMENT DIFFERS FROM KAGGLE'S PYTHON
# ENVIRONMENT SO THERE MAY BE MISSING LIBRARIES USED BY YOUR
# NOTEBOOK.

import os
import sys
from tempfile import NamedTemporaryFile
from urllib.request import urlopen
from urllib.parse import unquote, urlparse
from urllib.error import HTTPError
from zipfile import ZipFile
import tarfile
import shutil

CHUNK_SIZE = 40960
DATA_SOURCE_MAPPING = 'customer-segmentation-tutorial-in-python:https%3A%2F%2Fstorage.googleapis.com%2Fkaggle-data-sets%2F42674%2F74935%2Fbun

KAGGLE_INPUT_PATH='/kaggle/input'
KAGGLE_WORKING_PATH='/kaggle/working'
KAGGLE_SYMLINK='kaggle'

!umount /kaggle/input/ 2> /dev/null
shutil.rmtree('/kaggle/input', ignore_errors=True)
os.makedirs(KAGGLE_INPUT_PATH, 0o777, exist_ok=True)
os.makedirs(KAGGLE_WORKING_PATH, 0o777, exist_ok=True)

try:
  os.symlink(KAGGLE_INPUT_PATH, os.path.join("..", 'input'), target_is_directory=True)
except FileExistsError:
  pass
try:
  os.symlink(KAGGLE_WORKING_PATH, os.path.join("..", 'working'), target_is_directory=True)
except FileExistsError:
  pass

for data_source_mapping in DATA_SOURCE_MAPPING.split(','):
    directory, download_url_encoded = data_source_mapping.split(':')
    download_url = unquote(download_url_encoded)
    filename = urlparse(download_url).path
    destination_path = os.path.join(KAGGLE_INPUT_PATH, directory)
    try:
        with urlopen(download_url) as fileres, NamedTemporaryFile() as tfile:
            total_length = fileres.headers['content-length']
            print(f'Downloading {directory}, {total_length} bytes compressed')
            dl = 0
            data = fileres.read(CHUNK_SIZE)
            while len(data) > 0:
                dl += len(data)
                tfile.write(data)
                done = int(50 * dl / int(total_length))
                sys.stdout.write(f"\r[{'=' * done}{' ' * (50-done)}] {dl} bytes downloaded")
                sys.stdout.flush()
                data = fileres.read(CHUNK_SIZE)
            if filename.endswith('.zip'):
              with ZipFile(tfile) as zfile:
                zfile.extractall(destination_path)
            else:
              with tarfile.open(tfile.name) as tarfile:
                tarfile.extractall(destination_path)
            print(f'\nDownloaded and uncompressed: {directory}')
    except HTTPError as e:
        print(f'Failed to load (likely expired) {download_url} to path {destination_path}')
        continue
    except OSError as e:
        print(f'Failed to load {download_url} to path {destination_path}')
        continue

print('Data source import complete.')
```

```
Downloading customer-segmentation-tutorial-in-python, 1583 bytes compressed
[==================================================] 1583 bytes downloaded
```

```
Downloaded and uncompressed: customer-segmentation-tutorial-in-python
Data source import complete.
```

Customer Segmentation for targeted Matrketing

Loading the Libraries

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

Reading the Dataset

```
df = pd.read_csv("/kaggle/input/customer-segmentation-tutorial-in-python/Mall_Customers.csv")
df.head()
```

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

Next steps: Generate code with df View recommended plots

Shape of the Dataset

```
df.shape
```

```
(200, 5)
```

Sample of the Datset

```
df.sample(10)
```

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
140	141	Female	57	75	5
193	194	Female	38	113	91
187	188	Male	28	101	68
9	10	Female	30	19	72
80	81	Male	57	54	51
189	190	Female	36	103	85
26	27	Female	45	28	32
130	131	Male	47	71	9
167	168	Female	33	86	95
44	45	Female	49	39	28

Exploratory Data Analysis (EDA)

Info of the DataSet

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype 
---  ------                  --------------  ----- 
 0   CustomerID              200 non-null    int64 
 1   Gender                  200 non-null    object
 2   Age                     200 non-null    int64 
 3   Annual Income (k$)      200 non-null    int64 
 4   Spending Score (1-100)  200 non-null    int64 
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

Checking Missing Values

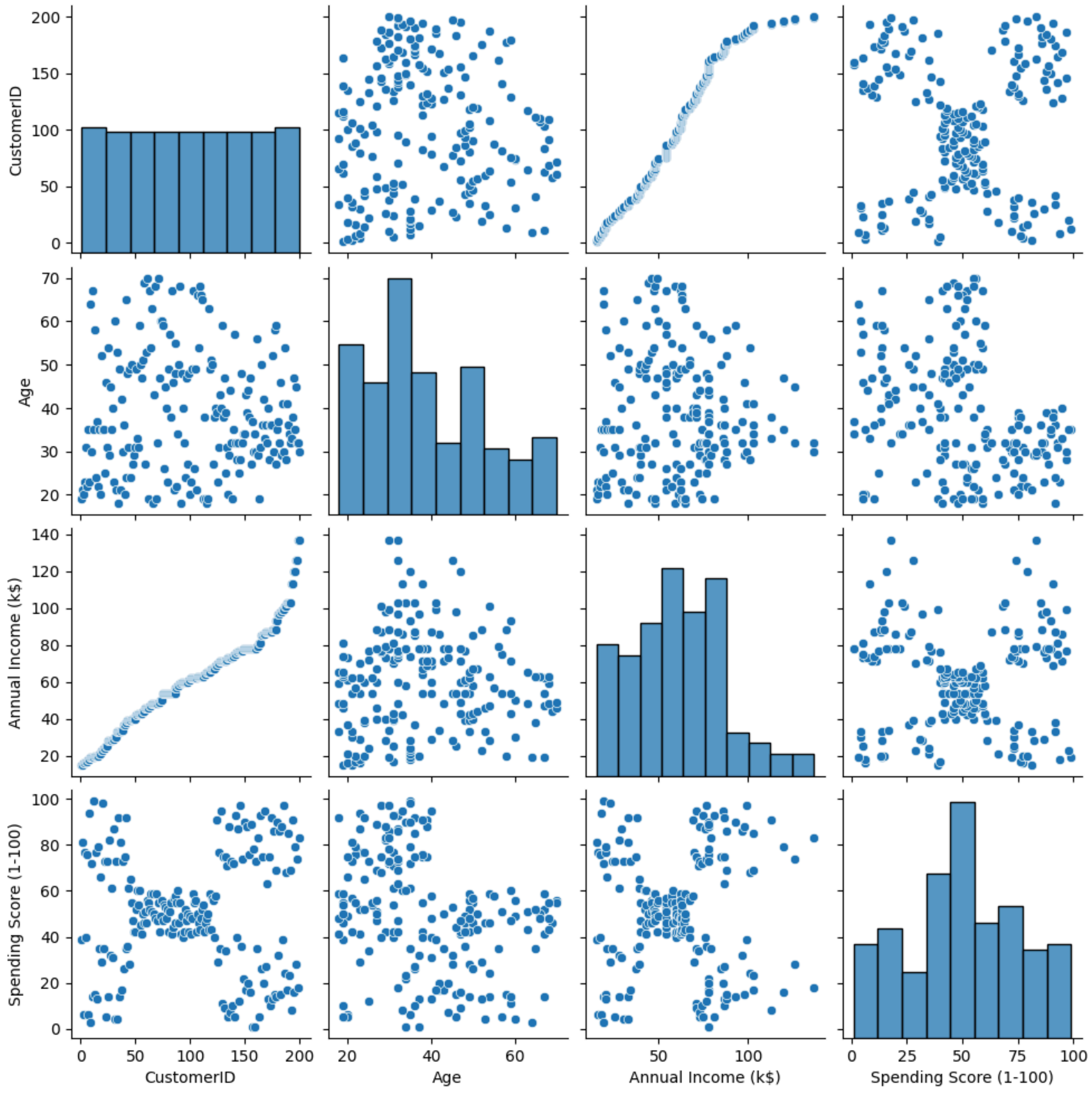
```
df.isna().sum()
```

```
CustomerID                0
Gender                    0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

We have no missing Values in the DataSet.

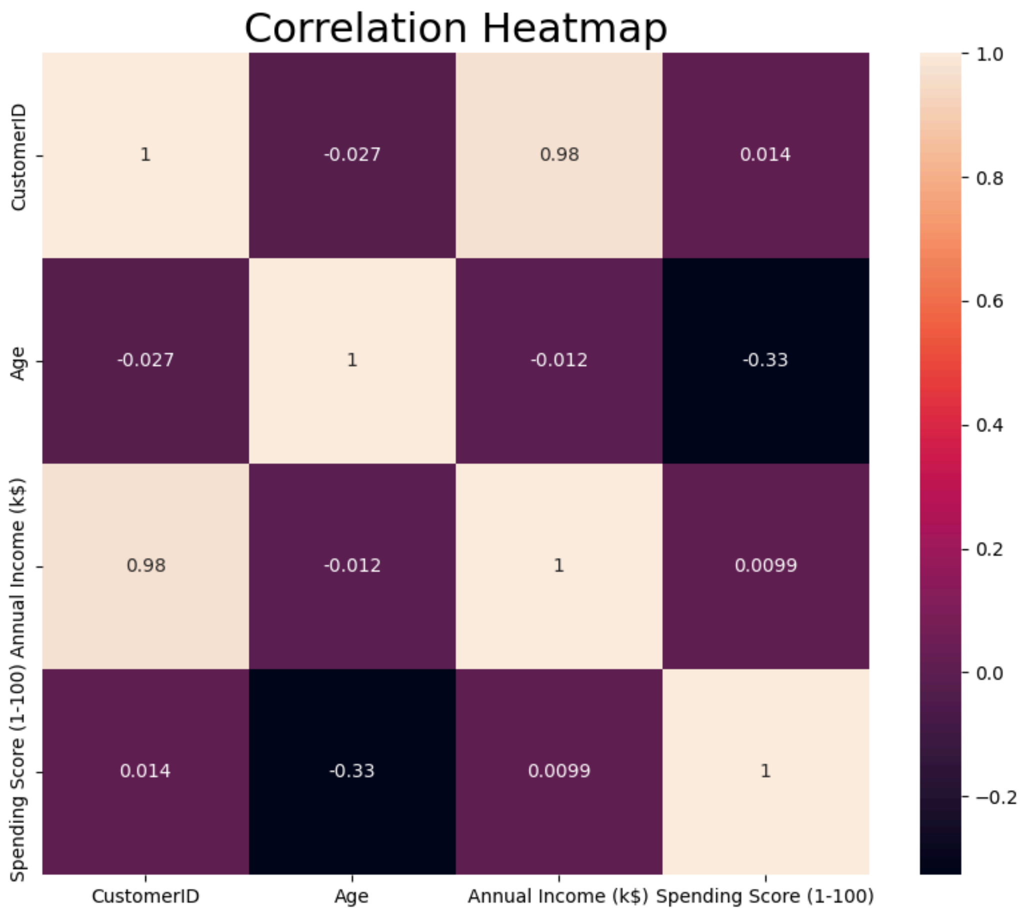
Pairwise relationship between Variables of the Dataset

```
sns.pairplot(df)
plt.show()
```



Correlation

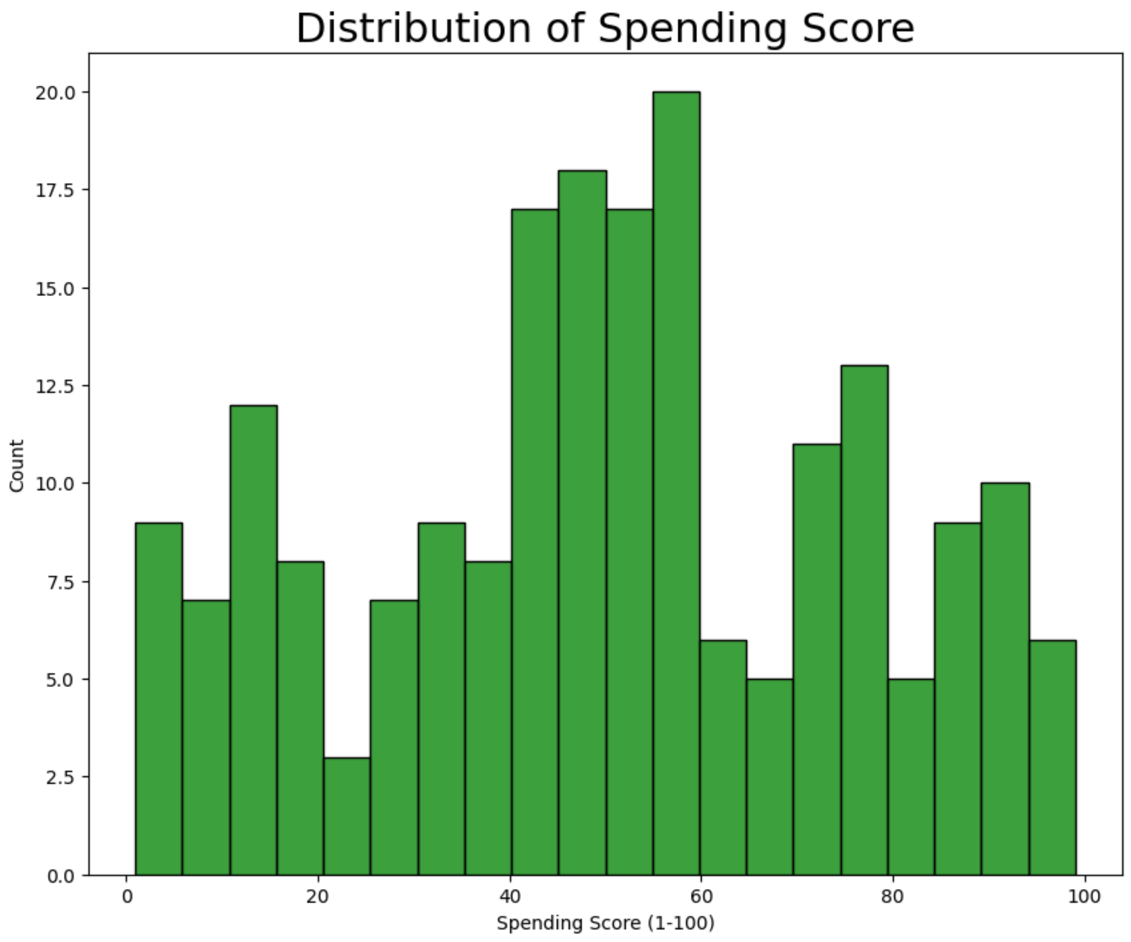
```
correlation = df.corr()
plt.figure(figsize=(10,8))
sns.heatmap(correlation, annot=True)
plt.title("Correlation Heatmap", fontsize = 22)
plt.show()
```



No multicolinearity as per the Correlation

Analyzing the data with respect to "Spending Score"

```
plt.figure(figsize=(10,8))
sns.histplot(df['Spending Score (1-100)'], bins= 20, color='g')
plt.title("Distribution of Spending Score", fontsize = 22)
plt.show()
```

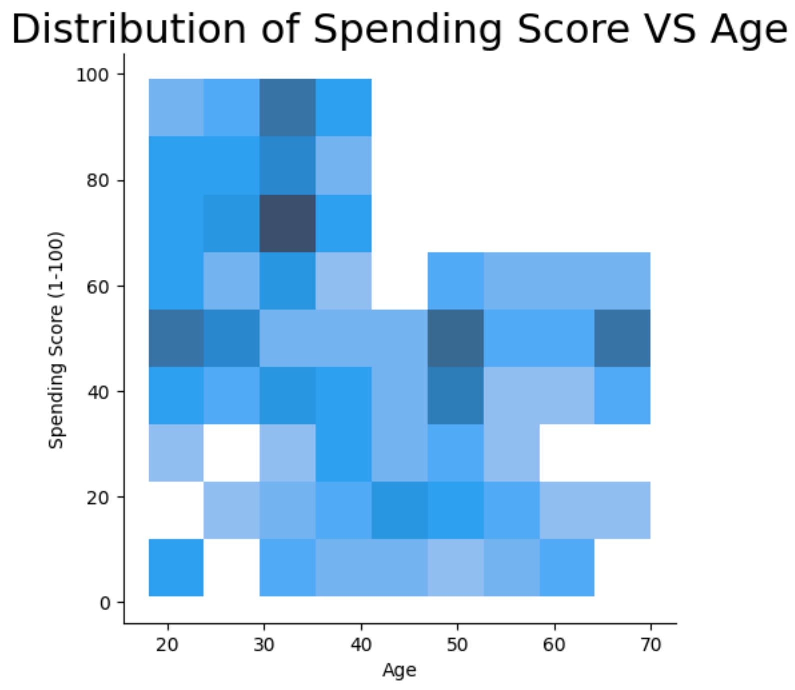


Customers have high spending score between 40 to 60

Distribution of Spending Score with respect to Age

```
plt.figure(figsize=(12,10))
sns.displot(data= df,y='Spending Score (1-100)',x='Age')
plt.title("Distribution of Spending Score VS Age", fontsize = 22)
plt.show()
```

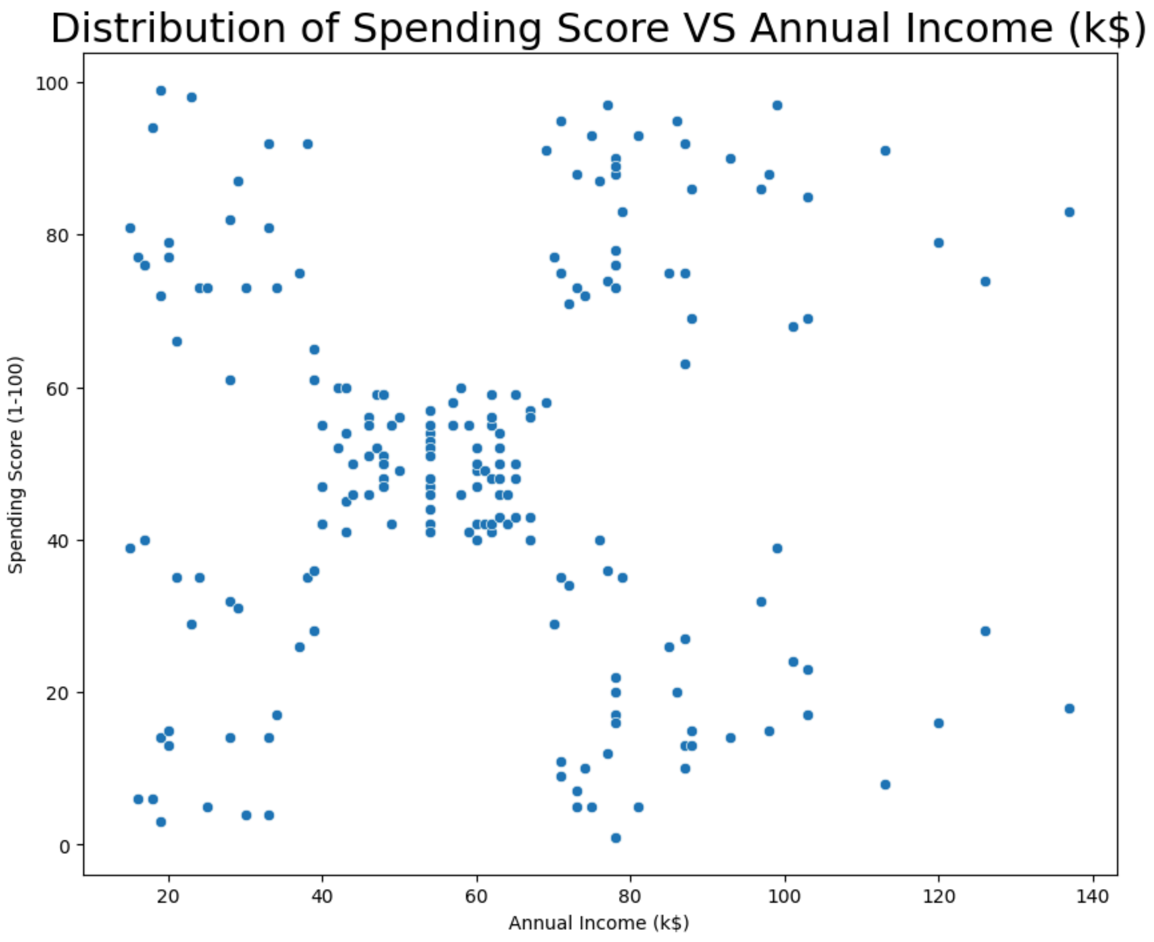
```
<Figure size 1200x1000 with 0 Axes>
```



The Age of Customer from 20 to 40 have high Spending Score

Distribution of Spending Score with respect to Annual Income

```
plt.figure(figsize=(10,8))
sns.scatterplot(data= df,y='Spending Score (1-100)',x='Annual Income (k$)')
plt.title("Distribution of Spending Score VS Annual Income (k$)", fontsize = 22)
plt.show()
```

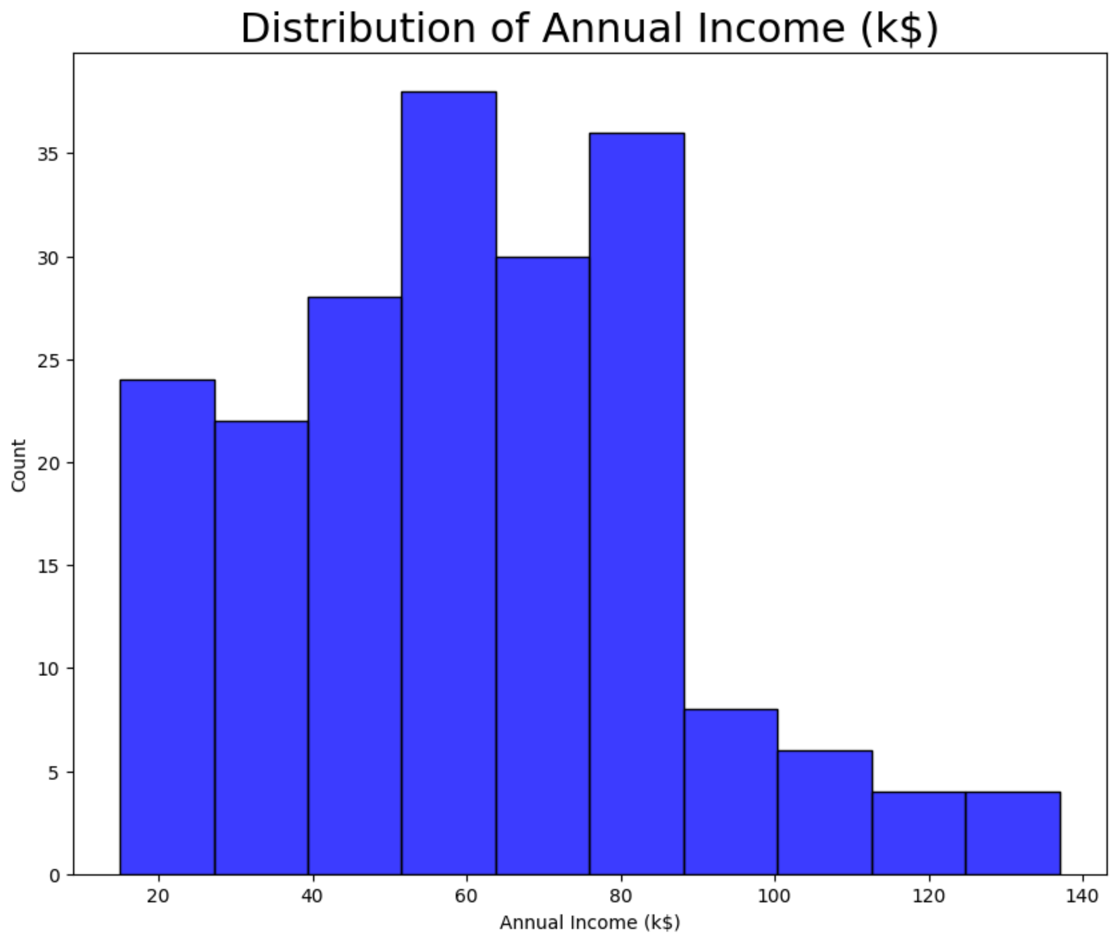


Customers having Annual Income range 20k to 40k and 80k to 100k have higher Spending Score. And a big chunk of customers are around ~50k income with ~50 Spending Score

Analyzing the data with respect to "Annual Income"

Distribution of Annual Income

```
plt.figure(figsize=(10,8))
sns.histplot(df['Annual Income (k$)'], color='b')
plt.title("Distribution of Annual Income (k$)", fontsize = 22)
plt.show()
```



Most customers visiting Mall have Annual Income of 50k to 80k.

Distributuion Annual Income with respect to Age

```
plt.figure(figsize=(12,10))
sns.displot(data= df,y='Annual Income (k$)',x='Age')
plt.title("Distribution of Annual Income (k$) VS Age ", fontsize = 22)
plt.show()
```

```
<Figure size 1200x1000 with 0 Axes>
```

High Annual Income Customers are around the age of 30 to 45.

Average Income distribution by Gender

```
gender_income = df.groupby('Gender')['Annual Income (k$)'].agg('mean').reset_index()
```