03_anova_testAssignment

March 31, 2022

0.1 T-value

The t-value is a test statistic that measures the ratio between the difference in means and the standard error of the difference.

0.2 why type = 2?

In ANOVA type 1 is used for balanced data and typ2 2 is used for unbalanced data

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

[ ]:
```
tips = sns.load_dataset('tips')
tips.head()
```

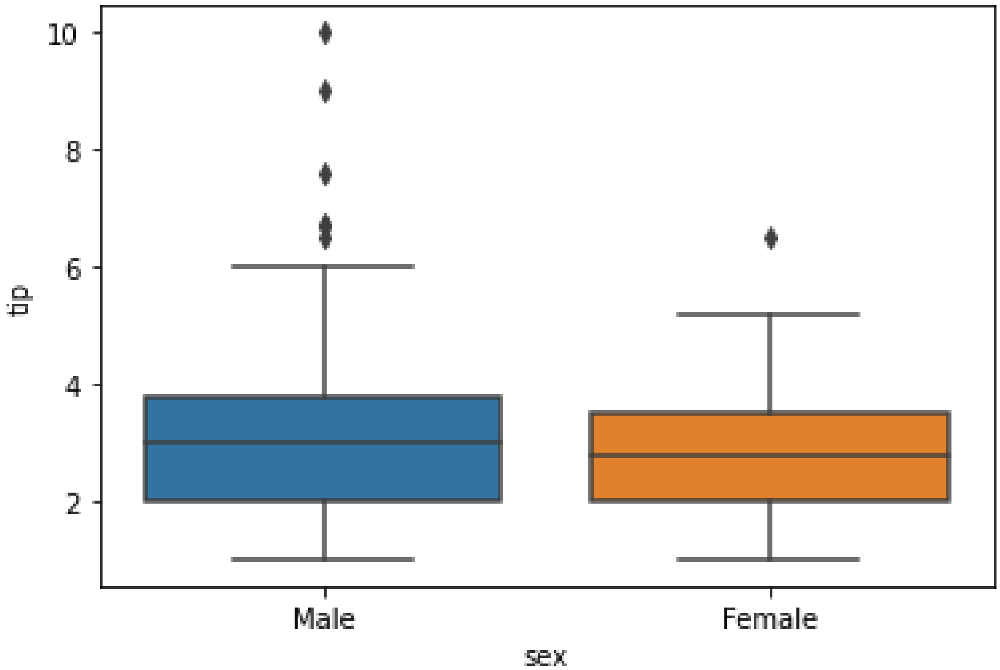
[ ]:
```
   total_bill   tip     sex smoker  day    time  size
0       16.99  1.01  Female     No  Sun  Dinner     2
1       10.34  1.66    Male     No  Sun  Dinner     3
2       21.01  3.50    Male     No  Sun  Dinner     3
3       23.68  3.31    Male     No  Sun  Dinner     2
4       24.59  3.61  Female     No  Sun  Dinner     4
```

[ ]:
```
tips.describe()
```

[ ]:
```
       total_bill         tip        size
count  244.000000  244.000000  244.000000
mean    19.785943    2.998279    2.569672
std      8.902412    1.383638    0.951100
min      3.070000    1.000000    1.000000
25%     13.347500    2.000000    2.000000
50%     17.795000    2.900000    2.000000
75%     24.127500    3.562500    3.000000
max     50.810000   10.000000    6.000000
```

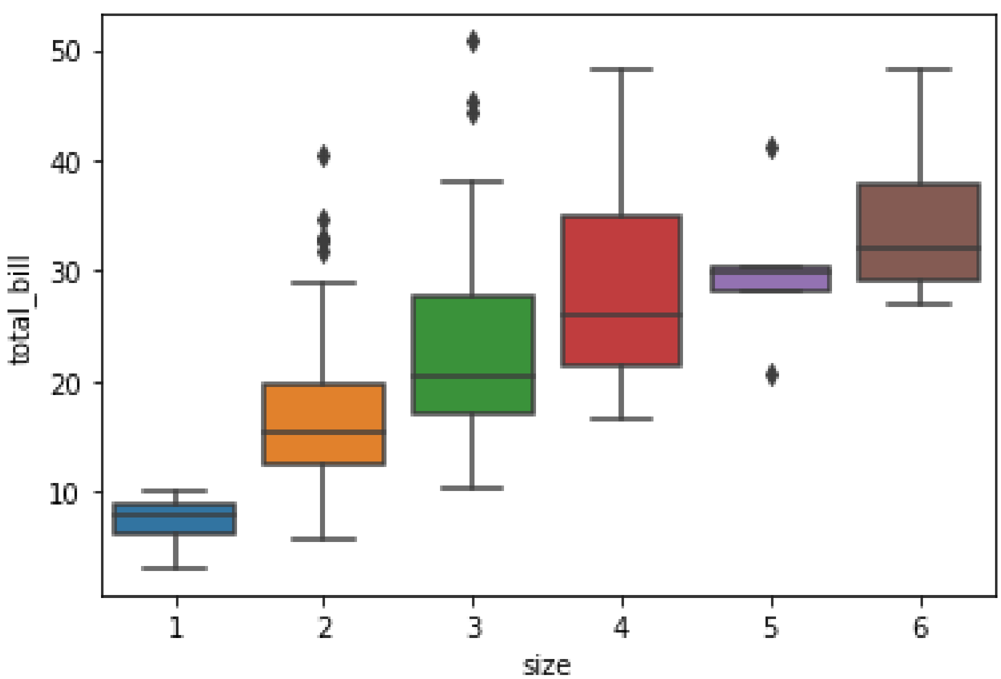
[ ]:
```
sns.boxplot(x='sex', y='tip',data=tips) #comparision betwun two categorical␣
 ↪variable for one continous
```

[ ]: <AxesSubplot:xlabel='sex', ylabel='tip'>



[ ]:
```
sns.boxplot(x='size', y='total_bill',data=tips)
```

[ ]: <AxesSubplot:xlabel='size', ylabel='total_bill'>



```
[ ]: #stat
     import statsmodels.api as sm
     from statsmodels.formula.api import ols
```

```
[ ]: # one way ANOVA

     mod = ols('tip ~ total_bill', data=tips).fit()

     aov_table = sm.stats.anova_lm(mod, type=2) #assignment why type = 2
     print(aov_table)
```

```
                df      sum_sq     mean_sq           F        PR(>F)
total_bill     1.0  212.423733  212.423733  203.357723  6.692471e-34
Residual     242.0  252.788744    1.044582         NaN           NaN
```

```
[ ]: # tukey test hsd test
     import pingouin as pg
     aov = pg.anova(data= tips, dv = 'tip', between ='total_bill', detailed=True)
     print(aov)
```

```
       Source          SS   DF        MS        F    p-unc       np2
0  total_bill  448.167810  228  1.965648  1.72985  0.10982  0.963362
1      Within   17.044667   15  1.136311      NaN      NaN       NaN
```

```
[ ]: # tukey HSD
     pt = pg.pairwise_tukey(data= tips, dv= 'total_bill', between='tip')
     print(pt)
```

```
         A      B  mean(A)    mean(B)       diff        se         T  \
0     1.00   1.01   7.1675  16.990000  -9.822500  7.823029 -1.255588
1     1.00   1.10   7.1675  12.900000  -5.732500  7.823029 -0.732772
2     1.00   1.17   7.1675  32.830000 -25.662500  7.823029 -3.280379
3     1.00   1.25   7.1675   9.696667  -2.529167  5.344146 -0.473259
4     1.00   1.32   7.1675   9.680000  -2.512500  7.823029 -0.321167
…       …      …        …          …          …         …         …
7498  6.73   9.00  48.2700  48.330000  -0.060000  9.895436 -0.006063
7499  6.73  10.00  48.2700  50.810000  -2.540000  9.895436 -0.256684
7500  7.58   9.00  39.4200  48.330000  -8.910000  9.895436 -0.900415
7501  7.58  10.00  39.4200  50.810000 -11.390000  9.895436 -1.151036
7502  9.00  10.00  48.3300  50.810000  -2.480000  9.895436 -0.250621

       p-tukey    hedges
0     1.000000 -1.020938
1     1.000000 -0.595829
2     0.785992 -2.667327
```

```
3     1.000000 -0.304385
4     1.000000 -0.261146
…        …        …
7498  1.000000 -0.034300
7499  1.000000 -1.452024
7500  1.000000 -5.093517
7501  1.000000 -6.511241
7502  1.000000 -1.417724

[7503 rows x 9 columns]
```