Twoway

March 24, 2023

[1]:
```
import pandas as pd
import numpy as np
from statsmodels.multivariate.manova import MANOVA
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
df= pd.read_excel("Heart_data.xlsx")
df.head(5)
```

[2]:

	Obs	Sex	Diastolic	Systolic	Height	Weight	Cholesterol	BP_Status	Woking_status
0	1	Female	78	124	62.50	140	281	Normal	Yes
1	2	Female	92	144	59.75	194	181	High	No
2	3	Female	90	170	62.25	132	250	High	Yes
3	4	Female	80	128	65.75	158	242	Normal	Yes
4	5	Male	76	110	66.00	156	281	Optimal	Yes

[14]:
```
df.describe().T
```

[14]:

	count	mean	std	min	25%	50%	75%	max
Obs	114.0	57.500000	33.052988	1.0	29.25	57.500	85.75	114.00
Diastolic	114.0	82.894737	13.146128	60.0	74.50	80.000	88.00	134.00
Systolic	114.0	137.201754	25.340925	98.0	120.00	132.000	146.00	272.00
Height	114.0	65.065789	3.329117	59.0	62.25	64.625	67.50	72.75
Weight	114.0	150.140351	24.605876	91.0	134.00	148.000	165.00	
Cholesterol	114.0	227.947368	41.496528	150.0	196.50	225.000	263.00	

```
Weight       231.00
Cholesterol  339.00
```

[15]:
```
male=df[df["Sex"]=="Male"]
```

[16]:
```
male.describe().T
```

[16]:
```
              count        mean        std    min     25%     50%       75%  \
Obs            46.0   50.369565  30.771819    5.0   21.75   47.500   70.7500
Diastolic      46.0   81.608696  13.337463   60.0   72.00   78.000   89.5000
Systolic       46.0  133.521739  19.898341   98.0  120.50  131.000  144.0000
Height         46.0   67.994565   2.391239   62.5   66.25   67.875   69.9375
Weight         46.0  165.652174  22.326086  122.0  152.25  165.000  180.5000
Cholesterol    46.0  230.369565  43.420609  150.0  198.50  225.000  263.0000

                max
Obs          104.00
Diastolic    134.00
Systolic     210.00
Height        72.75
Weight       231.00
Cholesterol  319.00
```

[17]:
```
female=df[df["Sex"]=="Female"]
```

[18]:
```
female.describe().T
```

[18]:
```
              count        mean        std    min     25%     50%    75%  \
Obs            68.0   62.323529  33.883224    1.0   32.50   64.50   90.5
Diastolic      68.0   83.764706  13.041973   60.0   76.00   81.00   88.0
Systolic       68.0  139.691176  28.311306  106.0  120.00  132.00  152.5
Height         68.0   63.084559   2.231311   59.0   61.75   62.75   64.5
Weight         68.0  139.647059  20.233536   91.0  124.75  140.00  149.0
Cholesterol    68.0  226.308824  40.387769  150.0  196.00  224.50  261.5

                max
Obs          114.00
Diastolic    130.00
Systolic     272.00
Height        68.75
Weight       194.00
Cholesterol  339.00
```

[19]:
```
Y=df[df["Woking_status"]=="Yes"]
```

[22]:
```
Y.head(4)
```

[22]:
```
   Obs     Sex  Diastolic  Systolic  Height  Weight  Cholesterol BP_Status  \
0    1  Female         78       124   62.50     140          281    Normal
2    3  Female         90       170   62.25     132          250      High
3    4  Female         80       128   65.75     158          242    Normal
4    5    Male         76       110   66.00     156          281   Optimal

  Woking_status
0           Yes
2           Yes
3           Yes
4           Yes
```

[21]:
```
Y.shape
```

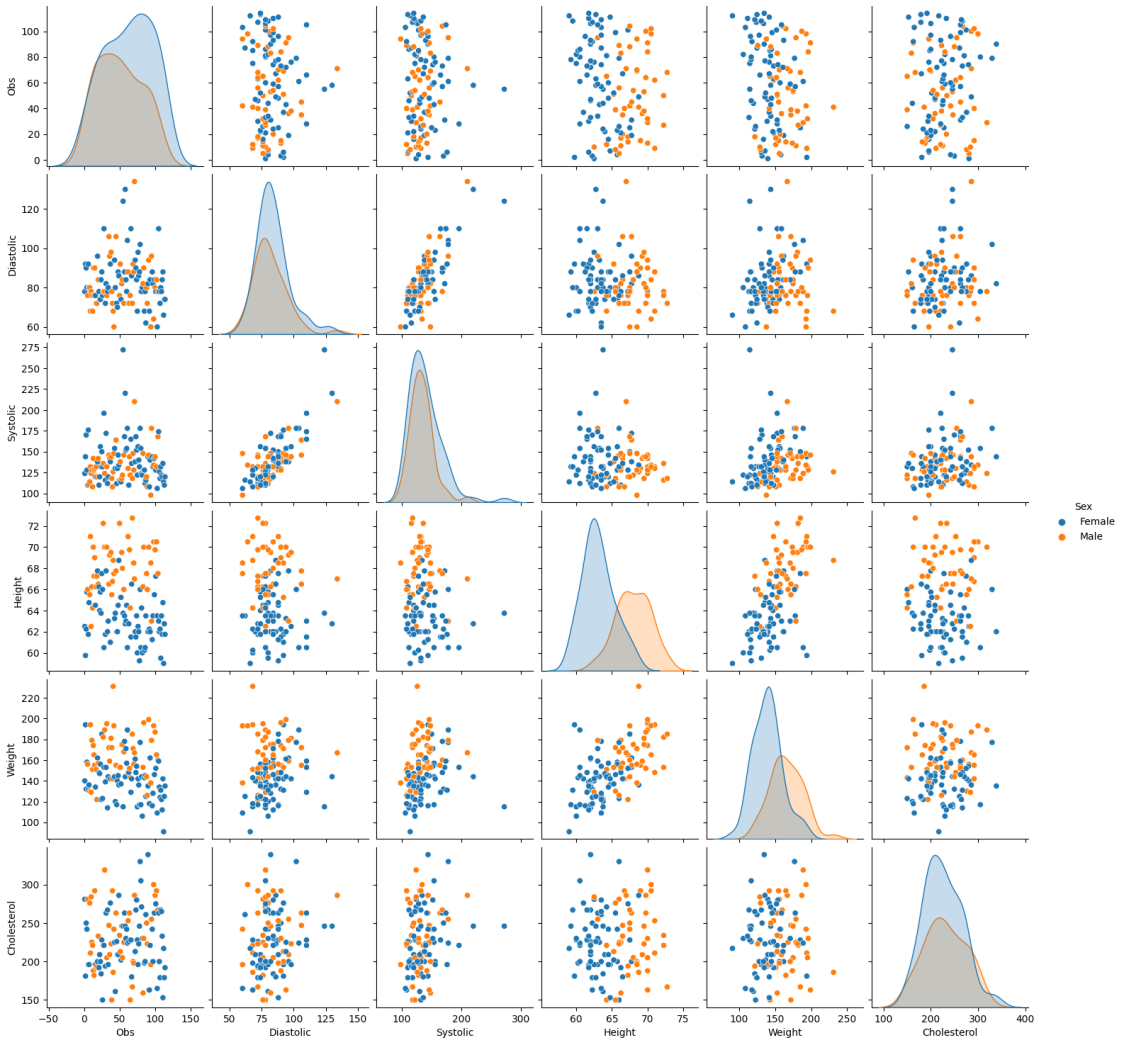
[21]:
```
(101, 9)
```

[3]:
```
manova = MANOVA.from_formula('Diastolic +Systolic + Cholesterol +Weight ~Sex +␣
 ↪Woking_status', data=df)
result = manova.mv_test()
print(result.summary())
```

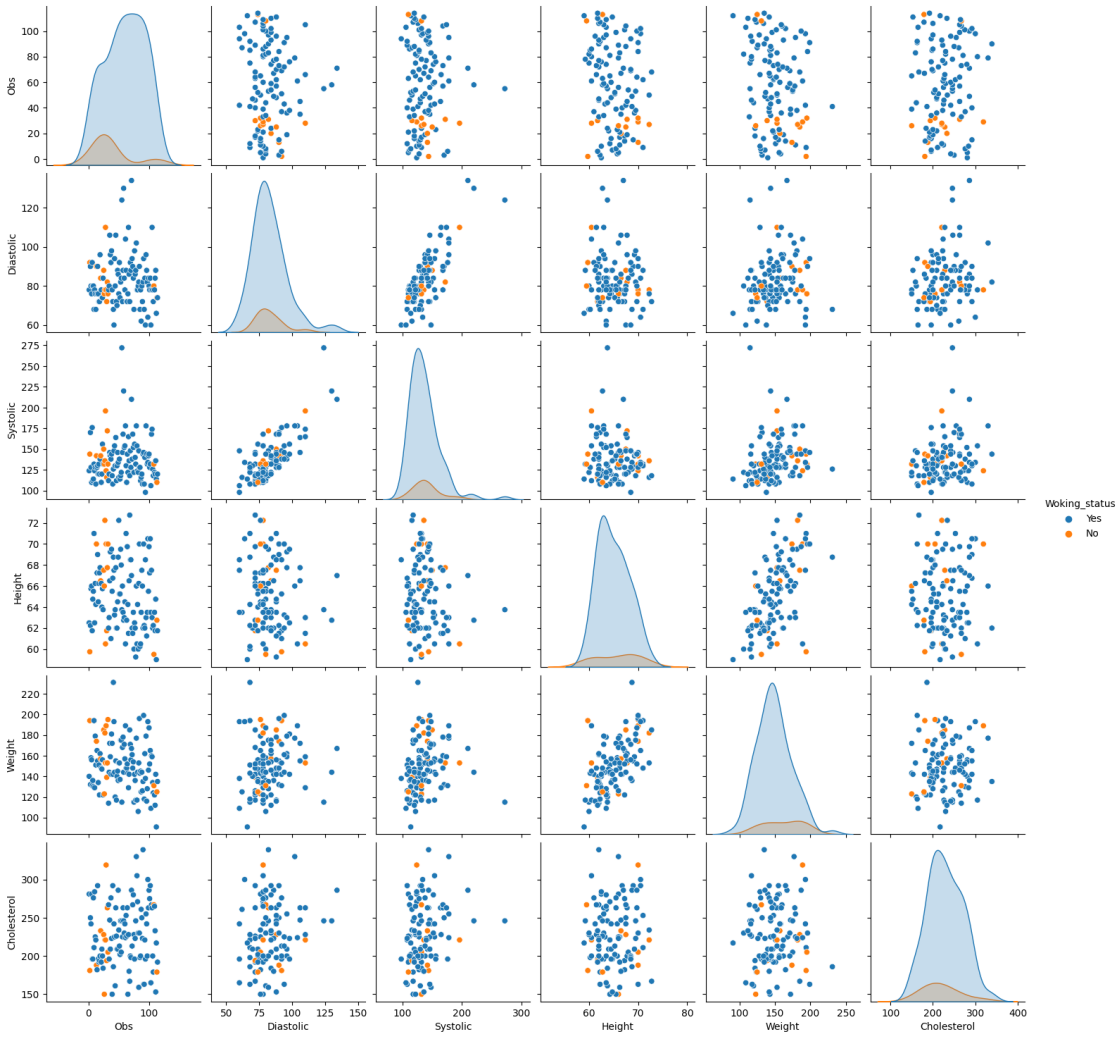
```
                  Multivariate linear model
============================================================

------------------------------------------------------------
       Intercept         Value  Num DF  Den DF  F Value  Pr > F
------------------------------------------------------------
         Wilks' lambda  0.0881 4.0000 108.0000 279.5874 0.0000
        Pillai's trace  0.9119 4.0000 108.0000 279.5874 0.0000
Hotelling-Lawley trace 10.3551 4.0000 108.0000 279.5874 0.0000
   Roy's greatest root 10.3551 4.0000 108.0000 279.5874 0.0000
------------------------------------------------------------

------------------------------------------------------------
            Sex           Value  Num DF  Den DF  F Value Pr > F
------------------------------------------------------------
           Wilks' lambda 0.6686 4.0000 108.0000 13.3845 0.0000
          Pillai's trace 0.3314 4.0000 108.0000 13.3845 0.0000
  Hotelling-Lawley trace 0.4957 4.0000 108.0000 13.3845 0.0000
     Roy's greatest root 0.4957 4.0000 108.0000 13.3845 0.0000
------------------------------------------------------------

------------------------------------------------------------
       Woking_status      Value  Num DF  Den DF  F Value Pr > F
------------------------------------------------------------
           Wilks' lambda 0.9493 4.0000 108.0000  1.4428 0.2249
          Pillai's trace 0.0507 4.0000 108.0000  1.4428 0.2249
  Hotelling-Lawley trace 0.0534 4.0000 108.0000  1.4428 0.2249
```

```
      Roy's greatest root 0.0534 4.0000 108.0000  1.4428 0.2249
=====================================================================
```

[4]:
```
sns.pairplot(df,hue='Sex')
plt.show()
```



[5]:
```
sns.pairplot(df,hue='Woking_status')
plt.show()
```


Obs
Diastolic
Systolic
Height
Weight
Cholesterol
Woking_status
Yes
No

[ ]: