Scipy

August 19, 2022

[ ]:
```
#Scipy------Scientific Python
#scientific calculation
```

[5]:
```
import scipy.constants
from scipy import constants
```

[6]:
```
print(constants.pi)
print(dir(constants))
```

```
3.141592653589793
['Avogadro', 'Boltzmann', 'Btu', 'Btu_IT', 'Btu_th', 'ConstantWarning', 'G',
'Julian_year', 'N_A', 'Planck', 'R', 'Rydberg', 'Stefan_Boltzmann', 'Wien',
'__all__', '__builtins__', '__cached__', '__doc__', '__file__', '__loader__',
'__name__', '__package__', '__path__', '__spec__', '_obsolete_constants',
'absolute_import', 'acre', 'alpha', 'angstrom', 'arcmin', 'arcminute', 'arcsec',
'arcsecond', 'astronomical_unit', 'atm', 'atmosphere', 'atomic_mass', 'atto',
'au', 'bar', 'barrel', 'bbl', 'blob', 'c', 'calorie', 'calorie_IT',
'calorie_th', 'carat', 'centi', 'codata', 'constants', 'convert_temperature',
'day', 'deci', 'degree', 'degree_Fahrenheit', 'deka', 'division', 'dyn', 'dyne',
'e', 'eV', 'electron_mass', 'electron_volt', 'elementary_charge', 'epsilon_0',
'erg', 'exa', 'exbi', 'femto', 'fermi', 'find', 'fine_structure', 'fluid_ounce',
'fluid_ounce_US', 'fluid_ounce_imp', 'foot', 'g', 'gallon', 'gallon_US',
'gallon_imp', 'gas_constant', 'gibi', 'giga', 'golden', 'golden_ratio', 'grain',
'gram', 'gravitational_constant', 'h', 'hbar', 'hectare', 'hecto', 'horsepower',
'hour', 'hp', 'inch', 'k', 'kgf', 'kibi', 'kilo', 'kilogram_force', 'kmh',
'knot', 'lambda2nu', 'lb', 'lbf', 'light_year', 'liter', 'litre', 'long_ton',
'm_e', 'm_n', 'm_p', 'm_u', 'mach', 'mebi', 'mega', 'metric_ton', 'micro',
'micron', 'mil', 'mile', 'milli', 'minute', 'mmHg', 'mph', 'mu_0', 'nano',
'nautical_mile', 'neutron_mass', 'nu2lambda', 'ounce', 'oz', 'parsec', 'pebi',
'peta', 'physical_constants', 'pi', 'pico', 'point', 'pound', 'pound_force',
'precision', 'print_function', 'proton_mass', 'psi', 'pt', 'short_ton', 'sigma',
'slinch', 'slug', 'speed_of_light', 'speed_of_sound', 'stone', 'survey_foot',
'survey_mile', 'tebi', 'tera', 'test', 'ton_TNT', 'torr', 'troy_ounce',
'troy_pound', 'u', 'unit', 'value', 'week', 'yard', 'year', 'yobi', 'yotta',
'zebi', 'zepto', 'zero_Celsius', 'zetta']
```

[7]:
```
#mathematical opns
#integration
#3x+2
from scipy.integrate import quad
def inte(x):
    return 3*x+2
quad(inte,0,1)
```

[7]:
```
(3.5, 3.885780586188048e-14)
```

[11]:
```
#double integral
from scipy.integrate import dblquad
def inte(x,y):
    return 3*x+4*y+2
dblquad(inte,0,1,4,7) #(0,1)-xlimit, #(4,7)-ylimit
```

[11]:
```
(61.49999999999999, 7.491112505659241e-13)
```

[15]:
```
#statistical package----->stats
#outlier analysis
import seaborn as sns
data=sns.load_dataset('tips')
data
```

[15]:

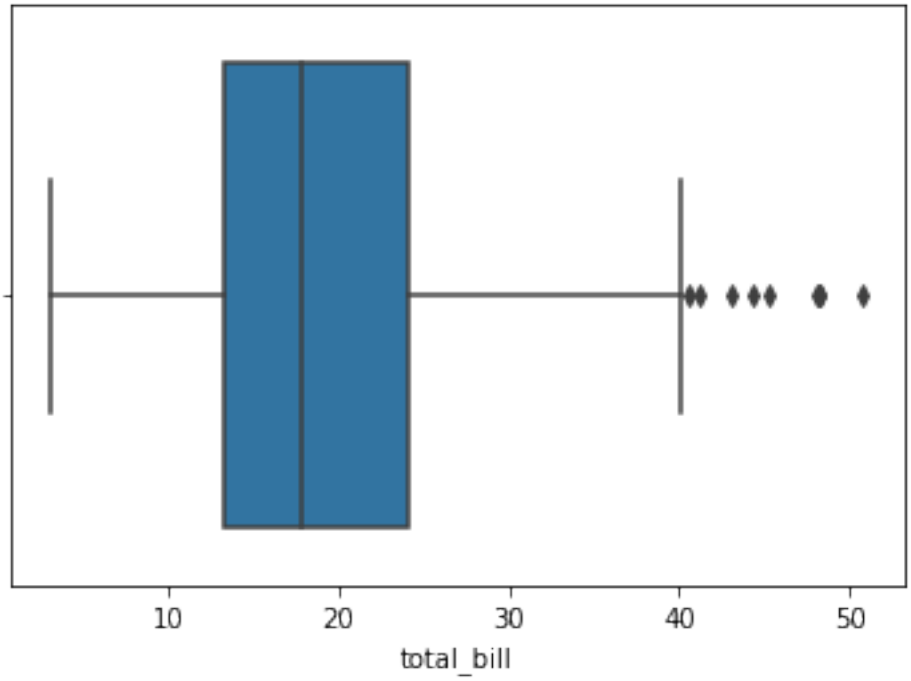
	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4
..	…	…	…	…	…	…	…
239	29.03	5.92	Male	No	Sat	Dinner	3
240	27.18	2.00	Female	Yes	Sat	Dinner	2
241	22.67	2.00	Male	Yes	Sat	Dinner	2
242	17.82	1.75	Male	No	Sat	Dinner	2
243	18.78	3.00	Female	No	Thur	Dinner	2

[244 rows x 7 columns]

[16]:
```
sns.boxplot(data['total_bill'])
```

```
/usr/local/lib/python3.7/site-packages/seaborn/_decorators.py:43: FutureWarning:
Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

[16]: <AxesSubplot:xlabel='total_bill'>



[23]:
```
from scipy import stats
q1=stats.scoreatpercentile(data['total_bill'],25)
q2=stats.scoreatpercentile(data['total_bill'],50)
q3=stats.scoreatpercentile(data['total_bill'],75)
iqr=q3-q1
lb=q1-1.5*iqr
ub=q3+1.5*iqr
print('q1--',q1)
print('q2--',q2)
print('q3--',q2)
print('iqr--',iqr)
print('lowerbound--',lb)
print('upperbound--',ub)
outlier_values=data['total_bill'][((data['total_bill']<lb)|(data['total_bill']>ub))]
print(outlier_values)
```

```
q1-- 13.3475
q2-- 17.795
q3-- 17.795
iqr-- 10.779999999999998
lowerbound-- -2.8224999999999945
upperbound-- 40.29749999999999
59     48.27
```

```
102    44.30
142    41.19
156    48.17
170    50.81
182    45.35
184    40.55
197    43.11
212    48.33
Name: total_bill, dtype: float64
```

[34]:
```
#hypothesis testing  Ho accepted if
import numpy as np
#Correlation ------2 numerical data prefer correlation
salary=np.array([100,200,300,400,500])
exp=np.array([3,5,7,9,10])
```

[35]:
```
#pearson
#help(stats.pearsonr)
coeff,pvalue=stats.pearsonr(salary,exp)
print('coeff:',coeff,'pval:',pvalue)
if pvalue<0.05:
    print('Alternate hypothesis: There is a relation')
else:
    print('Null Hypothesis: No relation')
salary1=np.array([-100,200,-300,400,-500])
exp1=np.array([3,5,7,9,10])
coeff1,pvalue1=stats.pearsonr(salary1,exp1)
print('coeff:',coeff1,'pval:',pvalue1)
if pvalue1<0.05:
    print('Alternate hypothesis: There is a relation')
else:
    print('Null Hypothesis: No relation')
```

```
coeff: 0.9938837346736188 pval: 0.0005736731093322215
Alternate hypothesis: There is a relation
coeff: -0.1819369266975983 pval: 0.7696351041293764
Null Hypothesis: No relation
```

[46]:
```
#Chi-square test: when two datas are categorical data and you need to find␣
 ↪relation btw them use chisquare test
#2categorical data
import pandas as pd
data1=pd.crosstab(data['sex'],data['time'])  #used to find numerical values btw␣
 ↪2 categorical data
print(data1)
print(data1.values)
coeff,pval,dof,exp=stats.chi2_contingency(data1.values)
```

```
print('chisquare:',coeff,'pval:',pval,'dof:',dof,'exp:',exp)
if pval<0.05:
    print('alt_hypothesis:relation')
else:
    print('Null_hypothesis:No relation')
```

```
time    Lunch  Dinner
sex
Male       33     124
Female     35      52
[[ 33 124]
 [ 35  52]]
chisquare: 9.343808982970623 pval: 0.002237400118075248 dof: 1 exp: [[
43.75409836 113.24590164]
 [ 24.24590164  62.75409836]]
alt_hypothesis:relation
```

[ ]: