In [1]:
```
#M.Vishal
#240701598
#10/7/2025



import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

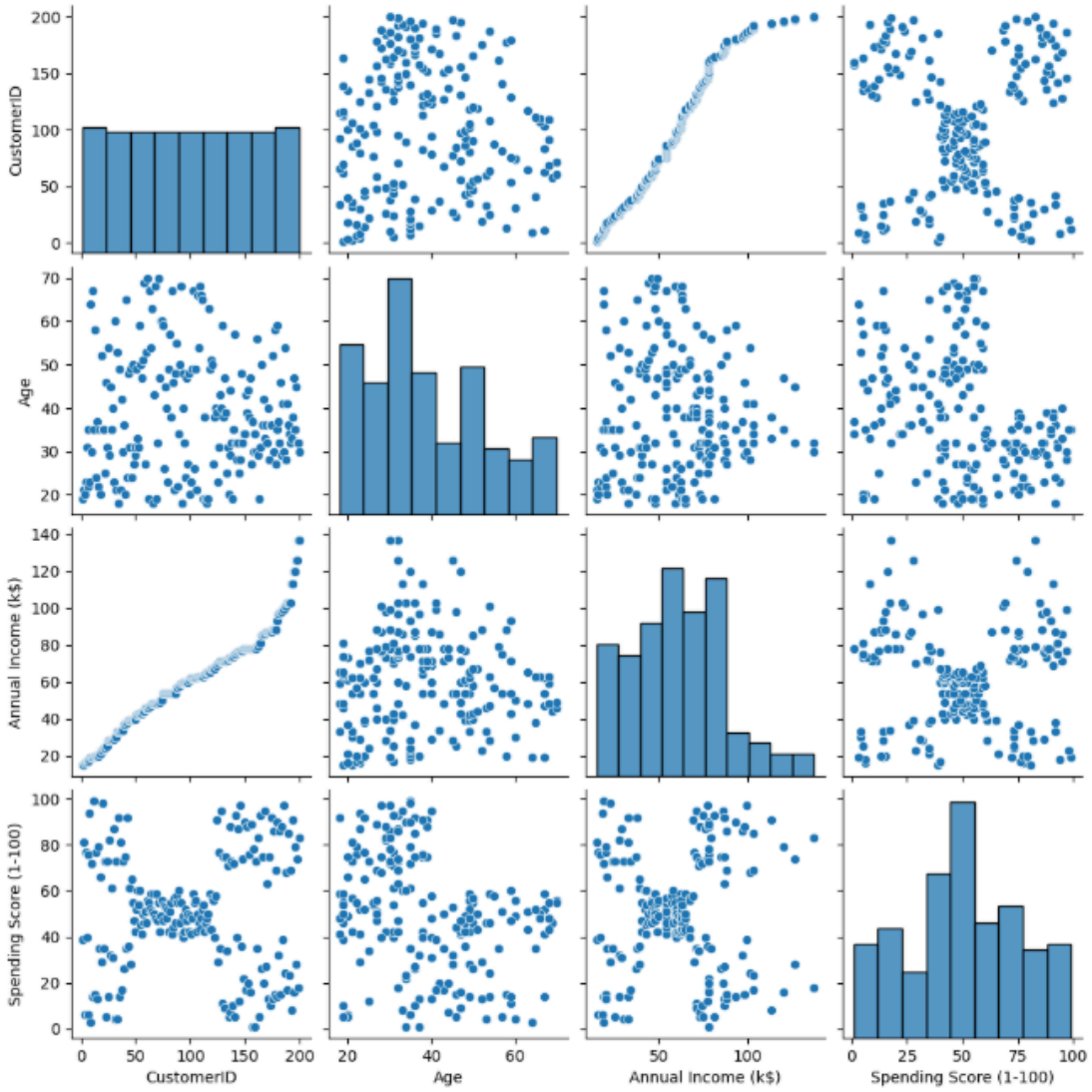
In [3]:
```
#M.Vishal
#240701598
#10/7/2025
df=pd.read_csv('Mall_Customers.csv')
```

In [4]:
```
#M.Vishal
#240701598
#10/7/2025
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
```

In [5]:
```
#M.Vishal
#240701598
#10/7/2025
sns.pairplot(df)
```

Out[5]:
```
<seaborn.axisgrid.PairGrid at 0x2afaeb19ad0>
```



In [6]:
```
#M.Vishal
#240701598
#10/7/2025
features=df.iloc[:,[3,4]].values
```

In [7]:
```
#M.Vishal
#240701598
#10/7/2025
from sklearn.cluster import KMeans
model=KMeans(n_clusters=5)
model.fit(features)
KMeans(n_clusters=5)
```

```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: The default value of `n_init` will c
hange from 10 to 'auto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:1436: UserWarning: KMeans is known to have a memory leak
on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the environment variable OM
P_NUM_THREADS=1.
  warnings.warn(
```

Out[7]:

KMeans

KMeans(n_clusters=5)

In [8]:
```
#M.Vishal
#240701598
#10/7/2025
Final=df.iloc[:,[3,4]]
Final['label']=model.predict(features)
Final.head()
```

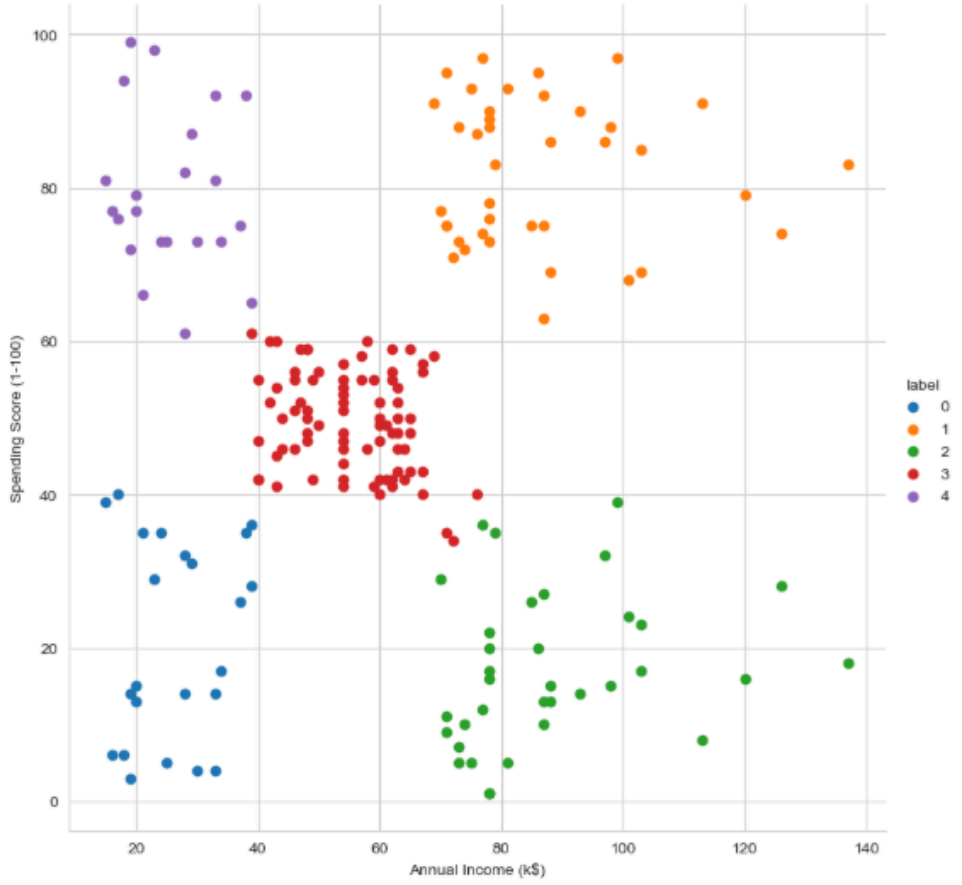
```
C:\Users\hdc0422206\AppData\Local\Temp\ipykernel_16284\470183701.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ve
rsus-a-copy
  Final['label']=model.predict(features)
```

Out[8]:

	Annual Income (k$)	Spending Score (1-100)	label
0	15	39	0
1	15	81	4
2	16	6	0
3	16	77	4
4	17	40	0

In [9]:
```
#M.Vishal
#240701598
#10/7/2025
sns.set_style("whitegrid")
sns.FacetGrid(Final,hue="label",height=8) \
.map(plt.scatter,"Annual Income (k$)", "Spending Score (1-100)") \
.add_legend();
plt.show()
```



In [11]:
```
#M.Vishal
#240701598
#10/7/2025
features_el=df.iloc[:,[2,3,4]].values
from sklearn.cluster import KMeans
wcss=[]
for i in range(1,10):
    model=KMeans(n_clusters=i)
    model.fit(features_el)
    wcss.append(model.inertia_)
plt.plot(range(1,10),wcss)
```

```
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P_NUM_THREADS=1.
```

Out[11]: [<matplotlib.lines.Line2D at 0x2afb104eb90>]