Assignment 4

```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
from sklearn.1inear_mode1 import LinearRegression
```

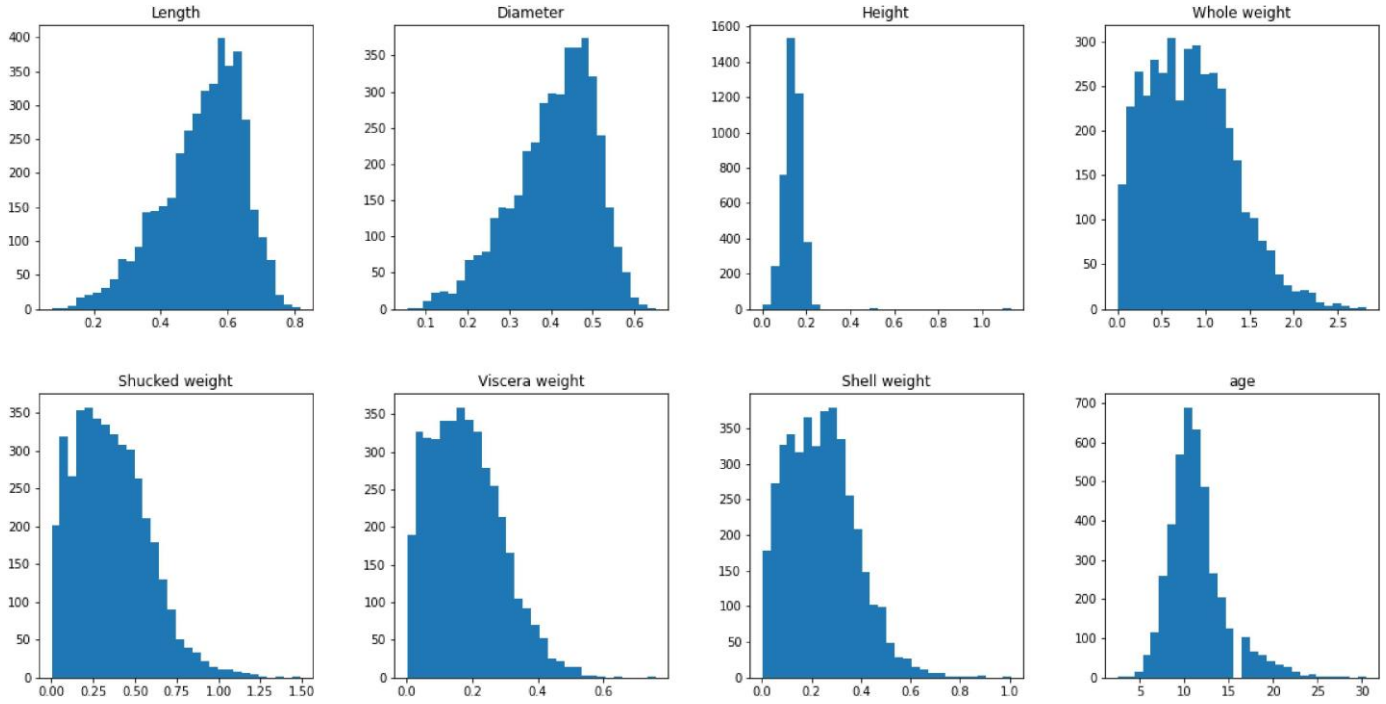
```
df=pd.read_csv("/content/drive/NyDrive/Colab Notebooks/abalone.csv")
```

```
df['age'] = df['Rings']+1.5
df = df.drop('Rings', axis = 1)
```

Univariate Analysis

```
df.hist(figsize=(20,10), grid=False, layout=(2, 4), bins = 3B)
```

```
|j+  array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7f3dlb8fb698>,
           <matplotlib.axes._subplots.AxesSubplot object at 0x7f3d1ade4d98>,
           <matplotlib.axes._subplots.AxesSubplot object at 0x7f3dladaa398>,
           <matplotlib.axes._subplots.AxesSubplot object at Bx7f3d1ad60998>],
          [<matplotlib.axes._subplots.AxesSubplot object at 0x7f3dladl6f98>,
           <matplotlib.axes._subplots.AxesSubplot object at Bx7f3dlacda5d8>,
           <matp1otlib.axes._subplots.AxesSubplot object at Bx7f3dlac8fc58>,
           <matplotlib.axes._subplots.AxesSubplot object at 8x7f3dlac53ld8>]],
         dtype=object)
```



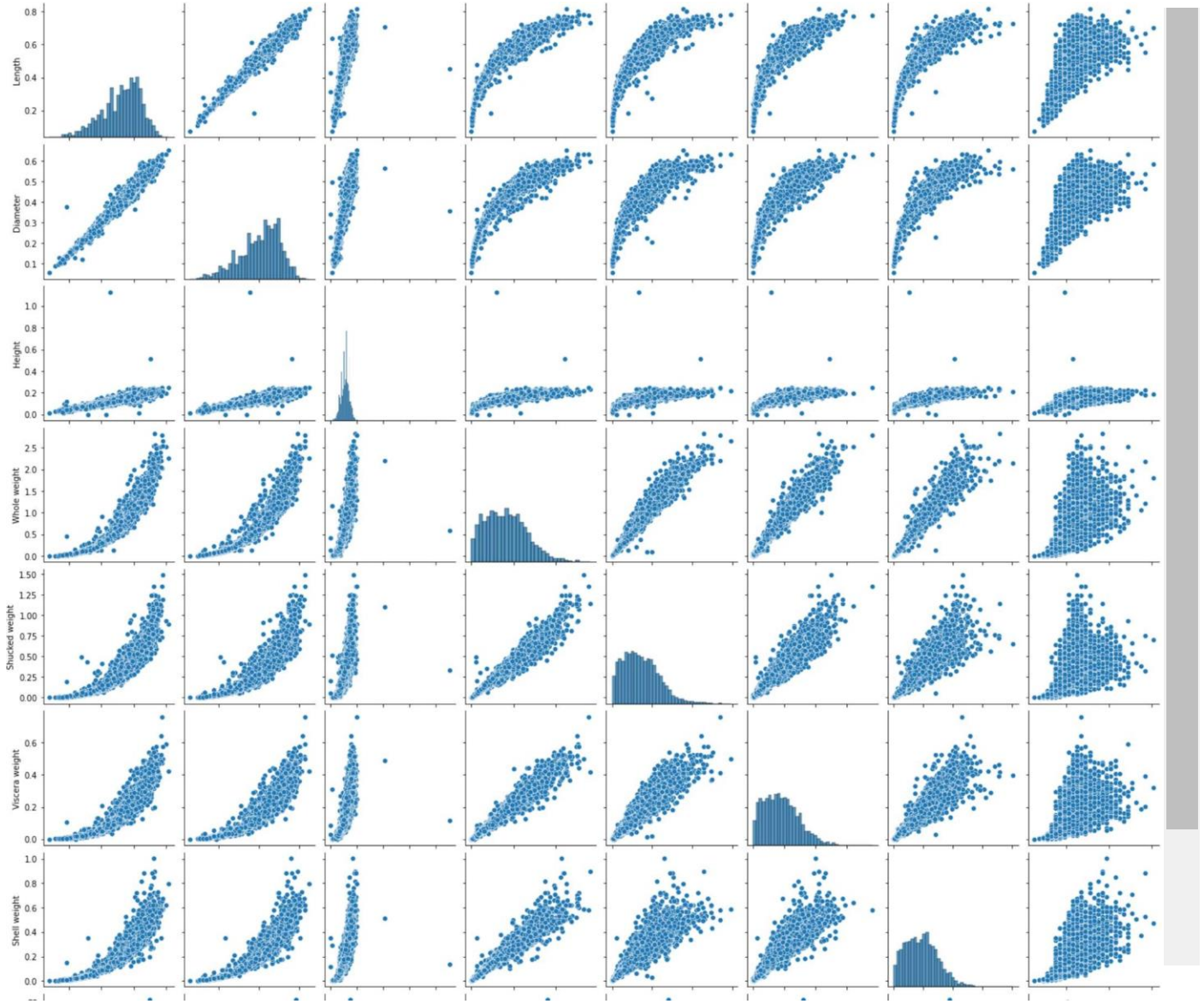

```
df.groupby('Sex')[['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight',
       'Viscera weight', 'Shell weight', 'age']].meau().sort_values('age')
```

Sex	Length	Diameter	Height	whole weight	Shucked weight	Viscera weight	Shell weight	age
	0.427746	0.326494	0.107996	0.431363	0.191035	0.092010	0.128182	9.390462
M	0.561391	0.439287	0.151381	0.991459	0.432946	0.215545	0.281969	12.205497
F	0.579093	0.454732	0.158011	1.046532	0.446188	0.230689	0.302010	12.629304

Bivariate Analysis

```
numerical_features = df.select_dtypes(include = [np.number]).columns
sns.pairplot(df[numerical_features])
```

<seaborn.axisgrid.PairGrid at 0x7f3d1a345650>



Descriptive statistics

```
df.describe()
```

	Length	Diameter	Height	whole weight	Shucked weight	viscera weight	Shell weight	age
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	11.433684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	2.500000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	9.500000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	10.500000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	12.500000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	30.500000

Check for missing values

```
df.isnull().sum()
```

Outlier handling

```
df - pd . get_dummies (d+)
dummy_data = df . copy ( )
var = 'Viscera weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)
```

```
# outliers removal
d-F. drop(df[ (d-F[ ' Viscera weight ']› 0.5) & (dT[ ' age ' ] ‹ 20) ] . Index, inp1ace=True)
df.drop(df[(df['Uiscera weight']<0.5) & (df['age'] › 25)].index, inplace=True)
var - 'Shell weight'
plt.scatter(x = df[var], y = df[’age'],)
plt.grid(True)
#Outliers removal
df.drop(df[(df['Shell weight’]› 0.6) & (df[’age'] ‹ 25)].index, inplace=True)
df.drop(df[(df['Shell weight']‹8.8) 8 (df['age'] › 25)].index, inplace=True)
```

```
var = 'Shucked weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)

#Outlier removal
df.drop(df[(df['Shucked weight']›= 1) & (df['age'] < 28)].index, inplace=True)
df.drop(df[(df['Shucked weight’]<1) & (df['age’] > 28)].iudex, inplace=True)
```

```
var = 'Nhole weight’
pit . scatter (x = d-F[var] , y = df[ 'age' ] )
p1t . grid(True)

df.drop(df[(df['Whole weight’] ›= 2.5) &
          (df[’age'] ‹ 25)].index, inplace = True)
df. drop(df-[ (df[ 'Nhole weight ’ ] ‹2. 5) & (
d-F[ ’age' ] › 25) ] . Index, 1nplace = True)
```

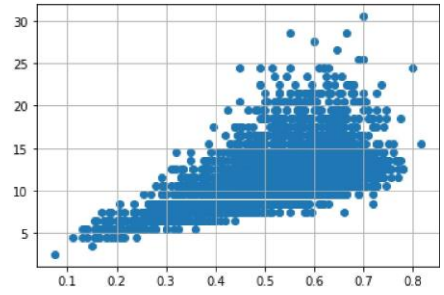
```
var = ' Diameter '
pit . scatter (x = d-F[var] , y = df[ ' age ' ] )
p1t . grid(True)

df. drop( df-[ ( df [ ' Diazeten ' ] ‹8. 1) &
          (df[’age'] ‹ 5)].index, inplace = True)
d-F-. drop(d-F[ (d-f-[ ' Oiazeten ' ]‹8. 6) fi (
df[ ’age ' ] › 25) ] . index, inplace = Tcue) d-
f-. drop(df[ (d-f-[ ' Oiaueten ' ]›=8.6) & (
d-F[ ’age' ] ‹ 25) ] . index, inplace = True)
```

```
van = ‘ Height '
p1t . scatter (x - df-[var] , y - df[ ' age ' ] )
p1t . grid(True)
d-F-. drop(df— [ (d-F-[ ' Height ' ] › 6.4) &
          (df[ ’age ' ] ‹ 15) ] . index, 1nplace = True)
d-F. drap(d fl-[ (d-F[ ' Height ' ]‹0. 4) & (
d-F[ ’age' ] › 25) ] . index, 1nplace = True)
```

```
var = 'Length'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

df.drop(df[(df['Leugth’] ‹8.1) &
          (df['age'] < 5)].index, inplace = True)
dfdropd[df['Leugth]‹0.8) & (
df['age'] › 25)].index, inplace = True)
df.dropd[df['Length]>=8.8) & (
df[’age'] ‹ 25)].iudex, inplace = True)
```



Categorical columns

```
numerical_features = df.select_dtypes(include = [np.number]).columns
categorica1_features  = df.select_dtypes(include  = [np.object]).columns
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:2: Deprecationwarning: 'up.object' is a deprecated alias for the builtin 'object' To siler
Deprecated in NumPy 1.20; for more details and guidance: https://numpy.org/devdocs/release/1.20.8-notes.html#deprecations
```

```
numerical_features
```

```
Index( [ ' Length ', ' Diameter', ' Height ', ' Mhole weight ' , ' Shucked weight ' ,
        'Uiscera weight', 'Shell weight', 'age'],
      dtype='object')
```

```
categonica1_featunes
```

```
Index( [ ' Sex ' ],  dtype= ' obj ect ' )
```

ENCODING

```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
print(df.Sex.value_counts())
```

```
M    1525
1    1341
F    1301
Name: Sex,  dtype:  int64
```

```
x=df.iloc[:, :5]
```

	Sex	Length	Dlameter	Height	Nhole we1ght
0	M	0.455	0.365	0.095	0.5140
1	M	0.350	0.265	0.090	0.2255
2	F	0.530	0.420	0.135	0.6770
3	M	0.440	0.365	0.125	0.5160
4		0.330	0.255	0.080	0.2050
4172	F	0.565	0.450	0.165	0.8870
4173	M	0.590	0.440	0.135	0.9660
4174	M	0.600	0.475	0.205	1.1760
4175	F	0.625	0.485	0.150	1.0945
4176	M	0.710	0.555	0.195	1.9485

4167 rows • 5 œlumns

```
y=df.iloc[:,5:]
```

	Shucked weight	Viscera weight	Shell weight	age
0	0.2245	0.1010	0.1500	16.5
1	0.0995	0.0485	0.0700	8.5
2	0.2565	0.1415	0.2100	10.5
3	0.2155	0.1140	0.1550	11.5
4	0.0895	0.0395	0.0550	8.5
4172	0.3700	0.2390	0.2490	12.5
4173	0.4390	0.2145	0.2605	11.5
4174	0.5255	0.2875	0.3080	10.5
4175	0.5310	0.2610	0.2960	11.5
4176	0.9455	0.3765	0.4950	13.5

4167 rows 4 œlumns

Train, Test, Split

```
from sklearn.model selection import train test split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2)
```

Model Building

```
from sklearn.linear model import LinearRegression
mlr=LinearRegression()
mlr.fit(x tnain,y tnain)
```

Train and Test model

```
x test [0:5 ]
```

	Sex	Length	Diameter	Height	Whole weight
661		0.535	0.450	0.170	0.781
370	F	0.650	0.545	0.165	1.566
2272	M	0.635	0.510	0.210	1.598
1003	M	0.595	0.455	0.150	1.044
1145	M	0.580	0.455	0.195	1.859

```
y test[0:5]
```

	Shucked weight	viscera weight	Shell weight	age
661	0.3055	0.1555	0.295	12.5
370	0.6645	0.3455	0.415	17.5
2272	0.6535	0.2835	0.580	16.5
1003	0.5180	0.2205	0.270	10.5
1145	0.9450	0.4260	0.441	10.5

Feature Scaling

```
from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
x_train=ss.fit_transform(x_train)
mlrpred=mlr.predict(x_test[B:9])
mlrpred
```

Performance measure

```
from sklearn.metrics import r2_score
r2 score(mm.predict(x test),y test)
```

0.5597133867640833