Exploratory Data Analysis

March 13, 2023

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df=pd.read_csv("/kaggle/input/cardio-good-fitness/CardioGoodFitness.csv")
```

[3]:
```
df.head()
```

[3]:
```
  Product  Age  Gender  Education MaritalStatus  Usage  Fitness  Income  Miles
0   TM195   18    Male         14        Single      3        4   29562    112
1   TM195   19    Male         15        Single      2        3   31836     75
2   TM195   19  Female         14     Partnered      4        3   30699     66
3   TM195   19    Male         12        Single      3        3   32973     85
4   TM195   20    Male         13     Partnered      4        2   35247     47
```

[4]:
```
df.tail()
```

[4]:
```
    Product  Age Gender  Education MaritalStatus  Usage  Fitness  Income  \
175   TM798   40   Male         21        Single      6        5   83416
176   TM798   42   Male         18        Single      5        4   89641
177   TM798   45   Male         16        Single      5        5   90886
178   TM798   47   Male         18     Partnered      4        5  104581
179   TM798   48   Male         18     Partnered      4        5   95508

     Miles
175    200
176    200
177    160
178    120
179    180
```

[5]:
```
df.shape
```

[5]:
```
(180, 9)
```

[6]:
```
df.size
```

```
[6]: 1620
```

```
[7]: df.columns
```

```
[7]: Index(['Product', 'Age', 'Gender', 'Education', 'MaritalStatus', 'Usage',
            'Fitness', 'Income', 'Miles'],
           dtype='object')
```

```
[8]: df.isnull().sum()
```

```
[8]: Product          0
     Age              0
     Gender           0
     Education        0
     MaritalStatus    0
     Usage            0
     Fitness          0
     Income           0
     Miles            0
     dtype: int64
```

```
[9]: df.duplicated().value_counts()
```

```
[9]: False    180
     dtype: int64
```

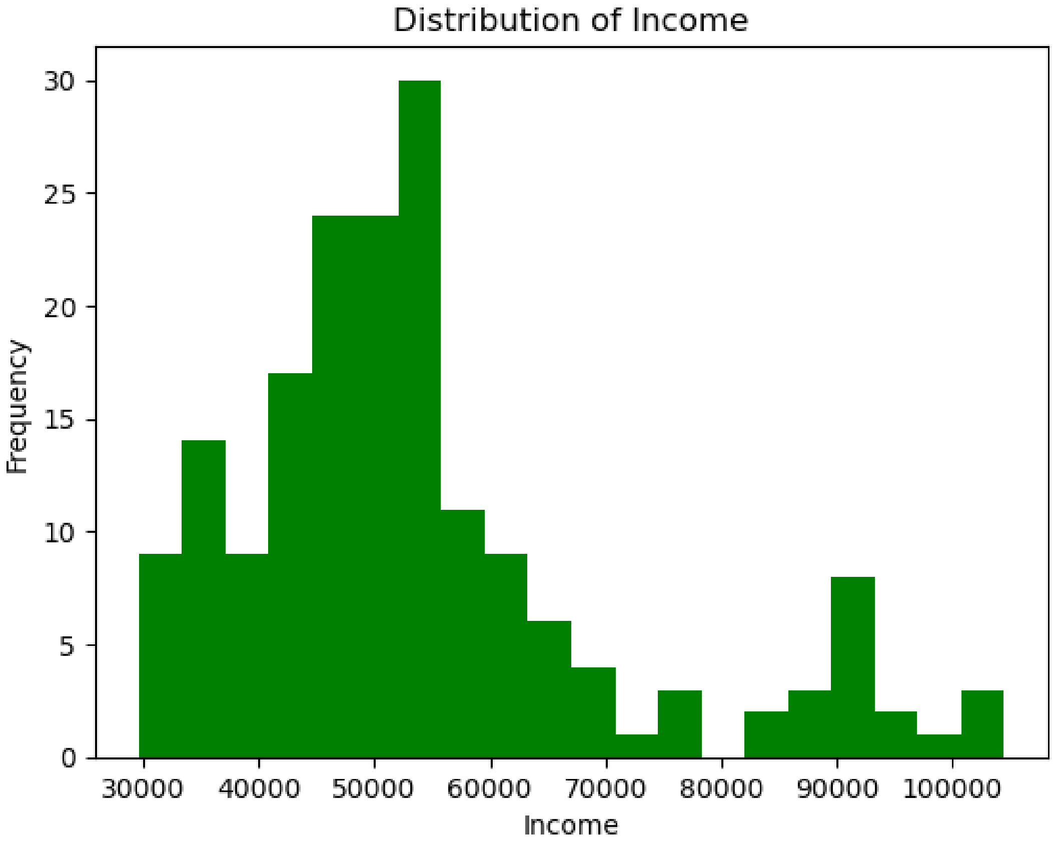
```
[10]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180 entries, 0 to 179
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Product        180 non-null    object
 1   Age            180 non-null    int64
 2   Gender         180 non-null    object
 3   Education      180 non-null    int64
 4   MaritalStatus  180 non-null    object
 5   Usage          180 non-null    int64
 6   Fitness        180 non-null    int64
 7   Income         180 non-null    int64
 8   Miles          180 non-null    int64
dtypes: int64(6), object(3)
memory usage: 12.8+ KB
```

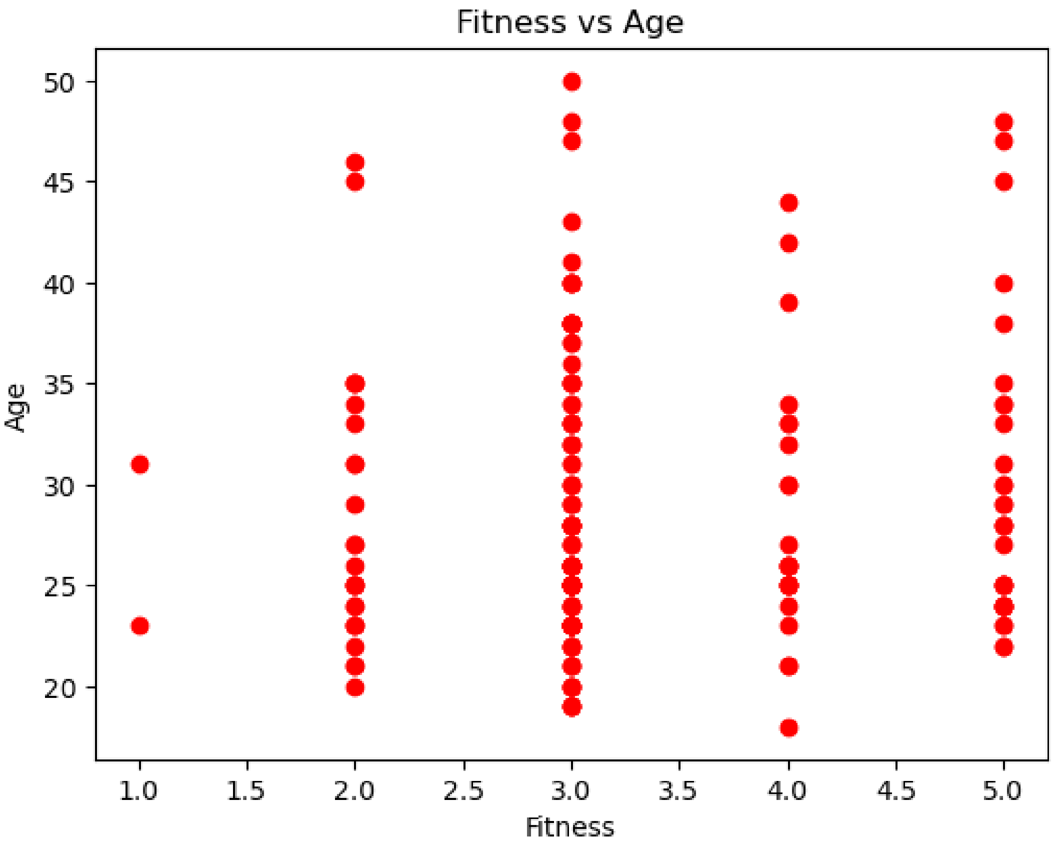
```
[11]: df.describe()
```

```
[11]:              Age   Education       Usage     Fitness         Income  \
      count  180.000000  180.000000  180.000000  180.000000     180.000000
      mean    28.788889   15.572222    3.455556    3.311111   53719.577778
      std      6.943498    1.617055    1.084797    0.958869   16506.684226
      min     18.000000   12.000000    2.000000    1.000000   29562.000000
      25%     24.000000   14.000000    3.000000    3.000000   44058.750000
      50%     26.000000   16.000000    3.000000    3.000000   50596.500000
      75%     33.000000   16.000000    4.000000    4.000000   58668.000000
      max     50.000000   21.000000    7.000000    5.000000  104581.000000

                  Miles
      count  180.000000
      mean   103.194444
      std     51.863605
      min     21.000000
      25%     66.000000
      50%     94.000000
      75%    114.750000
      max    360.000000
```

```
[17]: plt.hist(df['Income'], bins=20, color='green')
      plt.xlabel('Income')
      plt.ylabel('Frequency')
      plt.title('Distribution of Income')
      plt.show()
```

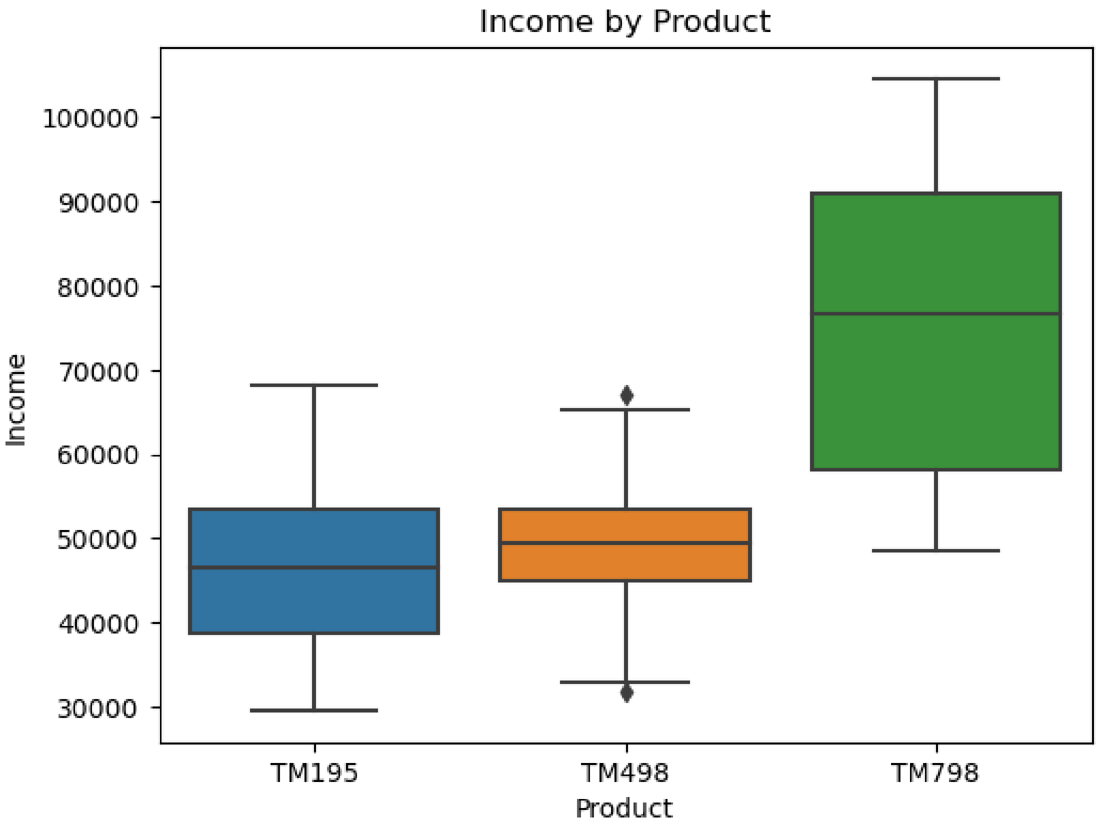


[23]:
```
plt.scatter(df['Fitness'], df['Age'], color='red')
plt.xlabel('Fitness')
plt.ylabel('Age')
plt.title('Fitness vs Age')
plt.show()
```



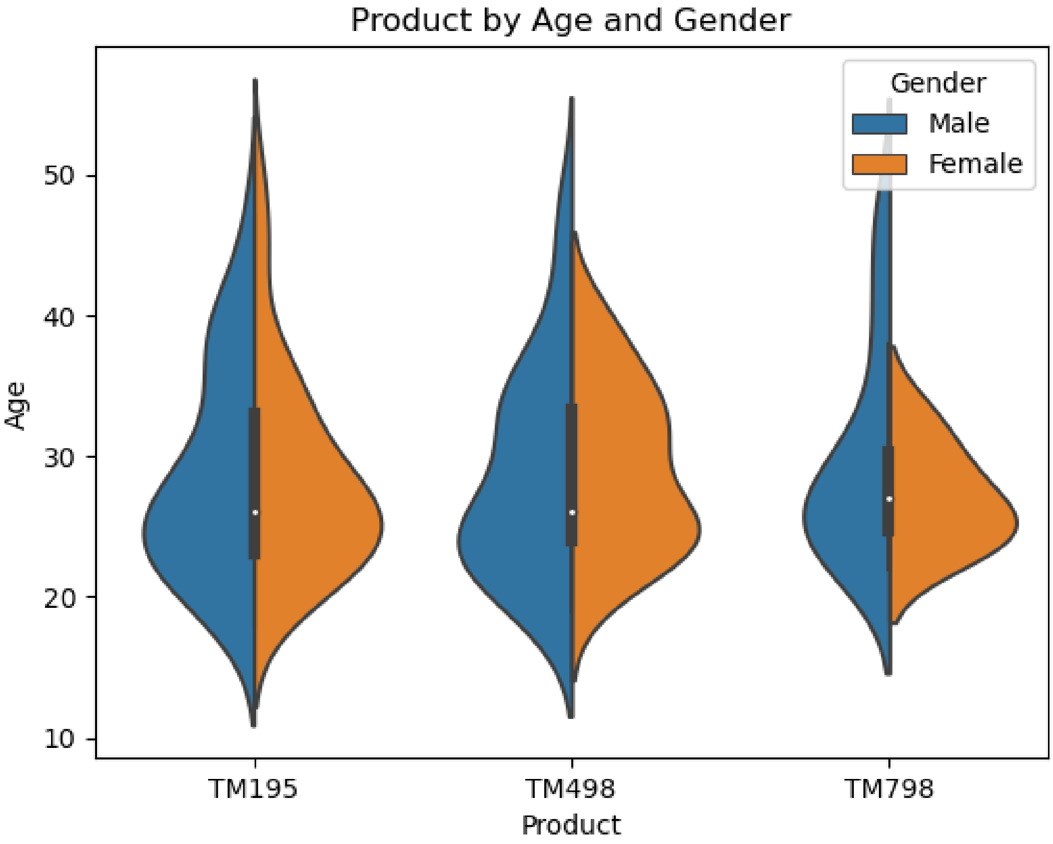
[19]:

```
# create a boxplot of the ratings by product
sns.boxplot(x='Product', y='Income', data=df)
plt.title('Income by Product')
plt.show()
```

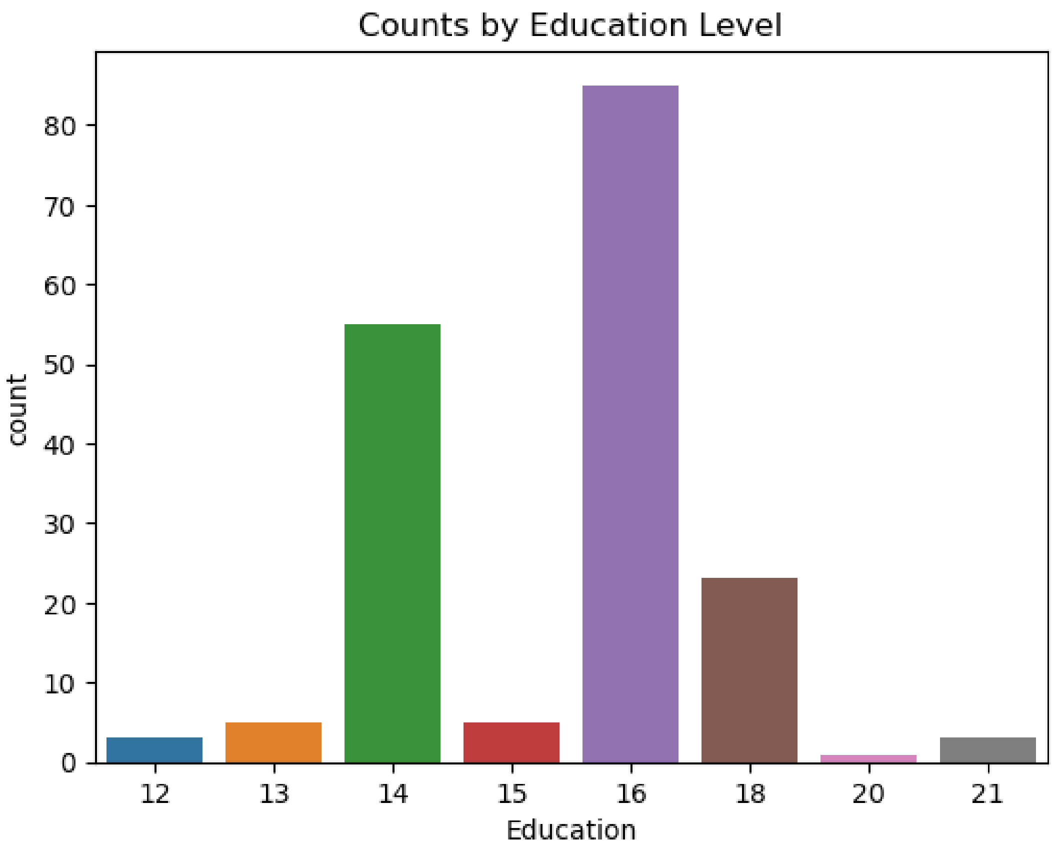


[20]:

```
# create a violin plot of the ratings by product and gender
sns.violinplot(x='Product', y='Age', hue='Gender', data=df, split=True)
plt.title('Product by Age and Gender')
plt.show()
```

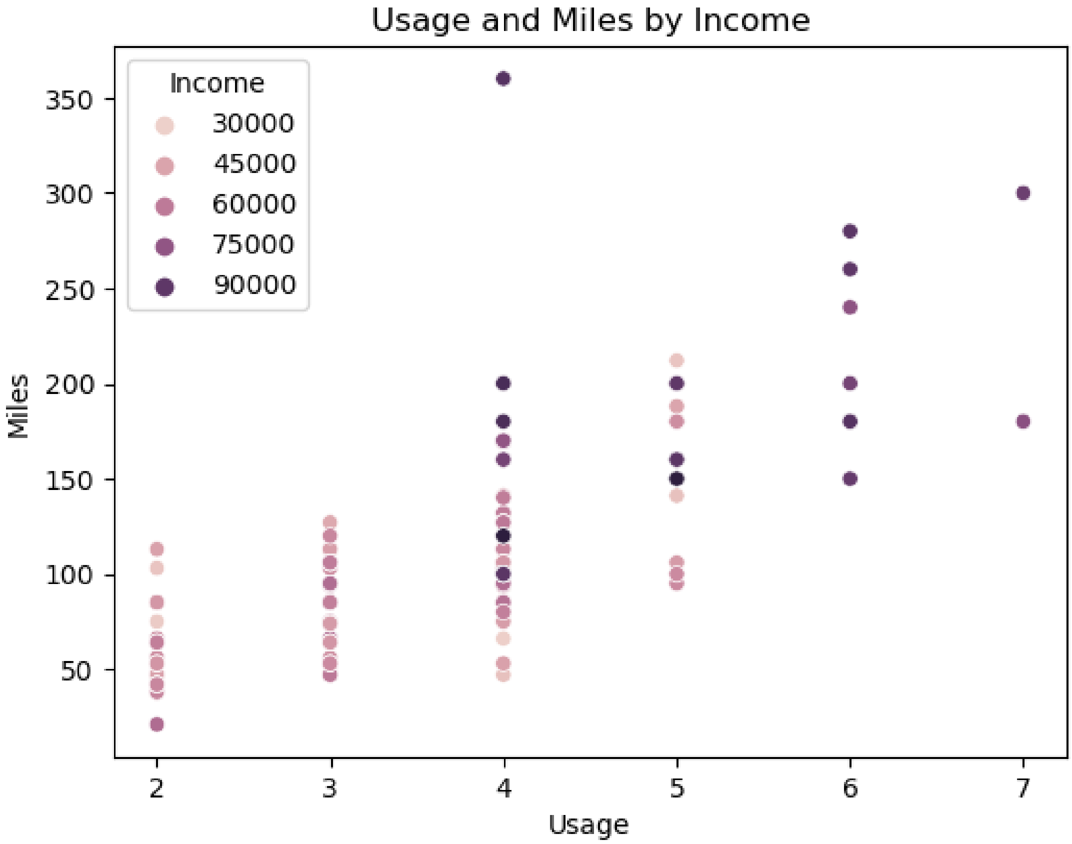


```
[21]: # create a bar chart of the counts by education level
      sns.countplot(x='Education', data=df)
      plt.title('Counts by Education Level')
      plt.show()
```

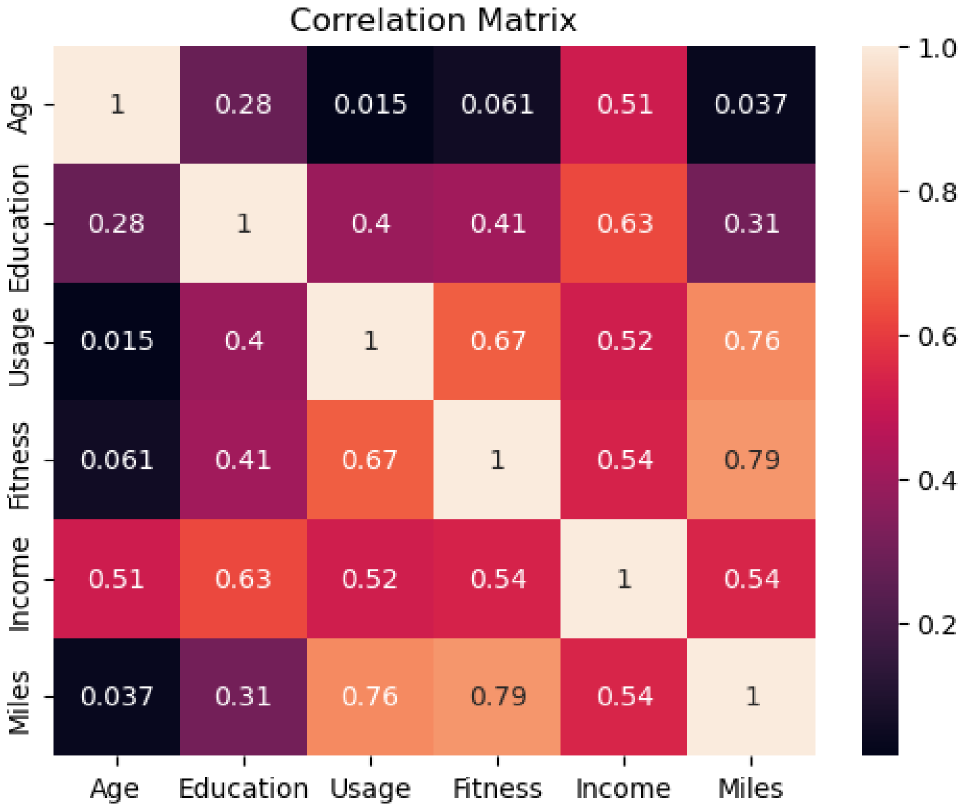


[22]:

```
# create a scatter plot of usage and miles by income
sns.scatterplot(x='Usage', y='Miles', hue='Income', data=df)
plt.title('Usage and Miles by Income')
plt.show()
```

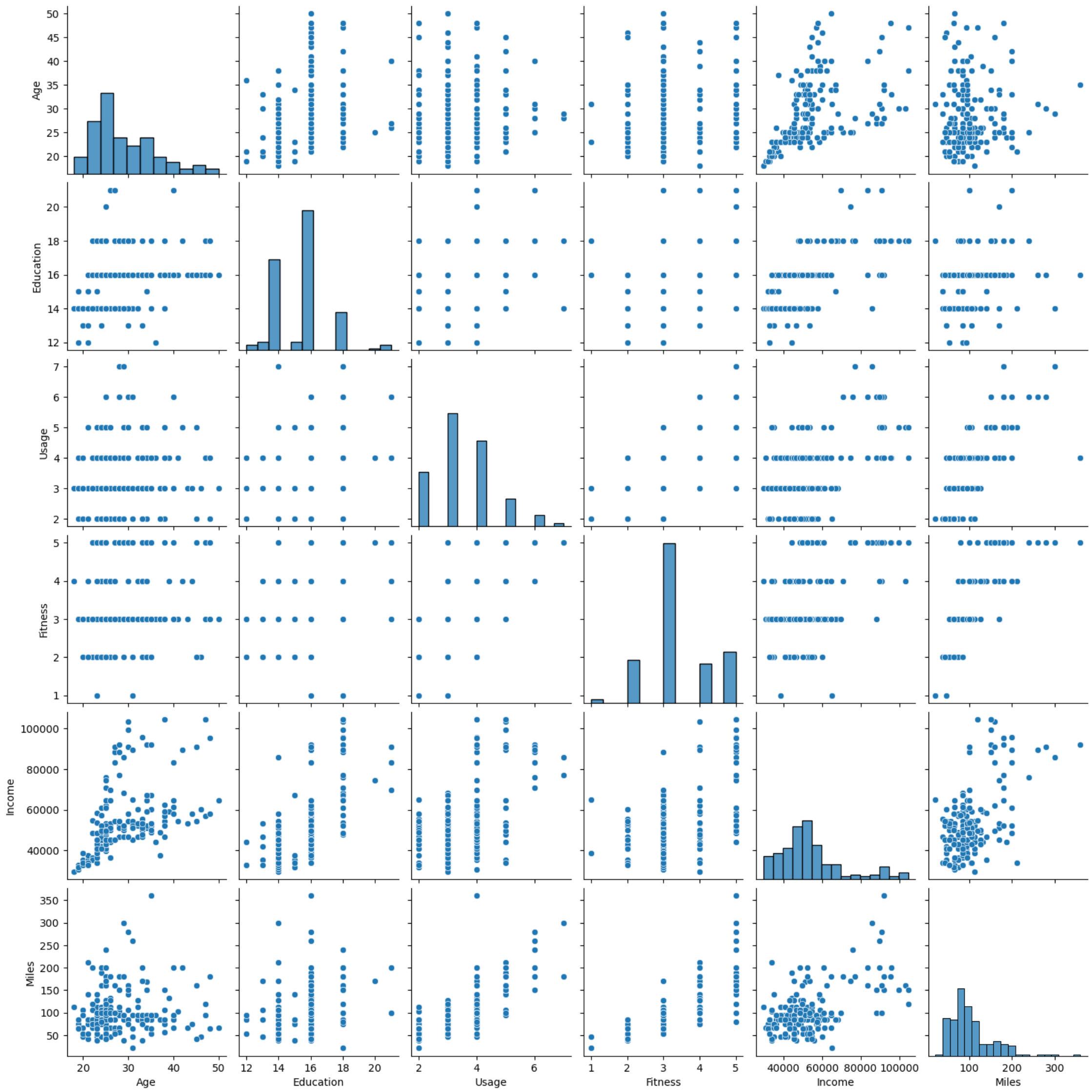


[24]:
```
# create a heatmap of the correlation matrix
corr_matrix = df[['Age', 'Education', 'Usage', 'Fitness', 'Income', 'Miles']].
 ↪corr()
sns.heatmap(corr_matrix, annot=True)
plt.title('Correlation Matrix')
plt.show()
```



[25]:
```
sns.pairplot(df)
```

[25]:
```
<seaborn.axisgrid.PairGrid at 0x7fc65ccf5d10>
```



[26]:

```
df['Product'].unique()
```

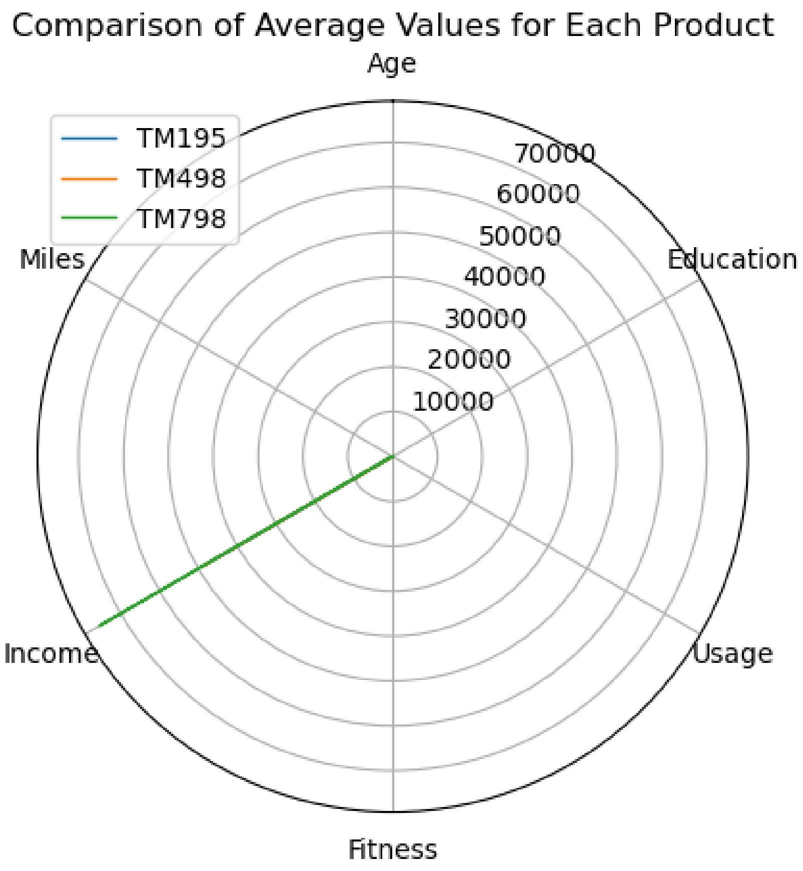
[26]:

```
array(['TM195', 'TM498', 'TM798'], dtype=object)
```

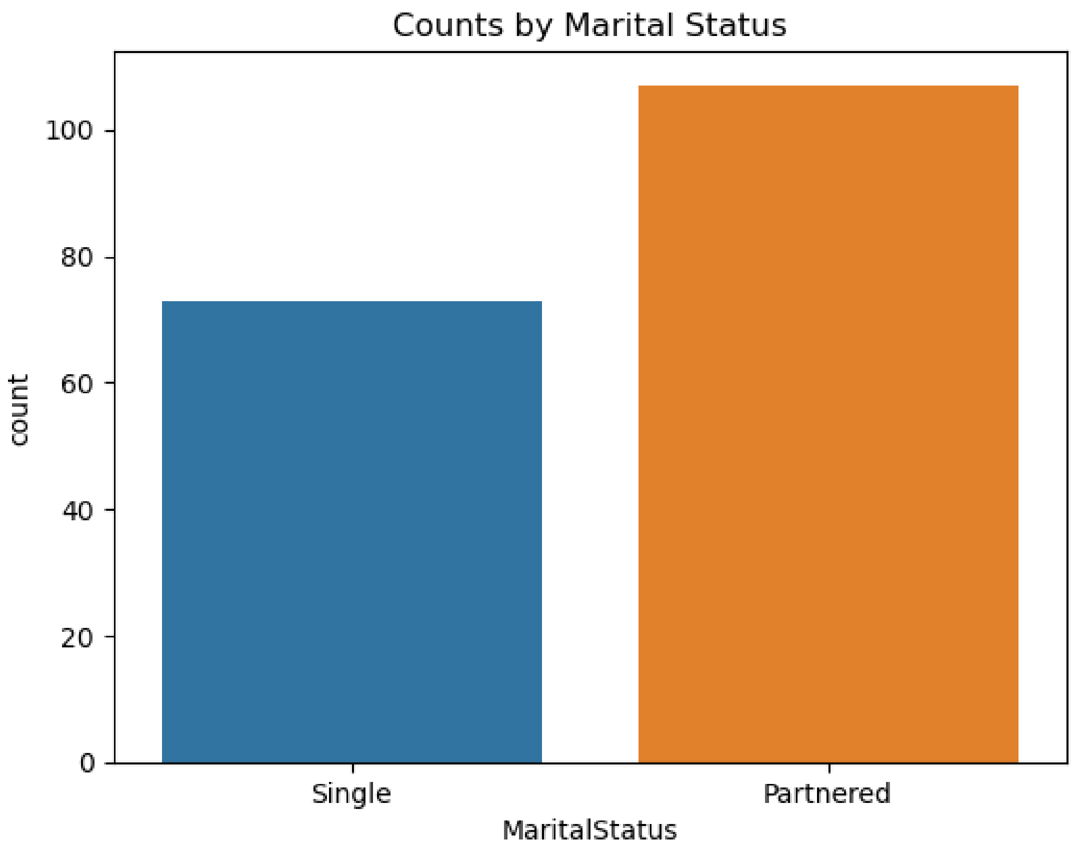
[29]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from math import pi

# subset the data by product
df_product1 = df[df['Product'] == 'TM195']
df_product2 = df[df['Product'] == 'TM498']
df_product3 = df[df['Product'] == 'TM798']
```

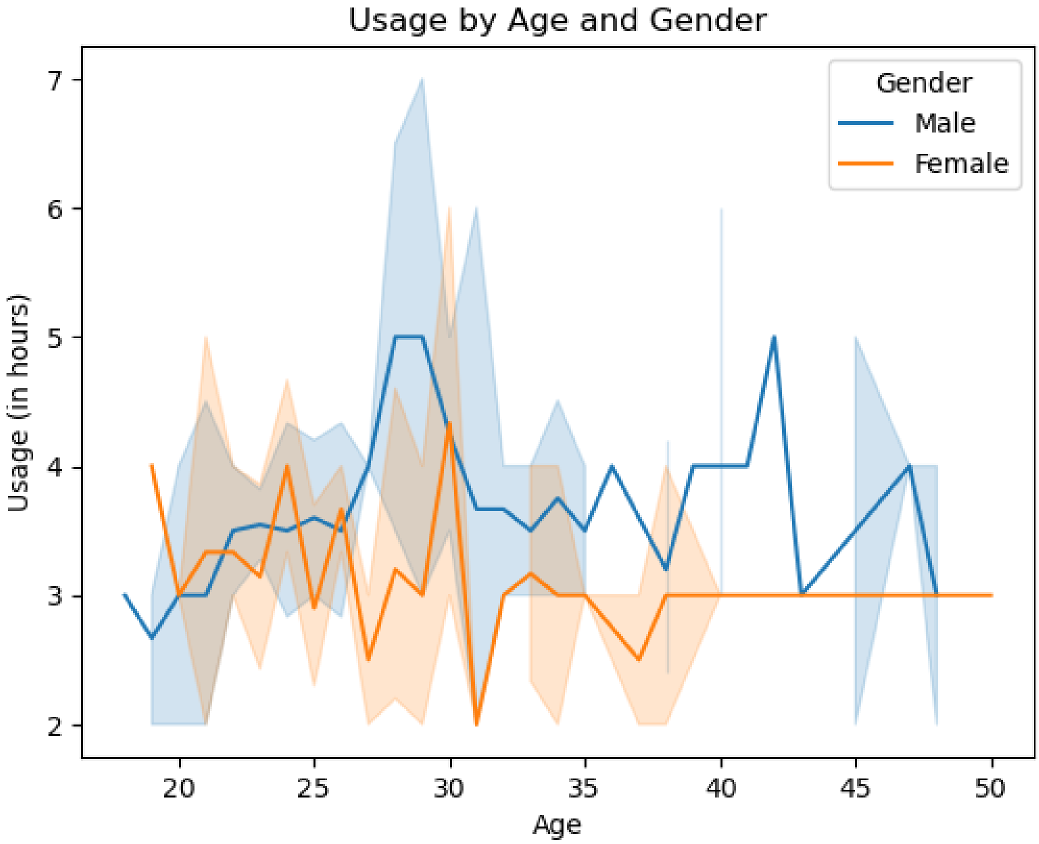
```
# calculate the average values for each column by product
product1_avg = df_product1[['Age', 'Education', 'Usage', 'Fitness', 'Income',␣
 ↪'Miles']].mean().values.tolist()
product2_avg = df_product2[['Age', 'Education', 'Usage', 'Fitness', 'Income',␣
 ↪'Miles']].mean().values.tolist()
product3_avg = df_product3[['Age', 'Education', 'Usage', 'Fitness', 'Income',␣
 ↪'Miles']].mean().values.tolist()

# create a list of column names
variables = ['Age', 'Education', 'Usage', 'Fitness', 'Income', 'Miles']

# create a function to create a radar chart
def create_radar_chart(product_avg, product_name):
    # calculate the angles for each variable
    angles = [n / float(len(variables)) * 2 * pi for n in range(len(variables))]
    angles += angles[:1]

    # create a sub-plot with a polar projection
    ax = plt.subplot(111, polar=True)

    # set the clockwise direction and start angle at 90 degrees
    ax.set_theta_offset(pi / 2)
    ax.set_theta_direction(-1)

    # add the first product values as a line
    values = product_avg + product_avg[:1]
    ax.plot(angles, values, linewidth=1, linestyle='solid', label=product_name)
    ax.fill(angles, values, alpha=0.1)

    # add the column names as labels
    plt.xticks(angles[:-1], variables)

    # add a legend and title
    plt.legend(loc='upper left')
    plt.title('Comparison of Average Values for Each Product')

# create the radar chart for each product
create_radar_chart(product1_avg, 'TM195')
create_radar_chart(product2_avg, 'TM498')
create_radar_chart(product3_avg, 'TM798')

# show the plot
plt.show()
```



[32]:
```
sns.countplot(x='MaritalStatus', data=df)
plt.title('Counts by Marital Status')
plt.show()
```



[33]:
```
sns.lineplot(x='Age', y='Usage', hue='Gender', data=df)
plt.title('Usage by Age and Gender')
plt.xlabel('Age')
plt.ylabel('Usage (in hours)')
plt.show()
```


Usage by Age and Gender
Gender
Male
Female
Usage (in hours)
2
3
4
5
6
7
Age
20
25
30
35
40
45
50

```
[ ]:
```