```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

training=pd.read_csv(r'mobile_price_range_data.csv')
test=pd.read_csv(r'test.csv')

pd.set_option('display.max_rows',None)
pd.set_option('display.max_columns',None)

training.head()
```

```
   battery_power  blue  clock_speed  dual_sim  fc  four_g  int_memory
m_dep  \
0            842     0          2.2         0   1       0           7
0.6
1           1021     1          0.5         1   0       1          53
0.7
2            563     1          0.5         1   2       1          41
0.9
3            615     1          2.5         0   0       0          10
0.8
4           1821     1          1.2         0  13       1          44
0.6

   mobile_wt  n_cores  pc  px_height  px_width   ram  sc_h  sc_w
talk_time  \
0        188        2   2         20       756  2549     9     7
19
1        136        3   6        905      1988  2631    17     3
7
2        145        5   6       1263      1716  2603    11     2
9
3        131        6   9       1216      1786  2769    16     8
11
4        141        2  14       1208      1212  1411     8     2
15

   three_g  touch_screen  wifi  price_range
0        0             0     1            1
1        1             1     0            2
2        1             1     0            2
3        1             0     0            2
4        1             1     0            1
```

```
test.head()
```

```
   id  battery_power  blue  clock_speed  dual_sim  fc  four_g
int_memory  \
0   1           1043     1          1.8         1  14       0
5
```

```
1   2            841     1          0.5         1   4       1
61
2   3           1807     1          2.8         0   1       0
27
3   4           1546     0          0.5         1  18       1
25
4   5           1434     0          1.4         0  11       1
49
```

```
   m_dep  mobile_wt  n_cores  pc  px_height  px_width   ram  sc_h
sc_w  \
0    0.1        193        3  16        226      1412  3476    12
7
1    0.8        191        5  12        746       857  3895     6
0
2    0.9        186        3   4       1270      1366  2396    17
10
3    0.5         96        8  20        295      1752  3893    10
0
4    0.5        108        6  18        749       810  1773    15
8
```

```
   talk_time  three_g  touch_screen  wifi
0          2        0             1     0
1          7        1             0     0
2         10        0             1     1
3          7        1             1     0
4          7        1             0     1
```

```
test.drop('id',axis=1,inplace=True)
```

```
test.head()
```

```
   battery_power  blue  clock_speed  dual_sim  fc  four_g  int_memory
m_dep  \
0           1043     1          1.8         1  14       0           5
0.1
1            841     1          0.5         1   4       1          61
0.8
2           1807     1          2.8         0   1       0          27
0.9
3           1546     0          0.5         1  18       1          25
0.5
4           1434     0          1.4         0  11       1          49
0.5
```

```
   mobile_wt  n_cores  pc  px_height  px_width   ram  sc_h  sc_w
talk_time  \
0        193        3  16        226      1412  3476    12     7
2
```

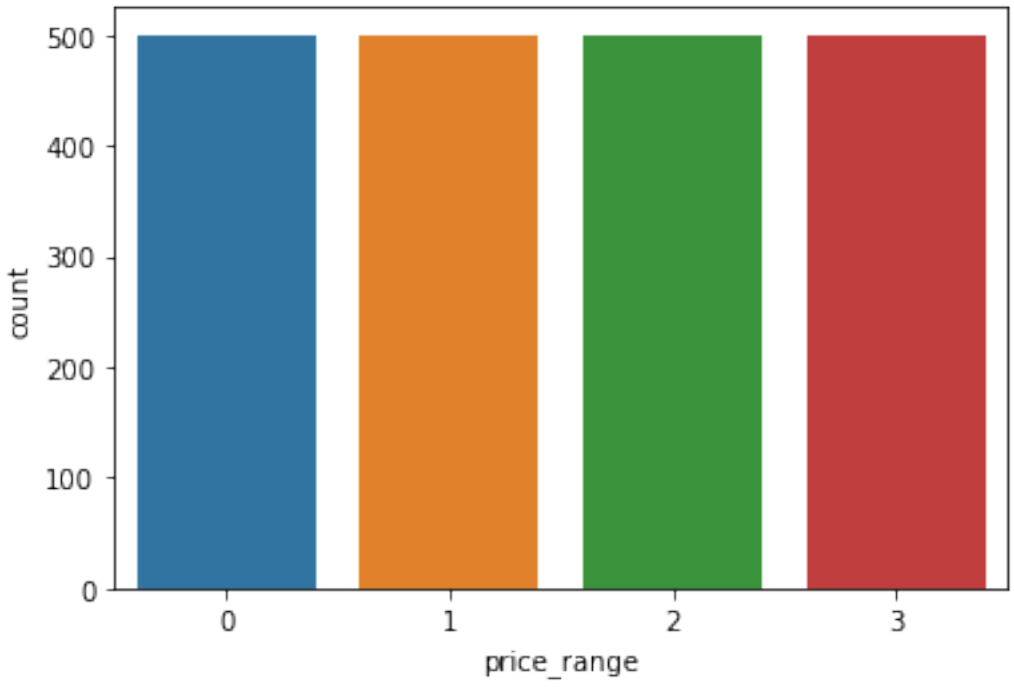
```
1         191         5  12         746        857  3895     6      0
7
2         186         3   4        1270       1366  2396    17     10
10
3          96         8  20         295       1752  3893    10      0
7
4         108         6  18         749        810  1773    15      8
7
```

```
   three_g  touch_screen  wifi
0        0             1     0
1        1             0     0
2        0             1     1
3        1             1     0
4        1             0     1
```

```
sns.countplot(training['price_range'])
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36:
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.
  warnings.warn(
```

```
<AxesSubplot:xlabel='price_range', ylabel='count'>
```




```
training.shape,test.shape
```

```
((2000, 21), (1000, 20))
```

```
training.isnull().sum()
```

```
battery_power    0
blue             0
clock_speed      0
dual_sim         0
fc               0
four_g           0
int_memory       0
m_dep            0
mobile_wt        0
n_cores          0
pc               0
px_height        0
px_width         0
ram              0
sc_h             0
sc_w             0
talk_time        0
three_g          0
touch_screen     0
wifi             0
price_range      0
dtype: int64
```

```
training.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2000 entries, 0 to 1999
Data columns (total 21 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   battery_power  2000 non-null   int64  
 1   blue           2000 non-null   int64  
 2   clock_speed    2000 non-null   float64
 3   dual_sim       2000 non-null   int64  
 4   fc             2000 non-null   int64  
 5   four_g         2000 non-null   int64  
 6   int_memory     2000 non-null   int64  
 7   m_dep          2000 non-null   float64
 8   mobile_wt      2000 non-null   int64  
 9   n_cores        2000 non-null   int64  
 10  pc             2000 non-null   int64  
 11  px_height      2000 non-null   int64  
 12  px_width       2000 non-null   int64  
 13  ram            2000 non-null   int64  
 14  sc_h           2000 non-null   int64  
 15  sc_w           2000 non-null   int64  
 16  talk_time      2000 non-null   int64  
 17  three_g        2000 non-null   int64  
 18  touch_screen   2000 non-null   int64  
```

```
 19  wifi           2000 non-null   int64
 20  price_range    2000 non-null   int64
dtypes: float64(2), int64(19)
memory usage: 328.2 KB
```

```
test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 20 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   battery_power  1000 non-null   int64
 1   blue           1000 non-null   int64
 2   clock_speed    1000 non-null   float64
 3   dual_sim       1000 non-null   int64
 4   fc             1000 non-null   int64
 5   four_g         1000 non-null   int64
 6   int_memory     1000 non-null   int64
 7   m_dep          1000 non-null   float64
 8   mobile_wt      1000 non-null   int64
 9   n_cores        1000 non-null   int64
 10  pc             1000 non-null   int64
 11  px_height      1000 non-null   int64
 12  px_width       1000 non-null   int64
 13  ram            1000 non-null   int64
 14  sc_h           1000 non-null   int64
 15  sc_w           1000 non-null   int64
 16  talk_time      1000 non-null   int64
 17  three_g        1000 non-null   int64
 18  touch_screen   1000 non-null   int64
 19  wifi           1000 non-null   int64
dtypes: float64(2), int64(18)
memory usage: 156.4 KB
```

```
training.describe()
```

```
       battery_power       blue  clock_speed     dual_sim           fc
\
count    2000.000000  2000.0000  2000.000000  2000.000000  2000.000000

mean     1238.518500     0.4950     1.522250     0.509500     4.309500

std       439.418206     0.5001     0.816004     0.500035     4.341444

min       501.000000     0.0000     0.500000     0.000000     0.000000

25%       851.750000     0.0000     0.700000     0.000000     1.000000

50%      1226.000000     0.0000     1.500000     1.000000     3.000000
```

```
75%      1615.250000     1.0000     2.200000     1.000000     7.000000

max      1998.000000     1.0000     3.000000     1.000000    19.000000


            four_g   int_memory        m_dep    mobile_wt      n_cores
\
count  2000.000000  2000.000000  2000.000000  2000.000000  2000.000000

mean      0.521500    32.046500     0.501750   140.249000     4.520500

std       0.499662    18.145715     0.288416    35.399655     2.287837

min       0.000000     2.000000     0.100000    80.000000     1.000000

25%       0.000000    16.000000     0.200000   109.000000     3.000000

50%       1.000000    32.000000     0.500000   141.000000     4.000000

75%       1.000000    48.000000     0.800000   170.000000     7.000000

max       1.000000    64.000000     1.000000   200.000000     8.000000


                pc    px_height     px_width          ram         sc_h
\
count  2000.000000  2000.000000  2000.000000  2000.000000  2000.000000

mean      9.916500   645.108000  1251.515500  2124.213000    12.306500

std       6.064315   443.780811   432.199447  1084.732044     4.213245

min       0.000000     0.000000   500.000000   256.000000     5.000000

25%       5.000000   282.750000   874.750000  1207.500000     9.000000

50%      10.000000   564.000000  1247.000000  2146.500000    12.000000

75%      15.000000   947.250000  1633.000000  3064.500000    16.000000

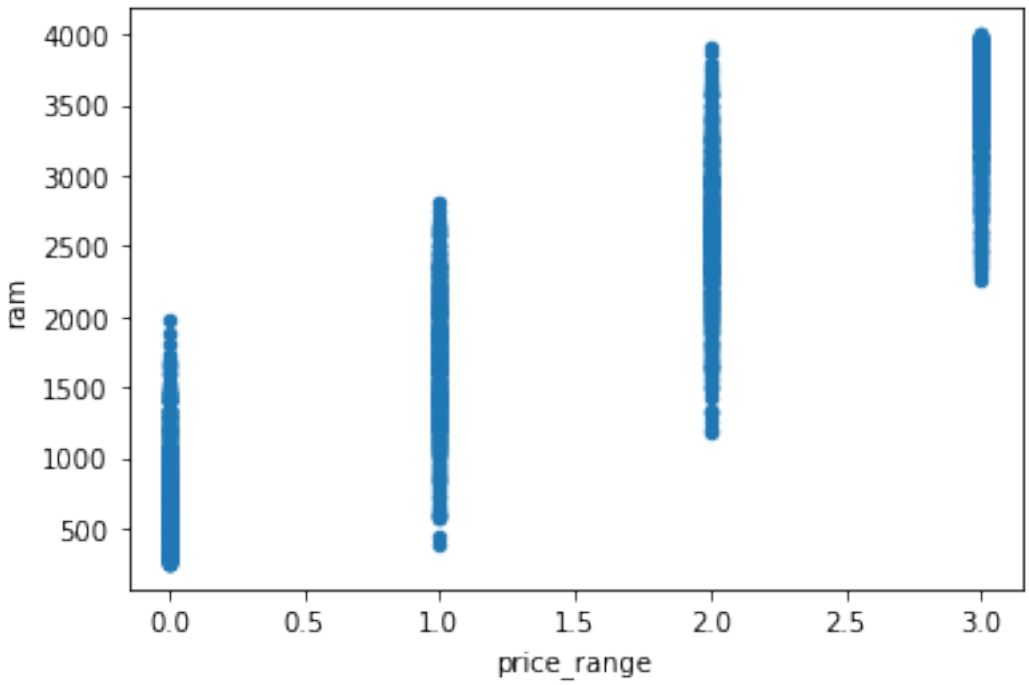
max      20.000000  1960.000000  1998.000000  3998.000000    19.000000


              sc_w    talk_time      three_g  touch_screen
wifi  \
count  2000.000000  2000.000000  2000.000000   2000.000000
2000.000000
```

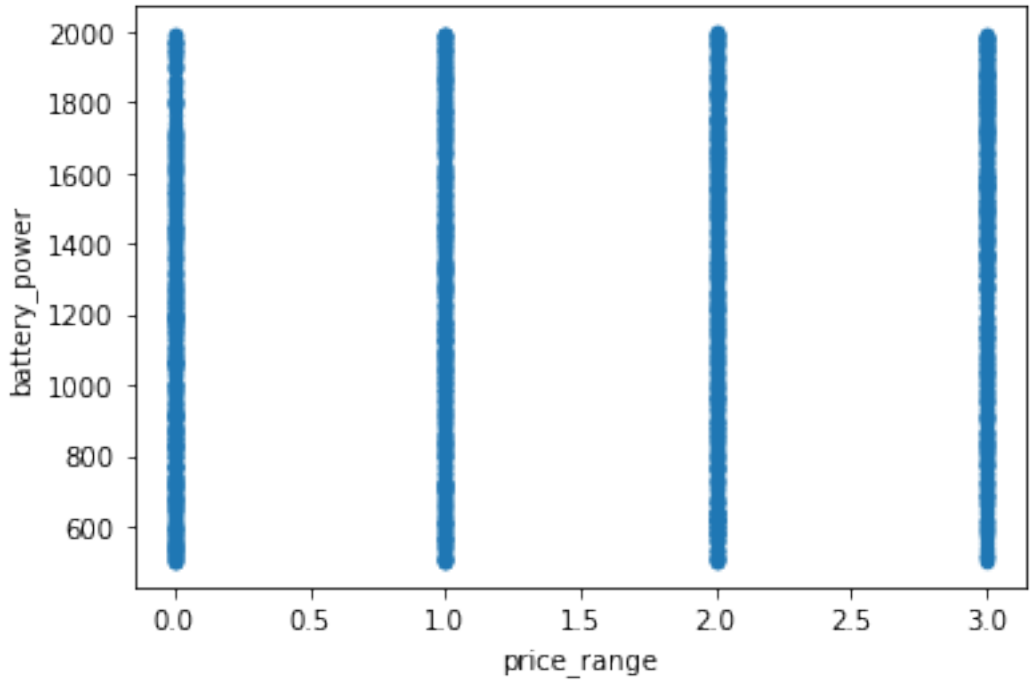
```
mean      5.767000    11.011000     0.761500      0.503000
0.507000
std       4.356398     5.463955     0.426273      0.500116
0.500076
min       0.000000     2.000000     0.000000      0.000000
0.000000
25%       2.000000     6.000000     1.000000      0.000000
0.000000
50%       5.000000    11.000000     1.000000      1.000000
1.000000
75%       9.000000    16.000000     1.000000      1.000000
1.000000
max      18.000000    20.000000     1.000000      1.000000
1.000000

       price_range
count  2000.000000
mean      1.500000
std       1.118314
min       0.000000
25%       0.750000
50%       1.500000
75%       2.250000
max       3.000000
```

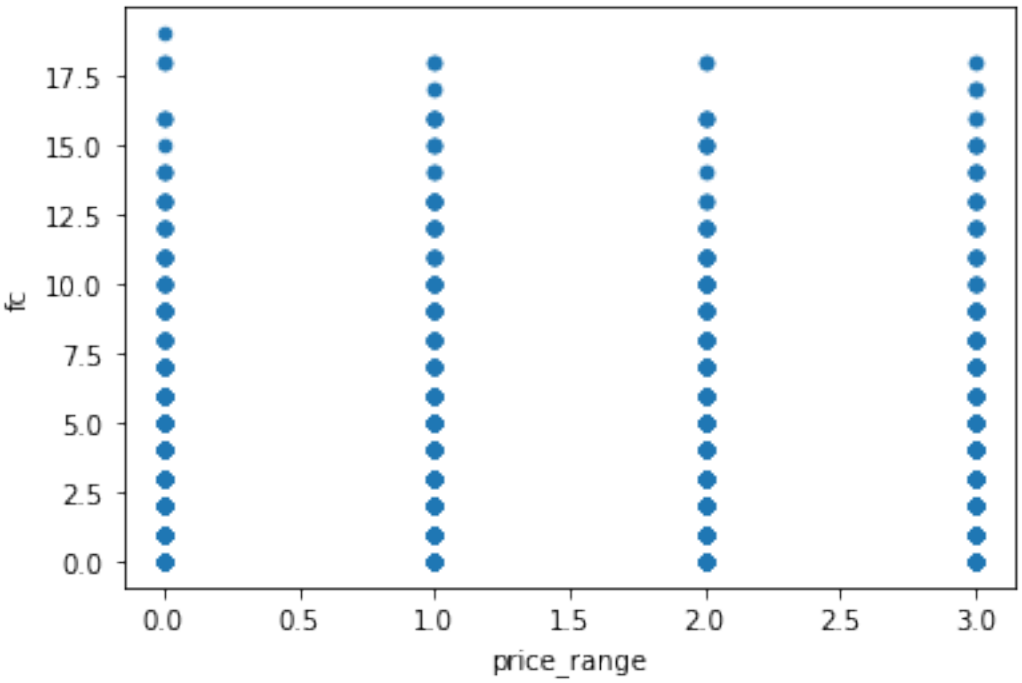
```
training.plot(x='price_range',y='ram',kind='scatter')
plt.show()
```



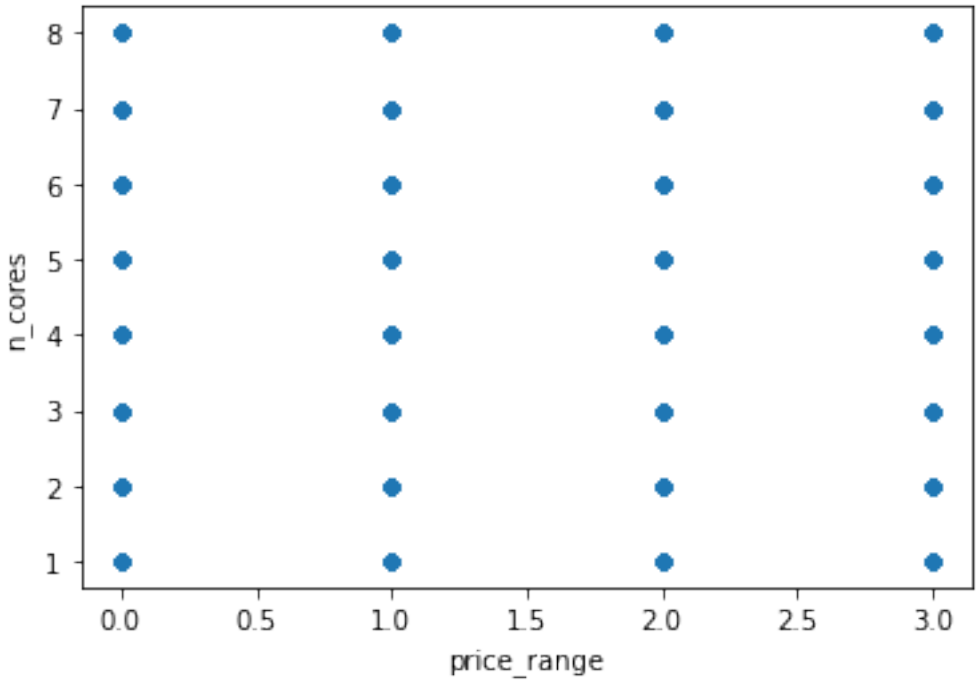
```
training.plot(x='price_range',y='battery_power',kind='scatter')
plt.show()
```



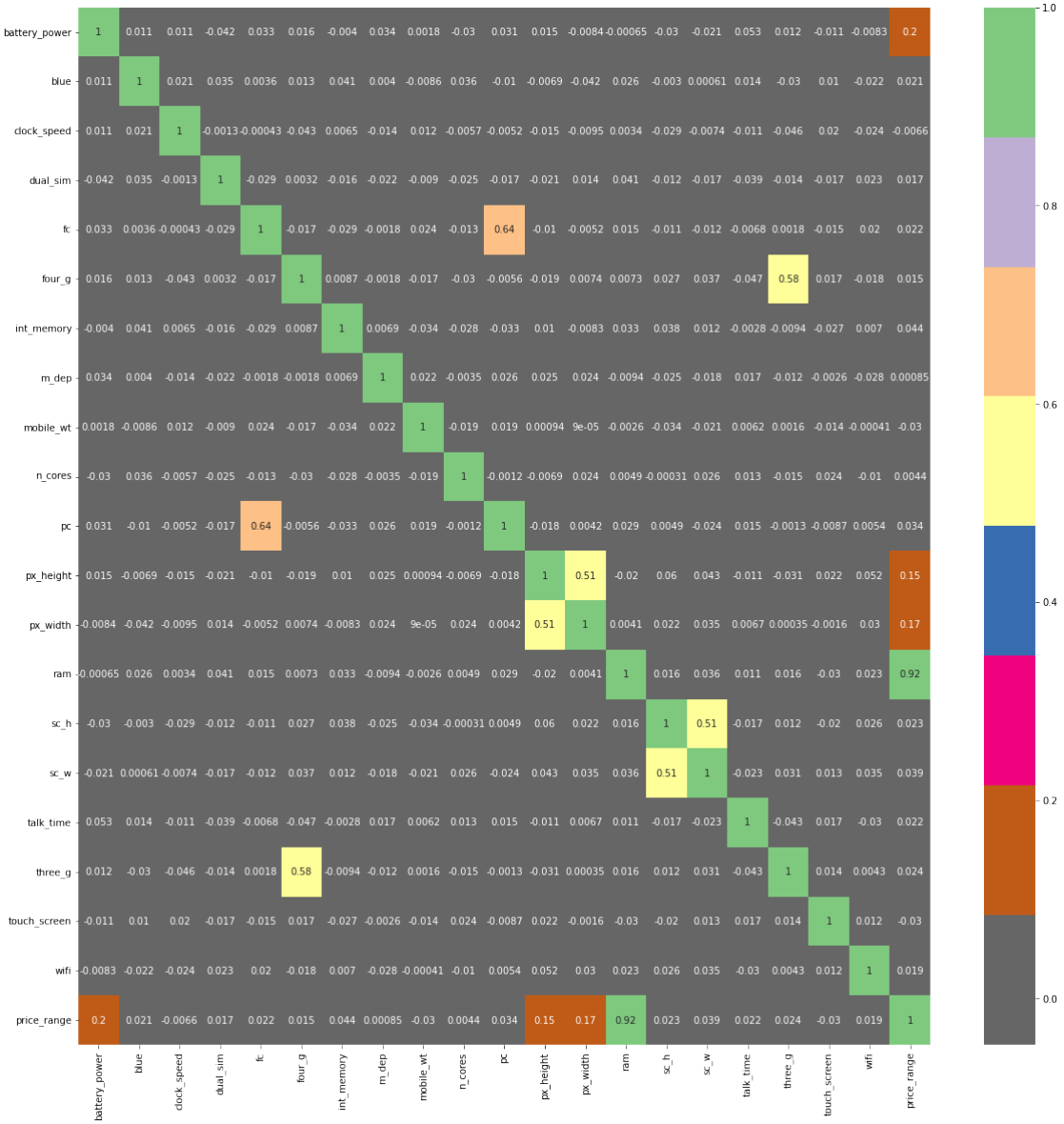

```
training.plot(x='price_range',y='fc',kind='scatter')
plt.show()
```




```
training.plot(x='price_range',y='n_cores',kind='scatter')
plt.show()
```

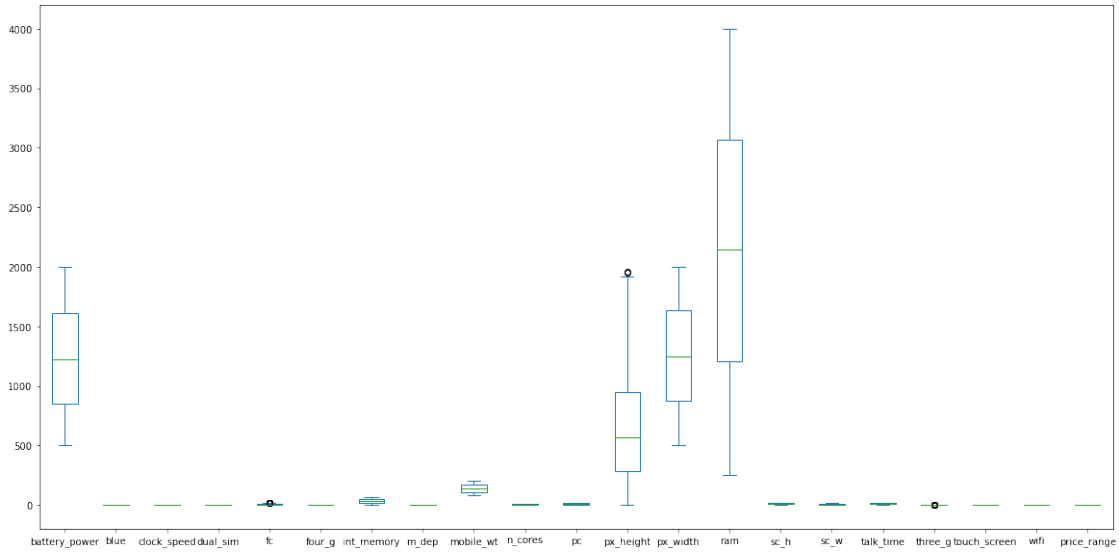



```
import seaborn as sns
plt.figure(figsize=(20,20))
sns.heatmap(training.corr(),annot=True,cmap=plt.cm.Accent_r)
plt.show()
```




```
training.plot(kind='box',figsize=(20,10))
```

```
<AxesSubplot:>
```




```
X = training.drop('price_range',axis=1)
y = training['price_range']

from sklearn.model_selection import train_test_split
X_train, X_test, Y_train, Y_test =
train_test_split(X,y,test_size=0.1,random_state=101)

from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
test = sc.transform(test)

X_train
```

```
array([[-1.62737257, -0.98675438, -1.01271559, ..., -1.78222729,
        -1.00892875, -0.99888951],
       [-0.75199354,  1.01342342,  0.58093235, ..., -1.78222729,
         0.99115027, -0.99888951],
       [-0.20630271,  1.01342342,  0.70352065, ...,  0.56109566,
        -1.00892875,  1.00111173],
       ...,
       [ 0.69636086,  1.01342342, -0.03200917, ...,  0.56109566,
        -1.00892875, -0.99888951],
       [ 0.83733099, -0.98675438, -1.2578922 , ...,  0.56109566,
        -1.00892875,  1.00111173],
       [ 0.4144206 , -0.98675438, -0.39977408, ...,  0.56109566,
         0.99115027,  1.00111173]])
```

```
X_test
```

```
array([[ 0.28481903, -0.98675438, -1.2578922 , ...,  0.56109566,
        -1.00892875, -0.99888951],
       [-1.44092821, -0.98675438, -1.2578922 , ...,  0.56109566,
         0.99115027,  1.00111173],
```

```
       [-1.49322358, -0.98675438, -0.15459747, ...,  0.56109566,
        -1.00892875,  1.00111173],
       ...,
       [-0.55418061,  1.01342342,  0.33575574, ...,  0.56109566,
        -1.00892875, -0.99888951],
       [ 0.09610095, -0.98675438, -0.89012729, ...,  0.56109566,
         0.99115027,  1.00111173],
       [-1.60690917, -0.98675438,  1.07128556, ...,  0.56109566,
         0.99115027, -0.99888951]])
```

test

```
array([[-0.4541373 ,  1.01342342,  0.33575574, ..., -1.78222729,
         0.99115027, -0.99888951],
       [-0.91342707,  1.01342342, -1.2578922 , ...,  0.56109566,
        -1.00892875, -0.99888951],
       [ 1.2829785 ,  1.01342342,  1.56163877, ..., -1.78222729,
         0.99115027,  1.00111173],
       ...,
       [-0.13127022, -0.98675438, -0.15459747, ...,  0.56109566,
        -1.00892875, -0.99888951],
       [ 0.65998148,  1.01342342, -1.2578922 , ..., -1.78222729,
         0.99115027, -0.99888951],
       [ 0.06199528,  1.01342342, -1.2578922 , ...,  0.56109566,
        -1.00892875,  1.00111173]])
```

```
from sklearn.tree import DecisionTreeClassifier
dtc = DecisionTreeClassifier()
dtc.fit(X_train , Y_train)
```

```
DecisionTreeClassifier()
```

```
p = dtc.predict(X_test)
p
```

```
array([1, 1, 2, 1, 0, 1, 2, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 3,
1,
       2, 3, 2, 2, 2, 1, 0, 0, 2, 3, 0, 0, 3, 0, 0, 0, 1, 1, 1, 2, 3,
2,
       2, 1, 1, 3, 3, 1, 0, 0, 2, 3, 3, 2, 0, 3, 3, 3, 2, 2, 3, 1, 3,
2,
       0, 1, 0, 2, 1, 2, 3, 2, 2, 3, 3, 2, 0, 2, 0, 0, 2, 1, 2, 2, 2,
2,
       0, 0, 3, 3, 0, 2, 0, 3, 2, 0, 2, 3, 0, 1, 2, 3, 0, 2, 0, 0, 2,
0,
       1, 0, 3, 2, 2, 2, 1, 3, 2, 0, 3, 3, 1, 3, 1, 3, 3, 2, 1, 1, 1,
0,
       1, 1, 0, 2, 3, 0, 2, 3, 2, 3, 0, 1, 0, 0, 1, 3, 2, 0, 2, 1, 3,
2,
       3, 2, 2, 0, 3, 1, 2, 2, 2, 2, 1, 2, 1, 1, 3, 3, 1, 2, 0, 3, 1,
3,
```

```
       1, 2, 3, 1, 2, 1, 0, 1, 3, 2, 1, 2, 1, 3, 1, 0, 2, 2, 0, 3, 0,
0,
       3, 0], dtype=int64)
```

```
from sklearn.metrics import accuracy_score, confusion_matrix
dtc_acc = accuracy_score(p,Y_test)
print(dtc_acc)
print(confusion_matrix(p,Y_test))
```

```
0.845
[[43  3  0  0]
 [ 7 38  7  0]
 [ 0  5 49  3]
 [ 0  0  6 39]]
```

```
from sklearn.svm import SVC
knn=SVC()
knn.fit(X_train,Y_train)
```

```
SVC()
```

```
pred1 = knn.predict(X_test)
pred1
```

```
array([1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 0, 3,
1,
       2, 3, 2, 2, 2, 2, 0, 0, 2, 3, 0, 0, 3, 0, 0, 0, 1, 1, 1, 1, 3,
2,
       3, 0, 2, 3, 3, 1, 0, 1, 2, 3, 2, 2, 0, 3, 2, 3, 2, 2, 3, 1, 3,
1,
       0, 1, 0, 2, 1, 2, 3, 2, 1, 3, 3, 2, 1, 2, 0, 0, 2, 2, 2, 2, 2,
1,
       0, 0, 3, 2, 0, 2, 0, 3, 2, 0, 2, 3, 0, 1, 3, 3, 0, 3, 0, 0, 2,
0,
       1, 0, 3, 2, 1, 1, 1, 3, 1, 0, 3, 2, 2, 3, 1, 2, 3, 2, 1, 1, 1,
0,
       0, 1, 0, 1, 3, 0, 2, 3, 1, 3, 0, 0, 0, 1, 1, 3, 2, 0, 2, 0, 2,
2,
       3, 2, 2, 0, 3, 2, 2, 2, 1, 2, 1, 2, 1, 0, 3, 3, 1, 2, 0, 3, 1,
3,
       2, 2, 3, 2, 1, 1, 0, 1, 2, 2, 2, 2, 0, 3, 1, 0, 2, 2, 0, 2, 0,
0,
       3, 0], dtype=int64)
```

```
from sklearn.metrics import accuracy_score
svc_acc = accuracy_score(pred1,Y_test)
print(svc_acc)
print(confusion_matrix(pred1,Y_test))
```

```
0.88
[[46  3  0  0]
 [ 4 40  8  0]
```

```
 [ 0  3 52  4]
 [ 0  0  2 38]]
```

```
from sklearn.linear_model import LogisticRegression  # its a
classification
lr=LogisticRegression()
lr.fit(X_train,Y_train)
```

```
LogisticRegression()
```

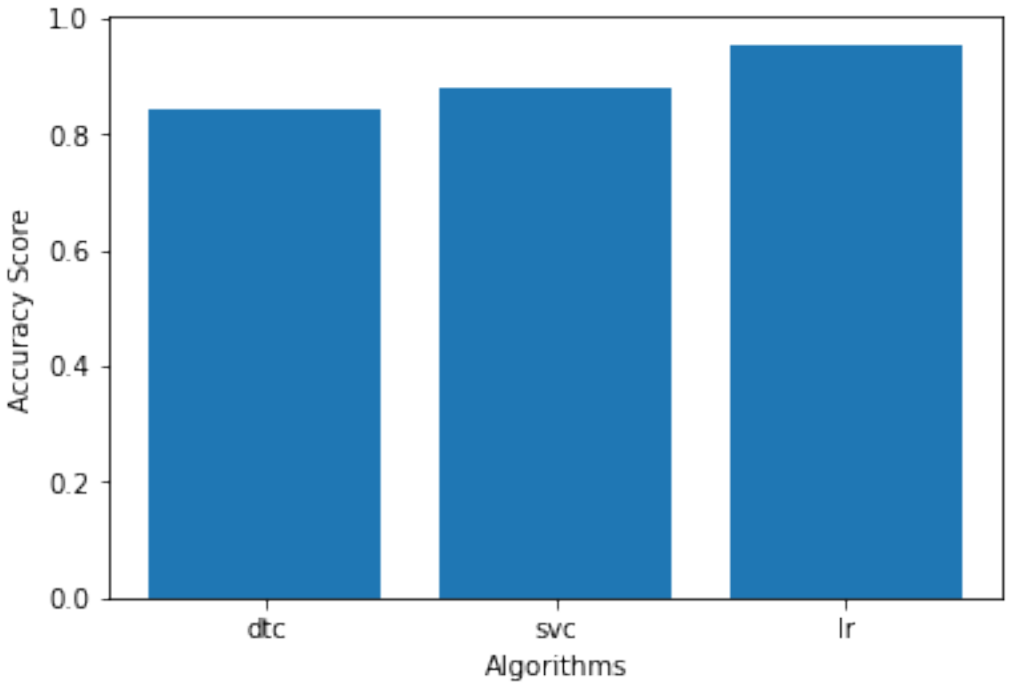
```
pred2 = lr.predict(X_test)
pred2
```

```
array([1, 1, 2, 1, 1, 1, 2, 1, 1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 3,
1,
       2, 3, 2, 2, 2, 2, 0, 0, 2, 3, 0, 0, 3, 0, 0, 0, 1, 1, 1, 2, 3,
2,
       3, 0, 1, 3, 3, 1, 0, 0, 3, 3, 3, 3, 1, 3, 2, 3, 2, 2, 3, 1, 3,
1,
       0, 0, 0, 2, 1, 2, 3, 2, 1, 3, 3, 2, 0, 2, 0, 0, 2, 1, 2, 2, 2,
1,
       0, 0, 3, 2, 0, 2, 0, 3, 2, 0, 2, 3, 0, 1, 3, 3, 0, 3, 0, 0, 2,
0,
       1, 0, 3, 2, 2, 1, 1, 3, 1, 0, 3, 2, 2, 3, 1, 2, 3, 2, 1, 1, 1,
0,
       0, 1, 0, 2, 3, 0, 2, 3, 1, 3, 0, 0, 0, 1, 1, 2, 2, 0, 3, 1, 2,
2,
       3, 2, 2, 0, 3, 2, 2, 2, 2, 2, 1, 2, 1, 1, 3, 3, 1, 2, 0, 3, 1,
3,
       2, 2, 3, 2, 2, 1, 0, 1, 3, 2, 1, 2, 0, 3, 1, 0, 2, 2, 0, 2, 0,
0,
       3, 0], dtype=int64)
```

```
from sklearn.metrics import accuracy_score
lr_acc = accuracy_score(pred2,Y_test)
print(lr_acc)
print(confusion_matrix(pred2,Y_test))
```

```
0.955
[[49  1  0  0]
 [ 1 45  3  0]
 [ 0  0 56  1]
 [ 0  0  3 41]]
```

```
plt.bar(x=['dtc','svc','lr'],height=[dtc_acc,svc_acc,lr_acc])
plt.xlabel("Algorithms")
plt.ylabel("Accuracy Score")
plt.show()
```




```
lr.predict(test)
```

```
array([3, 3, 2, 3, 1, 3, 3, 1, 3, 0, 3, 3, 0, 0, 2, 0, 2, 1, 3, 2, 1,
3,
       1, 1, 3, 0, 2, 0, 3, 0, 2, 0, 3, 0, 1, 1, 3, 1, 2, 1, 1, 2, 0,
0,
       0, 1, 0, 3, 1, 2, 1, 0, 3, 0, 3, 0, 3, 1, 1, 3, 3, 3, 0, 1, 1,
1,
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