Walmart

March 21, 2023

[85]:
```
import pandas as pd
import seaborn as sns
import numpy as np
from scipy.stats import norm
import matplotlib.pyplot as plt
```

[2]:
```
df = pd.read_csv("walmart_data.csv")
```

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

[3]:
```
   User_ID Product_ID Gender   Age  Occupation City_Category  \
0  1000001  P00069042      F  0-17          10             A
1  1000001  P00248942      F  0-17          10             A
2  1000001  P00087842      F  0-17          10             A

  Stay_In_Current_City_Years  Marital_Status  Product_Category  Purchase
0                          2               0                 3      8370
1                          2               0                 1     15200
2                          2               0                12      1422
```

[4]:
```
df.shape
```

[4]: (550068, 10)

[5]:
```
df.corr()
```

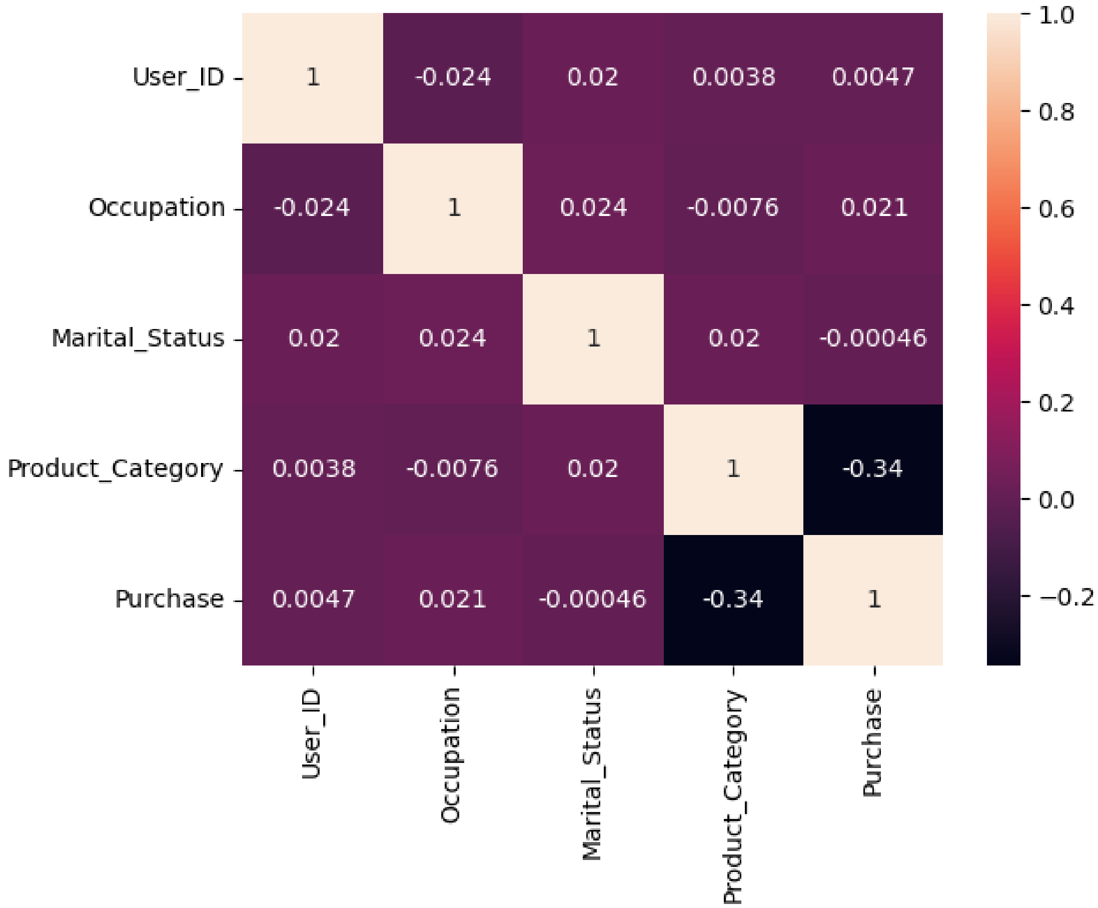
[5]:
```
                   User_ID  Occupation  Marital_Status  Product_Category  \
User_ID           1.000000   -0.023971        0.020443          0.003825
Occupation       -0.023971    1.000000        0.024280         -0.007618
Marital_Status    0.020443    0.024280        1.000000          0.019888
Product_Category  0.003825   -0.007618        0.019888          1.000000
Purchase          0.004716    0.020833       -0.000463         -0.343703

                  Purchase
User_ID           0.004716
Occupation        0.020833
Marital_Status   -0.000463
Product_Category -0.343703
```

```
Purchase            1.000000
```

[6]:
```
sns.heatmap(df.corr(),annot=True)
```

[6]:
```
<AxesSubplot:>
```



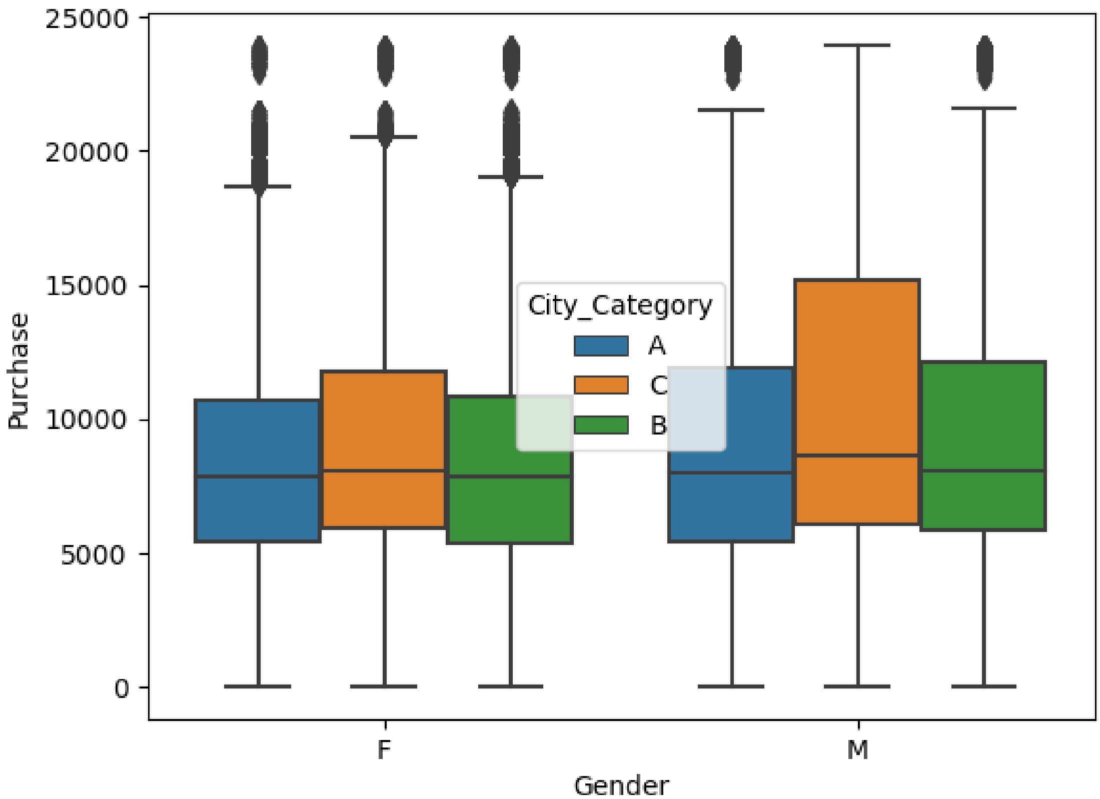
[71]:
```
df.describe()
```

[71]:
```
            User_ID     Occupation  Marital_Status  Product_Category  \
count  5.500680e+05  550068.000000   550068.000000     550068.000000
mean   1.003029e+06       8.076707        0.409653          5.404270
std    1.727592e+03       6.522660        0.491770          3.936211
min    1.000001e+06       0.000000        0.000000          1.000000
25%    1.001516e+06       2.000000        0.000000          1.000000
50%    1.003077e+06       7.000000        0.000000          5.000000
75%    1.004478e+06      14.000000        1.000000          8.000000
max    1.006040e+06      20.000000        1.000000         20.000000
```

	Purchase
count	550068.000000
mean	9263.968713
std	5023.065394
min	12.000000
25%	5823.000000
50%	8047.000000
75%	12054.000000
max	23961.000000

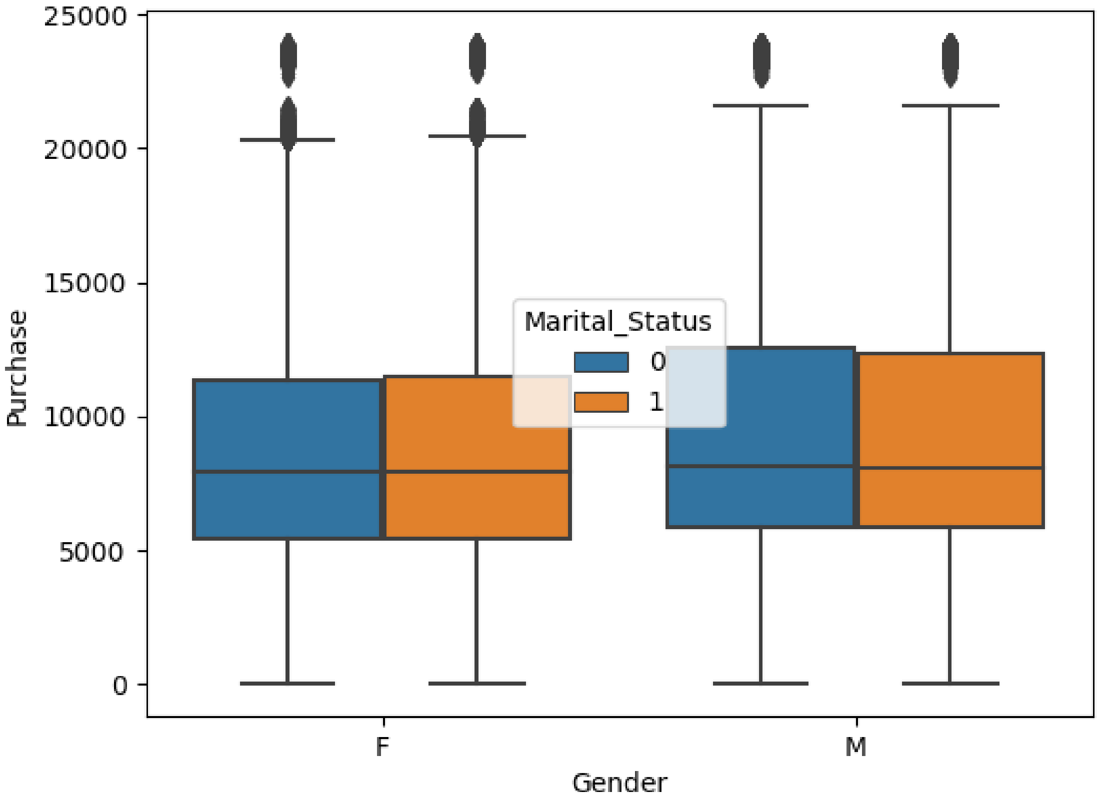
[73]:
```
sns.boxplot(data=df,x="Gender",y="Purchase",hue="City_Category")
```

[73]: <AxesSubplot:xlabel='Gender', ylabel='Purchase'>



[74]:
```
sns.boxplot(data=df,x="Gender",y="Purchase",hue="Marital_Status")
```

[74]: <AxesSubplot:xlabel='Gender', ylabel='Purchase'>



[7]:
```
df.groupby(["Gender"])["Purchase"].mean()
```

[7]:
```
Gender
F    8734.565765
M    9437.526040
Name: Purchase, dtype: float64
```

[66]:
```
print(df[df["Gender"] == "F"].shape[0]/df.shape[0])# Female Probabilty of␣
 ↪purchasing
print(1 - df[df["Gender"] == "F"].shape[0]/df.shape[0]) # Male Probabilty of␣
 ↪purchasing
```

```
0.24689492935418894
0.7531050706458111
```

1 Gender

1. 95% Confidence interval

[67]:
```
female_sample_mean = []
for i in range(100):
```

```
    female_sample_mean.append(np.random.choice(df[df["Gender"] ==␣
↪"F"]["Purchase"],1000).mean())
clt1 = np.mean(female_sample_mean) - (1.96*np.std(df[df["Gender"] ==␣
↪"F"]["Purchase"])/np.sqrt(1000))
clt2 = np.mean(female_sample_mean) + (1.96*np.std(df[df["Gender"] ==␣
↪"F"]["Purchase"])/np.sqrt(1000))

print("Confidence interval for female customers: ({}, {})".format(clt1, clt2))

# 95% confidence interval for female customers buying in the range of (8431.
↪818847341126, 9022.769032658869)
# The actual population mean for female customers = 8734.565765
# our sample confidence interval proves that 95% of female customers are buying␣
↪in the range of 8431.82 - 9022.76
```

```
Confidence interval for female customers: (8431.818847341126, 9022.769032658869)
```

[10]:
```
male_sample_mean = []
for i in range(100):
    male_sample_mean.append(np.random.choice(df[df["Gender"] ==␣
↪"M"]["Purchase"],1000).mean())
clt1 = np.mean(male_sample_mean) - (1.96*np.std(df[df["Gender"] ==␣
↪"M"]["Purchase"])/np.sqrt(1000))
clt2 = np.mean(male_sample_mean) + (1.96*np.std(df[df["Gender"] ==␣
↪"M"]["Purchase"])/np.sqrt(1000))

print("Confidence interval for Male customers: ({}, {})".format(clt1, clt2))

# 95% confidence interval for male customers buying in the range of (9336.
↪350516052735, 9535.963974547263)
# The actual population mean for male customers = 9437.526040
# our sample confidence interval proves that 95% of male customers are buying␣
↪in the range of 9336.35 - 9535.96
```

```
Confidence interval for Male customers: (9336.350516052735, 9535.963974547263)
```

2. 99% Confidence Interval

[11]:
```
f_sample_size = 1000
female_sample_mean = []
for i in range(100):
    female_sample_mean.append(np.random.choice(df[df["Gender"] ==␣
↪"F"]["Purchase"],f_sample_size).mean())
clt1 = np.mean(female_sample_mean) - (norm.ppf(0.99)*np.std(df[df["Gender"] ==␣
↪"F"]["Purchase"])/np.sqrt(f_sample_size))
clt2 = np.mean(female_sample_mean) + (norm.ppf(0.99)*np.std(df[df["Gender"] ==␣
↪"F"]["Purchase"])/np.sqrt(f_sample_size))
```

```
print("Confidence interval for female customers: ({}, {})".format(clt1, clt2))

# 99% confidence interval for female customers buying in the range of (8373.
↪068243449497, 9074.474216550503)
# The actual population mean for female customers = 8734.565765
# our sample confidence interval proves that 99% of female customers are buying␣
↪in the range of 8431.82 - 9022.76
```

```
Confidence interval for female customers: (8373.068243449497, 9074.474216550503)
```

[12]:
```
m_sample_size = 10000
male_sample_mean = []
for i in range(1000):
    male_sample_mean.append(np.random.choice(df[df["Gender"] ==␣
↪"M"]["Purchase"],m_sample_size).mean())
clt1 = np.mean(male_sample_mean) - (norm.ppf(0.99)*np.std(df[df["Gender"] ==␣
↪"M"]["Purchase"])/np.sqrt(m_sample_size))
clt2 = np.mean(male_sample_mean) + (norm.ppf(0.99)*np.std(df[df["Gender"] ==␣
↪"M"]["Purchase"])/np.sqrt(m_sample_size))

print("Confidence interval for Male customers: ({}, {})".format(clt1, clt2))

# 99% confidence interval for male customers buying in the range of (9317.
↪895776347275, 9554.819421652726)
# The actual population mean for male customers = 9437.526040
# our sample confidence interval proves that 99% of male customers are buying␣
↪in the range of 9317.90 - 9535.82
```

```
Confidence interval for Male customers: (9317.895776347275, 9554.819421652726)
```

3. 90% Confidence Interval

[13]:
```
f_sample_size = 1000
female_sample_mean = []
for i in range(100):
    female_sample_mean.append(np.random.choice(df[df["Gender"] ==␣
↪"F"]["Purchase"],f_sample_size).mean())
clt1 = np.mean(female_sample_mean) - (norm.ppf(0.90)*np.std(df[df["Gender"] ==␣
↪"F"]["Purchase"])/np.sqrt(f_sample_size))
clt2 = np.mean(female_sample_mean) + (norm.ppf(0.90)*np.std(df[df["Gender"] ==␣
↪"F"]["Purchase"])/np.sqrt(f_sample_size))

print("Confidence interval for female customers: ({}, {})".format(clt1, clt2))

# 90% confidence interval for female customers buying in the range of (8561.
↪08909164469, 8947.483548355312)
# The actual population mean for female customers = 8734.565765
```

```
# our sample confidence interval proves that 90% of female customers are buying␣
↪in the range of 8561.08 - 8947.48
```

```
Confidence interval for female customers: (8561.08909164469, 8947.483548355312)
```

[14]:
```
m_sample_size = 10000
male_sample_mean = []
for i in range(1000):
    male_sample_mean.append(np.random.choice(df[df["Gender"] ==␣
↪"M"]["Purchase"],m_sample_size).mean())
clt1 = np.mean(male_sample_mean) - (norm.ppf(0.90)*np.std(df[df["Gender"] ==␣
↪"M"]["Purchase"])/np.sqrt(m_sample_size))
clt2 = np.mean(male_sample_mean) + (norm.ppf(0.90)*np.std(df[df["Gender"] ==␣
↪"M"]["Purchase"])/np.sqrt(m_sample_size))

print("Confidence interval for Male customers: ({}, {})".format(clt1, clt2))

# 90% confidence interval for male customers buying in the range of (9373.
↪493768674123, 9504.011595325877)
# The actual population mean for male customers = 9437.526040
# our sample confidence interval proves that 90% of male customers are buying␣
↪in the range of 9373.49 - 9504.01
```

```
Confidence interval for Male customers: (9373.493768674123, 9504.011595325877)
```

[ ]:
```
# The amount spend by male was higher than female
# From clt analysis our sample data says that population of male is buying is␣
↪higher than female
# Male customers from city "C" is buying more compared to other cities
```

2 Marital_status sample experiment

1. 95% Confident Interval

[68]:
```
mar_sample_mean = []
for i in range(100):
    mar_sample_mean.append(np.random.choice(df[df['Marital_Status'] == 0].
↪Purchase, 1000).mean())

unmar_sample_mean = []
for i in range(100):
    unmar_sample_mean.append(np.random.choice(df[df['Marital_Status'] == 1].
↪Purchase, 1000).mean())

mar_standard_error = df[df['Marital_Status'] == 0].Purchase.std() / np.
↪sqrt(1000)
```

```
unmar_standard_error = df[df['Marital_Status'] == 1].Purchase.std() / np.
 ↪sqrt(1000)

mar_clt1 = np.mean(mar_sample_mean) - (1.96 * mar_standard_error)
mar_clt2 = np.mean(mar_sample_mean) + (1.96 * mar_standard_error)

unmar_clt1 = np.mean(unmar_sample_mean) - (1.96 * unmar_standard_error)
unmar_clt2 = np.mean(unmar_sample_mean) + (1.96 * unmar_standard_error)

print("Married customers purchase amount confidence interval:", mar_clt1, "-",␣
 ↪mar_clt2)
print("Unmarried customers purchase amount confidence interval:", unmar_clt1,␣
 ↪"-", unmar_clt2)

# 95% confidence interval of our sample mean for married = [8967.40317146172 ,␣
 ↪9590.599668538278]
# Unmarried customers purchase amount confidence interval: [8967.16184897741,␣
 ↪9589.062891022588]
```

```
Married customers purchase amount confidence interval: 8967.40317146172 -
9590.599668538278
Unmarried customers purchase amount confidence interval: 8967.16184897741 -
9589.062891022588
```

[16]:
```
df.groupby(["Marital_Status"])["Purchase"].mean()
```

[16]:
```
Marital_Status
0    9265.907619
1    9261.174574
Name: Purchase, dtype: float64
```

2. 99% Confident Interval

[69]:
```
mar_sample_mean = []
for i in range(100):
    mar_sample_mean.append(np.random.choice(df[df['Marital_Status'] == 0].
 ↪Purchase, 1000).mean())

unmar_sample_mean = []
for i in range(100):
    unmar_sample_mean.append(np.random.choice(df[df['Marital_Status'] == 1].
 ↪Purchase, 1000).mean())

mar_standard_error = df[df['Marital_Status'] == 0].Purchase.std() / np.
 ↪sqrt(1000)
unmar_standard_error = df[df['Marital_Status'] == 1].Purchase.std() / np.
 ↪sqrt(1000)
```

```
mar_clt1 = np.mean(mar_sample_mean) - (norm.ppf(0.99) * mar_standard_error)
mar_clt2 = np.mean(mar_sample_mean) + (norm.ppf(0.99) * mar_standard_error)

unmar_clt1 = np.mean(unmar_sample_mean) - (norm.ppf(0.99) *␣
↪unmar_standard_error)
unmar_clt2 = np.mean(unmar_sample_mean) + (norm.ppf(0.99) *␣
↪unmar_standard_error)

print("Married customers purchase amount confidence interval:", mar_clt1, "-",␣
↪mar_clt2)
print("Unmarried customers purchase amount confidence interval:", unmar_clt1,␣
↪"-", unmar_clt2)

# Married customers purchase amount confidence interval ~ [8890.088513345981 ,␣
↪9629.768026654016]
# Unmarried customers purchase amount confidence interval ~ [8889.550749024085␣
↪, 9627.692670975914]
```

```
Married customers purchase amount confidence interval: 8890.088513345981 -
9629.768026654016
Unmarried customers purchase amount confidence interval: 8889.550749024085 -
9627.692670975914
```

3. 90% Confident Interval

[70]:
```
mar_sample_mean = []
for i in range(100):
    mar_sample_mean.append(np.random.choice(df[df['Marital_Status'] == 0].
↪Purchase, 1000).mean())

unmar_sample_mean = []
for i in range(100):
    unmar_sample_mean.append(np.random.choice(df[df['Marital_Status'] == 1].
↪Purchase, 1000).mean())

mar_standard_error = df[df['Marital_Status'] == 0].Purchase.std() / np.
↪sqrt(1000)
unmar_standard_error = df[df['Marital_Status'] == 1].Purchase.std() / np.
↪sqrt(1000)

mar_clt1 = np.mean(mar_sample_mean) - (norm.ppf(0.90) * mar_standard_error)
mar_clt2 = np.mean(mar_sample_mean) + (norm.ppf(0.90) * mar_standard_error)

unmar_clt1 = np.mean(unmar_sample_mean) - (norm.ppf(0.90) *␣
↪unmar_standard_error)
unmar_clt2 = np.mean(unmar_sample_mean) + (norm.ppf(0.90) *␣
↪unmar_standard_error)
```

```
print("Married customers purchase amount confidence interval:", mar_clt1, "-",
 ↪mar_clt2)
print("Unmarried customers purchase amount confidence interval:", unmar_clt1,
 ↪"-", unmar_clt2)

# Married customers purchase amount confidence interval ~ [9055.07402039021 ,
 ↪9462.552819609788]
# Unmarried customers purchase amount confidence interval ~ [9063.087828865606
 ↪, 9469.719591134392]
```

```
Married customers purchase amount confidence interval: 9055.07402039021 -
9462.552819609788
Unmarried customers purchase amount confidence interval: 9063.087828865606 -
9469.719591134392
```

[ ]:
```
# For the comparispn of marital status, there is no major difference between
 ↪single and married
# From the clt analysis of above sample data shows that there is no difference
# which means that both single and married persons are buying products in the
 ↪range of [9055.07402039021 , 9469.719591134392]
```

[19]:
```
df["Age"].value_counts()
```

[19]:
```
26-35    219587
36-45    110013
18-25     99660
46-50     45701
51-55     38501
55+       21504
0-17      15102
Name: Age, dtype: int64
```

[20]:
```
df.groupby("Age")["Purchase"].mean()
```

[20]:
```
Age
0-17     8933.464640
18-25    9169.663606
26-35    9252.690633
36-45    9331.350695
46-50    9208.625697
51-55    9534.808031
55+      9336.280459
Name: Purchase, dtype: float64
```

[21]:
```
df["Age"].unique()
```

[21]: array(['0-17', '55+', '26-35', '46-50', '51-55', '36-45', '18-25'],
      dtype=object)

3 Age

1. 95% Confident Interval

[22]:
```
under_18 = []
above18_25 = []
above26_35 = []
above36_45 = []
above46_50 = []
above51_55 = []
above_55 = []
sample_size = 1000
for i in range(100):
    under_18.append(np.random.choice(df[df["Age"] ==␣
 ↪"0-17"]["Purchase"],sample_size).mean())
    above18_25.append(np.random.choice(df[df["Age"] ==␣
 ↪"18-25"]["Purchase"],sample_size).mean())
    above26_35.append(np.random.choice(df[df["Age"] ==␣
 ↪"26-35"]["Purchase"],sample_size).mean())
    above36_45.append(np.random.choice(df[df["Age"] ==␣
 ↪"36-45"]["Purchase"],sample_size).mean())
    above46_50.append(np.random.choice(df[df["Age"] ==␣
 ↪"46-50"]["Purchase"],sample_size).mean())
    above51_55.append(np.random.choice(df[df["Age"] ==␣
 ↪"51-55"]["Purchase"],sample_size).mean())
    above_55.append(np.random.choice(df[df["Age"] ==␣
 ↪"55+"]["Purchase"],sample_size).mean())


clt_under_18 = [np.mean(under_18) - (1.96*np.std(df[df["Age"] ==␣
 ↪"0-17"]["Purchase"])/np.sqrt(sample_size)),
                np.mean(under_18) + (1.96*np.std(df[df["Age"] ==␣
 ↪"0-17"]["Purchase"])/np.sqrt(sample_size))]
clt_above18_25 = [np.mean(above18_25) - (1.96*np.std(df[df["Age"] ==␣
 ↪"18-25"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above18_25) + (1.96*np.std(df[df["Age"] ==␣
 ↪"18-25"]["Purchase"])/np.sqrt(sample_size))]
clt_above26_35 = [np.mean(above26_35) - (1.96*np.std(df[df["Age"] ==␣
 ↪"26-35"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above26_35) + (1.96*np.std(df[df["Age"] ==␣
 ↪"26-35"]["Purchase"])/np.sqrt(sample_size))]
clt_above36_45 = [np.mean(above36_45) - (1.96*np.std(df[df["Age"] ==␣
 ↪"36-45"]["Purchase"])/np.sqrt(sample_size)),
```

```
                  np.mean(above36_45) + (1.96*np.std(df[df["Age"] ==␣
↪"36-45"]["Purchase"])/np.sqrt(sample_size))]
clt_above46_50 = [np.mean(above46_50) - (1.96*np.std(df[df["Age"] ==␣
↪"46-50"]["Purchase"])/np.sqrt(sample_size)),
                   np.mean(above46_50) + (1.96*np.std(df[df["Age"] ==␣
↪"46-50"]["Purchase"])/np.sqrt(sample_size))]
clt_above51_55 = [np.mean(above51_55) - (1.96*np.std(df[df["Age"] ==␣
↪"51-55"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above51_55) + (1.96*np.std(df[df["Age"] ==␣
↪"51-55"]["Purchase"])/np.sqrt(sample_size))]
clt_above_55 = [np.mean(above_55) - (1.96*np.std(df[df["Age"] ==␣
↪"55+"]["Purchase"])/np.sqrt(sample_size)),
                np.mean(above_55) + (1.96*np.std(df[df["Age"] ==␣
↪"55+"]["Purchase"])/np.sqrt(sample_size))]

print("Age under_18 purchase amount confidence interval:", clt_under_18)
print("Age above18_25 purchase amount confidence interval:", clt_above18_25)
print("Age above26_35 purchase amount confidence interval:", clt_above26_35)
print("Age above36_45 purchase amount confidence interval:", clt_above36_45)
print("Age above46_50 purchase amount confidence interval:", clt_above46_50)
print("Age above51_55 purchase amount confidence interval:", clt_above51_55)
print("Age above_55 purchase amount confidence interval:", clt_above_55)
```

```
Age under_18 purchase amount confidence interval: [8641.047247905422,
9274.606532094578]
Age above18_25 purchase amount confidence interval: [8878.963895358083,
9503.021784641915]
Age above26_35 purchase amount confidence interval: [8968.578917440082,
9589.688902559916]
Age above36_45 purchase amount confidence interval: [9020.935527495376,
9643.58079250463]
Age above46_50 purchase amount confidence interval: [8927.831548258893,
9543.567331741111]
Age above51_55 purchase amount confidence interval: [9215.535254590892,
9846.163745409109]
Age above_55 purchase amount confidence interval: [9020.704126434513,
9641.920913565486]
```

2. 99% Confident Interval

[23]:
```
under_18 = []
above18_25 = []
above26_35 = []
above36_45 = []
above46_50 = []
above51_55 = []
above_55 = []
```

```
sample_size = 1000
for i in range(100):
    under_18.append(np.random.choice(df[df["Age"] ==␣
 ↪"0-17"]["Purchase"],sample_size).mean())
    above18_25.append(np.random.choice(df[df["Age"] ==␣
 ↪"18-25"]["Purchase"],sample_size).mean())
    above26_35.append(np.random.choice(df[df["Age"] ==␣
 ↪"26-35"]["Purchase"],sample_size).mean())
    above36_45.append(np.random.choice(df[df["Age"] ==␣
 ↪"36-45"]["Purchase"],sample_size).mean())
    above46_50.append(np.random.choice(df[df["Age"] ==␣
 ↪"46-50"]["Purchase"],sample_size).mean())
    above51_55.append(np.random.choice(df[df["Age"] ==␣
 ↪"51-55"]["Purchase"],sample_size).mean())
    above_55.append(np.random.choice(df[df["Age"] ==␣
 ↪"55+"]["Purchase"],sample_size).mean())


clt_under_18 = [np.mean(under_18) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"0-17"]["Purchase"])/np.sqrt(sample_size)),
                np.mean(under_18) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"0-17"]["Purchase"])/np.sqrt(sample_size))]
clt_above18_25 = [np.mean(above18_25) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"18-25"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above18_25) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"18-25"]["Purchase"])/np.sqrt(sample_size))]
clt_above26_35 = [np.mean(above26_35) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"26-35"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above26_35) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"26-35"]["Purchase"])/np.sqrt(sample_size))]
clt_above36_45 = [np.mean(above36_45) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"36-45"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above36_45) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"36-45"]["Purchase"])/np.sqrt(sample_size))]
clt_above46_50 = [np.mean(above46_50) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"46-50"]["Purchase"])/np.sqrt(sample_size)),
                   np.mean(above46_50) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"46-50"]["Purchase"])/np.sqrt(sample_size))]
clt_above51_55 = [np.mean(above51_55) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"51-55"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above51_55) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"51-55"]["Purchase"])/np.sqrt(sample_size))]
clt_above_55 = [np.mean(above_55) - (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
 ↪"55+"]["Purchase"])/np.sqrt(sample_size)),
```

```
                np.mean(above_55) + (norm.ppf(0.99)*np.std(df[df["Age"] ==␣
↪"55+"]["Purchase"])/np.sqrt(sample_size))]

print("Age under_18 purchase amount confidence interval:", clt_under_18)
print("Age above18_25 purchase amount confidence interval:", clt_above18_25)
print("Age above26_35 purchase amount confidence interval:", clt_above26_35)
print("Age above36_45 purchase amount confidence interval:", clt_above36_45)
print("Age above46_50 purchase amount confidence interval:", clt_above46_50)
print("Age above51_55 purchase amount confidence interval:", clt_above51_55)
print("Age above_55 purchase amount confidence interval:", clt_above_55)
```

```
Age under_18 purchase amount confidence interval: [8550.827614221356,
9302.806845778645]
Age above18_25 purchase amount confidence interval: [8813.705334894425,
9554.407245105576]
Age above26_35 purchase amount confidence interval: [8899.560486574217,
9636.76349342578]
Age above36_45 purchase amount confidence interval: [8969.3010053735,
9708.326254626498]
Age above46_50 purchase amount confidence interval: [8847.166219266652,
9577.99052073335]
Age above51_55 purchase amount confidence interval: [9173.352571396803,
9921.853208603201]
Age above_55 purchase amount confidence interval: [8956.875374270254,
9694.20514572975]
```

[24]:
```
df.groupby("Age")["Purchase"].mean()
```

[24]:
```
Age
0-17     8933.464640
18-25    9169.663606
26-35    9252.690633
36-45    9331.350695
46-50    9208.625697
51-55    9534.808031
55+      9336.280459
Name: Purchase, dtype: float64
```

3. 90% Confidence Interval

[25]:
```
under_18 = []
above18_25 = []
above26_35 = []
above36_45 = []
above46_50 = []
above51_55 = []
above_55 = []
sample_size = 1000
```

```python
for i in range(100):
    under_18.append(np.random.choice(df[df["Age"] == "0-17"]["Purchase"],sample_size).mean())
    above18_25.append(np.random.choice(df[df["Age"] == "18-25"]["Purchase"],sample_size).mean())
    above26_35.append(np.random.choice(df[df["Age"] == "26-35"]["Purchase"],sample_size).mean())
    above36_45.append(np.random.choice(df[df["Age"] == "36-45"]["Purchase"],sample_size).mean())
    above46_50.append(np.random.choice(df[df["Age"] == "46-50"]["Purchase"],sample_size).mean())
    above51_55.append(np.random.choice(df[df["Age"] == "51-55"]["Purchase"],sample_size).mean())
    above_55.append(np.random.choice(df[df["Age"] == "55+"]["Purchase"],sample_size).mean())



clt_under_18 = [np.mean(under_18) - (norm.ppf(0.90)*np.std(df[df["Age"] == "0-17"]["Purchase"])/np.sqrt(sample_size)),
                np.mean(under_18) + (norm.ppf(0.90)*np.std(df[df["Age"] == "0-17"]["Purchase"])/np.sqrt(sample_size))]
clt_above18_25 = [np.mean(above18_25) - (norm.ppf(0.90)*np.std(df[df["Age"] == "18-25"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above18_25) + (norm.ppf(0.90)*np.std(df[df["Age"] == "18-25"]["Purchase"])/np.sqrt(sample_size))]
clt_above26_35 = [np.mean(above26_35) - (norm.ppf(0.90)*np.std(df[df["Age"] == "26-35"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above26_35) + (norm.ppf(0.90)*np.std(df[df["Age"] == "26-35"]["Purchase"])/np.sqrt(sample_size))]
clt_above36_45 = [np.mean(above36_45) - (norm.ppf(0.90)*np.std(df[df["Age"] == "36-45"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above36_45) + (norm.ppf(0.90)*np.std(df[df["Age"] == "36-45"]["Purchase"])/np.sqrt(sample_size))]
clt_above46_50 = [np.mean(above46_50) - (norm.ppf(0.90)*np.std(df[df["Age"] == "46-50"]["Purchase"])/np.sqrt(sample_size)),
                   np.mean(above46_50) + (norm.ppf(0.90)*np.std(df[df["Age"] == "46-50"]["Purchase"])/np.sqrt(sample_size))]
clt_above51_55 = [np.mean(above51_55) - (norm.ppf(0.90)*np.std(df[df["Age"] == "51-55"]["Purchase"])/np.sqrt(sample_size)),
                  np.mean(above51_55) + (norm.ppf(0.90)*np.std(df[df["Age"] == "51-55"]["Purchase"])/np.sqrt(sample_size))]
clt_above_55 = [np.mean(above_55) - (norm.ppf(0.90)*np.std(df[df["Age"] == "55+"]["Purchase"])/np.sqrt(sample_size)),
                np.mean(above_55) + (norm.ppf(0.90)*np.std(df[df["Age"] == "55+"]["Purchase"])/np.sqrt(sample_size))]
```

```python
print("Age under_18 purchase amount confidence interval:", clt_under_18)
print("Age above18_25 purchase amount confidence interval:", clt_above18_25)
print("Age above26_35 purchase amount confidence interval:", clt_above26_35)
print("Age above36_45 purchase amount confidence interval:", clt_above36_45)
print("Age above46_50 purchase amount confidence interval:", clt_above46_50)
print("Age above51_55 purchase amount confidence interval:", clt_above51_55)
print("Age above_55 purchase amount confidence interval:", clt_above_55)
```

```
Age under_18 purchase amount confidence interval: [8715.701191500526,
9129.955728499472]
Age above18_25 purchase amount confidence interval: [8943.047468519859,
9351.089491480141]
Age above26_35 purchase amount confidence interval: [9078.691276274054,
9484.805803725947]
Age above36_45 purchase amount confidence interval: [9115.987152716441,
9523.105527283557]
Age above46_50 purchase amount confidence interval: [9003.712554774627,
9406.313145225375]
Age above51_55 purchase amount confidence interval: [9323.390895284409,
9735.72912471559]
Age above_55 purchase amount confidence interval: [9106.897689874928,
9513.082050125071]
```

[ ]:
```python
# from the above confidence interval analysis our sample tells that if age is␣
↪increases from 18 to around 50 their purchase power also increases
# After 55+ age their purchase power is also decreases gently not sudden drop,␣
↪but the trend drops a little bit
```

Visual Analysis

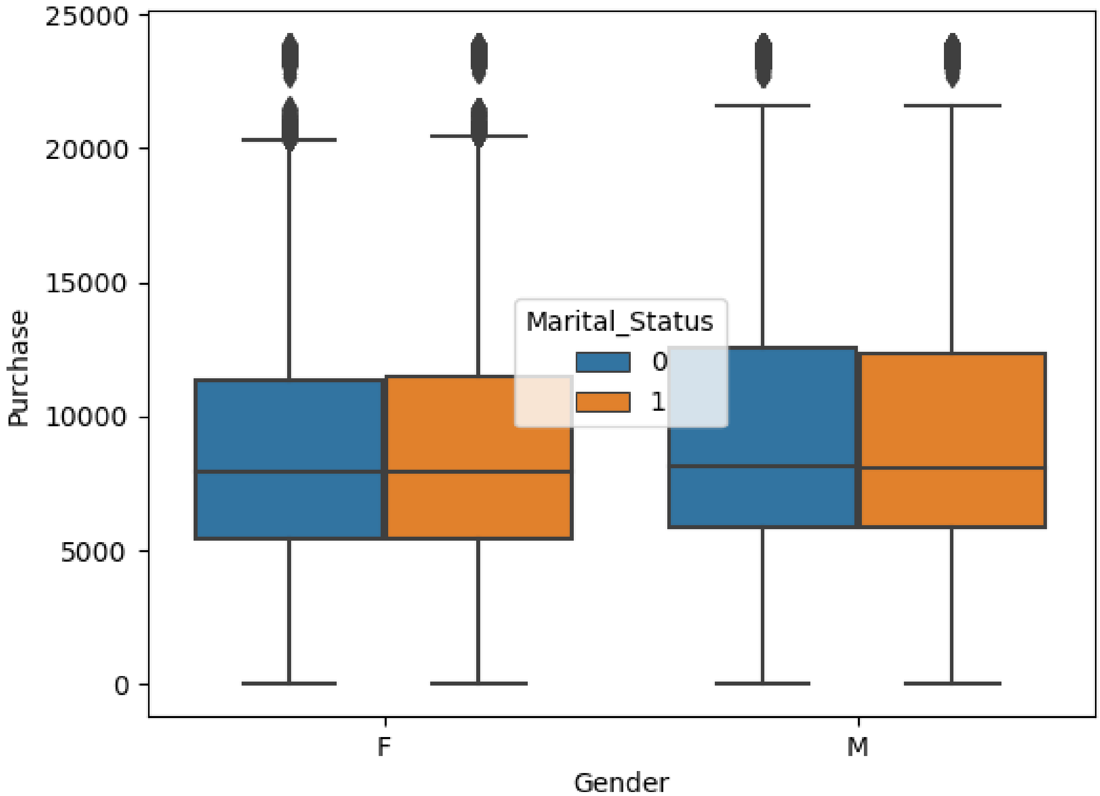
[26]:
```python
df.head(3)
```

[26]:
```
   User_ID Product_ID Gender   Age  Occupation City_Category  \
0  1000001  P00069042      F  0-17          10             A
1  1000001  P00248942      F  0-17          10             A
2  1000001  P00087842      F  0-17          10             A

  Stay_In_Current_City_Years  Marital_Status  Product_Category  Purchase
0                          2               0                 3      8370
1                          2               0                 1     15200
2                          2               0                12      1422
```

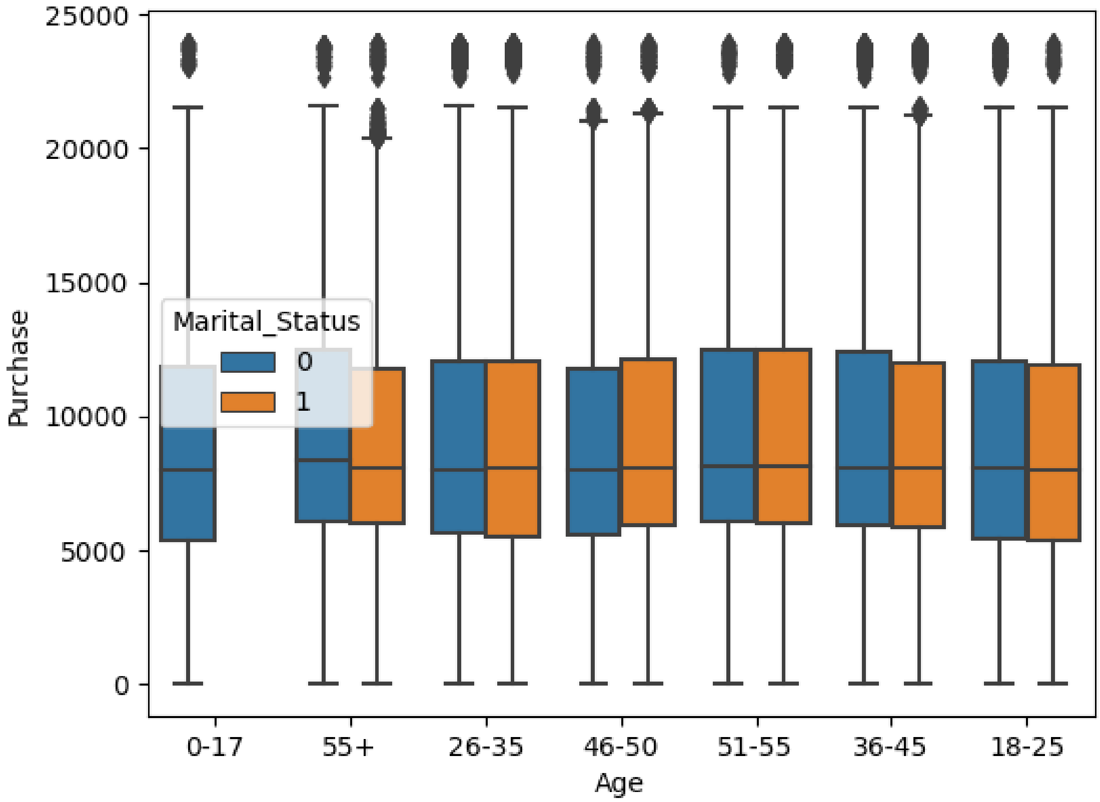
[30]:
```python
sns.boxplot(data=df,x="Gender",y="Purchase",hue="Marital_Status")
```

[30]: <AxesSubplot:xlabel='Gender', ylabel='Purchase'>



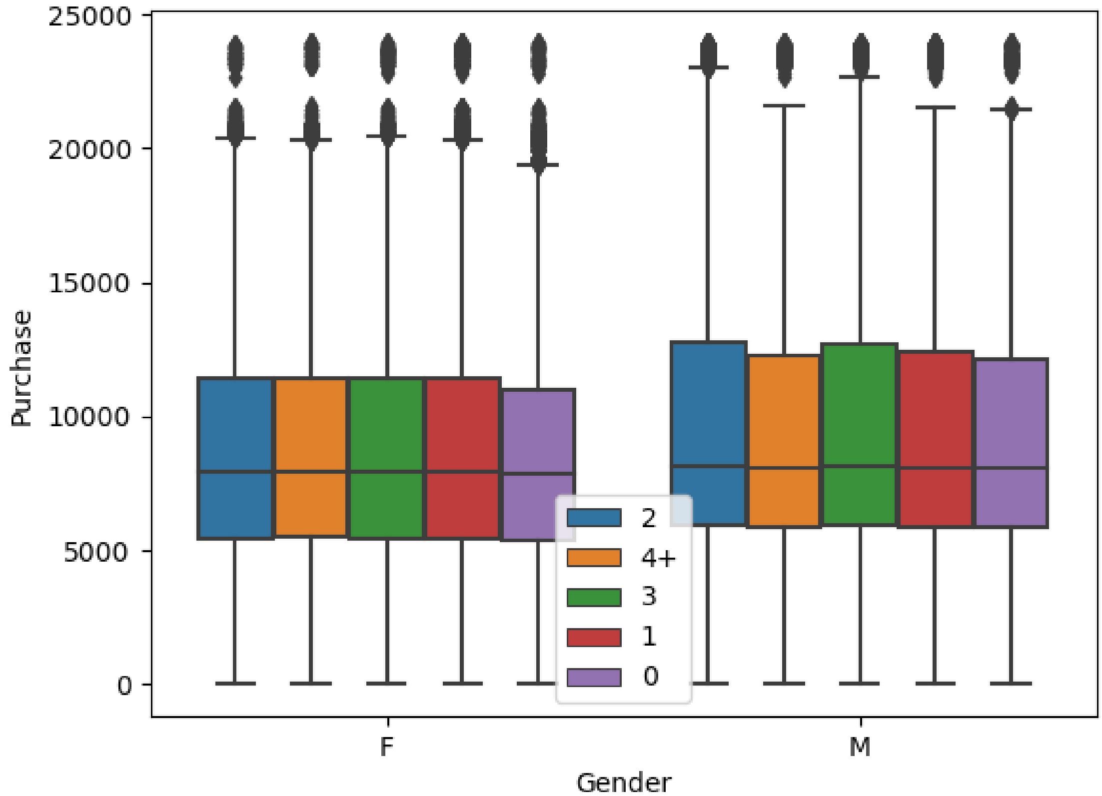
[46]:
```
sns.boxplot(data=df,x="Age",y="Purchase",hue="Marital_Status")
```

[46]: <AxesSubplot:xlabel='Age', ylabel='Purchase'>



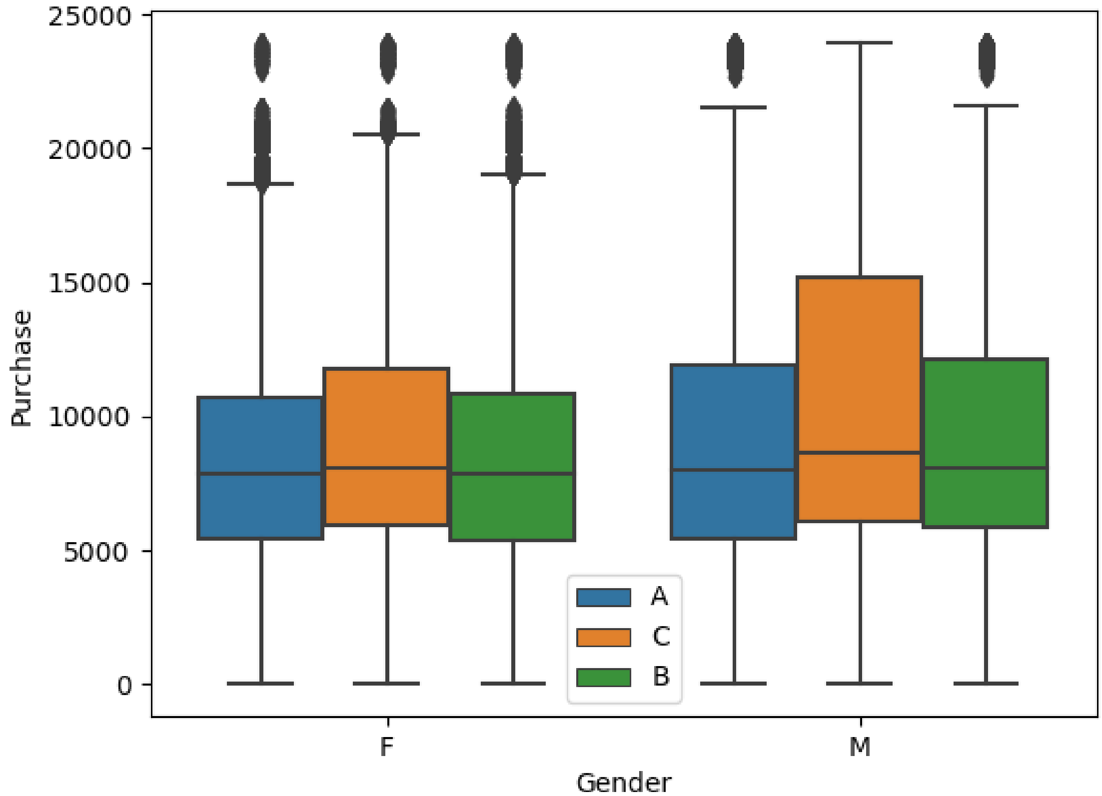
[88]:
```
sns.boxplot(data=df,x="Gender",y="Purchase",hue="Stay_In_Current_City_Years")
plt.legend(loc="lower center")
```

[88]: <matplotlib.legend.Legend at 0x1a83b314cd0>



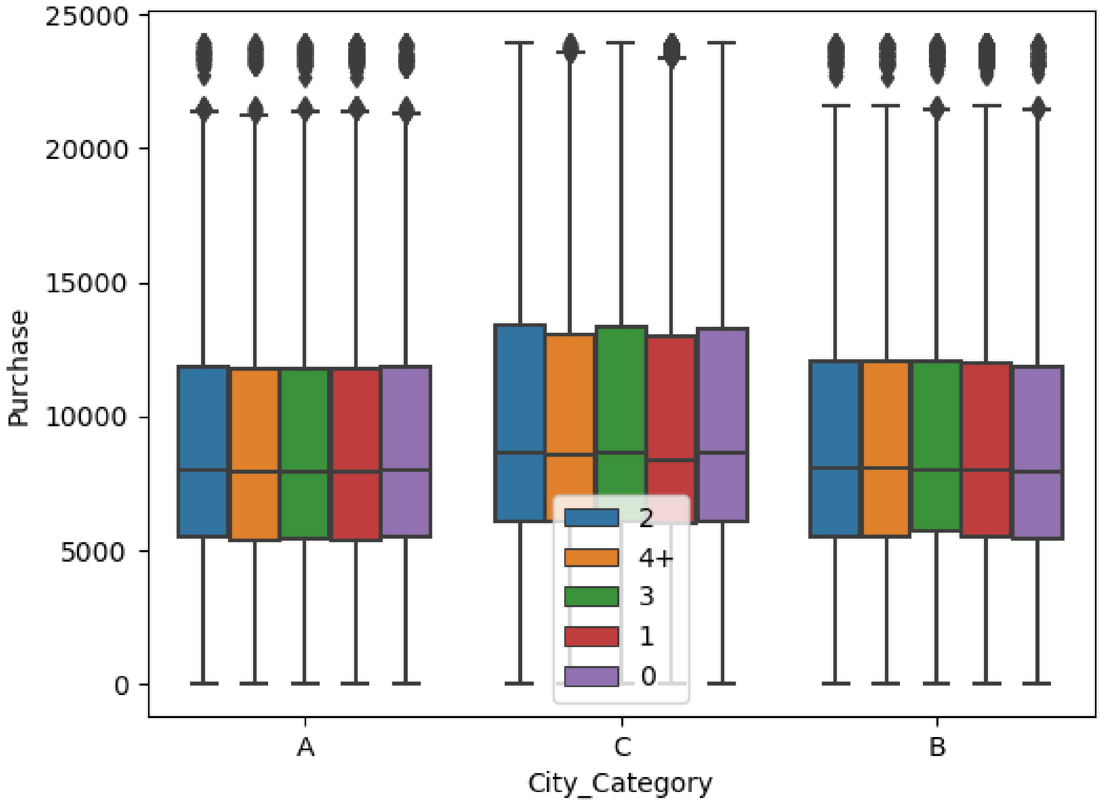
[89]:
```
sns.boxplot(data=df,x="Gender",y="Purchase",hue="City_Category")
plt.legend(loc="lower center")
```

[89]:
```
<matplotlib.legend.Legend at 0x1a837f51580>
```




```
[95]: sns.
        ↪boxplot(data=df,x="City_Category",y="Purchase",hue="Stay_In_Current_City_Years")
      plt.legend(loc="lower center")
```

```
[95]: <matplotlib.legend.Legend at 0x1a83b1e5340>
```



[61]:
```
pd.
↪crosstab(index=df["Gender"],columns=df["Marital_Status"],margins=True,normalize=True)*100
```

[61]:
```
Marital_Status          0          1         All
Gender
F               14.329319  10.360174   24.689493
M               44.705382  30.605125   75.310507
All             59.034701  40.965299  100.000000
```

[62]:
```
pd.
↪crosstab(index=df["Gender"],columns=df["Marital_Status"],margins=True,normalize="columns")*
```

[62]:
```
Marital_Status          0          1        All
Gender
F               24.272706  25.290121  24.689493
M               75.727294  74.709879  75.310507
```

[59]:
```
# Probability of buying products by female given she is married == 24%
# Probability of buying products by female given she is single == 25%
# Probability of buying products by male given he is married == 75%
# Probability of buying products by male given he is single == 74%
```

[59]: 0.24272705716423748

[64]:
```
pd.
↪crosstab(index=df["Gender"],columns=df["Marital_Status"],margins=True,normalize="index")*10
```

[64]:
```
Marital_Status          0          1
Gender
F               58.038127  41.961873
M               59.361414  40.638586
All             59.034701  40.965299
```

[ ]:
```
# Probability of buying products by married given she is female == 58%
# Probability of buying products by single given she is female == 41%
# Probability of buying products by married given he is male == 59%
# Probability of buying products by single given he is male == 40%
```

4 Business recommendation

[ ]:
```
# Male customers are buying more, but we can't say that they are purchasing␣
↪more in black friday, because there is no datetime column.
# So we can improve recommendation to male customers and married people in the␣
↪age of 35 to 40. They are the one with high purchase power.
# If we recommend based on the demand of city that would help walmart to grow␣
↪in business, from data we can see the city c is having high purchase.
```