day-5-623

February 16, 2024

[1]:
```
import pandas as pd
d = pd.read_csv("bmi.csv")
d
```

[1]:

	Gender	Height	Weight	Index
0	Male	174	96	4
1	Male	189	87	2
2	Female	185	110	4
3	Female	195	104	3
4	Male	149	61	3
..	…	…	…	…
495	Female	150	153	5
496	Female	184	121	4
497	Female	141	136	5
498	Male	150	95	5
499	Male	173	131	5

[500 rows x 4 columns]

[2]:
```
# Converting male to 0 and female to 1
d['Gender'] = d['Gender'].map({'Male':0, 'Female':1})
d
```

[2]:

	Gender	Height	Weight	Index
0	0	174	96	4
1	0	189	87	2
2	1	185	110	4
3	1	195	104	3
4	0	149	61	3
..	…	…	…	…
495	1	150	153	5
496	1	184	121	4
497	1	141	136	5
498	0	150	95	5
499	0	173	131	5

[500 rows x 4 columns]

[3]:
```
x = d.drop('Index', axis=1)
x
```

[3]:
```
     Gender  Height  Weight
0         0     174      96
1         0     189      87
2         1     185     110
3         1     195     104
4         0     149      61
..      ...     ...     ...
495       1     150     153
496       1     184     121
497       1     141     136
498       0     150      95
499       0     173     131

[500 rows x 3 columns]
```

[4]:
```
y = d['Index']
y
```

[4]:
```
0      4
1      2
2      4
3      3
4      3
      ..
495    5
496    4
497    5
498    5
499    5
Name: Index, Length: 500, dtype: int64
```

[5]:
```
x.shape
```

[5]:
```
(500, 3)
```

[6]:
```
y.shape
```

[6]:
```
(500,)
```

[7]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x,y, test_size=0.3,␣
 ↪random_state=101)
x_train.shape
y_train.shape
```

[7]: (350,)

[8]:
```
from sklearn.linear_model import LogisticRegression
log_model = LogisticRegression()
# To train the dataset
log_model.fit(x_train, y_train)
```

```
C:\ProgramData\anaconda3\Lib\site-
packages\sklearn\linear_model\_logistic.py:460: ConvergenceWarning: lbfgs failed
to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  n_iter_i = _check_optimize_result(
```

[8]: LogisticRegression()

[9]:
```
pred = log_model.predict(x_test)
pred
```

[9]:
```
array([5, 4, 5, 2, 3, 3, 1, 4, 5, 4, 5, 3, 5, 3, 5, 2, 5, 5, 4, 5, 4, 5,
       4, 5, 2, 4, 3, 4, 5, 2, 5, 4, 4, 5, 4, 5, 0, 2, 5, 4, 3, 5, 4, 5,
       5, 5, 4, 2, 1, 3, 5, 5, 5, 4, 2, 2, 2, 5, 4, 5, 3, 3, 5, 5, 3, 5,
       4, 4, 4, 5, 5, 4, 5, 5, 1, 4, 3, 3, 5, 2, 2, 2, 5, 3, 5, 5, 5, 5,
       5, 2, 3, 5, 2, 4, 4, 0, 4, 5, 5, 5, 2, 4, 4, 5, 2, 3, 5, 5, 1, 1,
       5, 4, 5, 3, 5, 5, 5, 2, 4, 4, 5, 4, 4, 5, 4, 5, 5, 1, 4, 2, 5, 1,
       5, 4, 3, 5, 5, 5, 3, 5, 5, 4, 3, 5, 1, 5, 2, 4, 5, 5], dtype=int64)
```

[10]:
```
(d['Gender']==0).sum()
(d['Gender']==1).sum()
```

[10]: 255

[11]:
```
data = pd.get_dummies(d, columns=["Gender"], dtype=int, drop_first=True)
data
```

[11]:

	Height	Weight	Index	Gender_1
0	174	96	4	0
1	189	87	2	0
2	185	110	4	1
3	195	104	3	1
4	149	61	3	0
..	…	…	…	…

```
495     150     153      5         1
496     184     121      4         1
497     141     136      5         1
498     150      95      5         0
499     173     131      5         0

[500 rows x 4 columns]
```

[12]:
```
from sklearn.metrics import accuracy_score
accuracy_score(y_test, pred)
```

[12]:
```
0.7666666666666667
```

[13]:
```
# Linear Regression
# Data:

# X(Week)                                          Y(Sales in Thousand)
# ------------------------------------------------------------------------
#     1                                                    1.2
#     2                                                    1.8
#     3                                                    2.5
#     4                                                    3.2
#     5                                                    3.8

# Linear regression formula --> y = a0+a1*x

# a1--> ((meanof(x*y)) - (meanof(x)*meanof(y)))/meanof(x^2) - (meanof(x)^2)
# a0 = meanof(y)-a1*meanof(x)
#                 x         y                x^2         x*y
#     ------------------------------------------------------------------
#                 1        1.2                1          1.2

#                 2        1.8                4          3.6

#                 3        2.5                9          7.5

#                 4        3.2                16         12.8

#                 5        3.8                25         9
#      ------------------------------------------------------------------
# Sum:            15      12.5                55         44.4
# Average:        3        2.5                11         8.88

# a1 = 0.66
# a0 = 0.54

# The sales of 3rd week
```

```
# y = a0+(a1*x) --> 0.54+(0.66*3) --> 2.52

# The sales of 7th week
# y = 0.54+(0.66*7) --> 5.16
```

[14]:
```
# Project-1
df = pd.read_csv("Linear_regr_Salary_dataset.csv")
df.head()
```

[14]:

	Unnamed: 0	YearsExperience	Salary
0	0	1.2	39344.0
1	1	1.4	46206.0
2	2	1.6	37732.0
3	3	2.1	43526.0
4	4	2.3	39892.0

[15]:
```
df.shape
```

[15]:
```
(30, 3)
```

[16]:
```
df.isnull().sum()
```

[16]:
```
Unnamed: 0         0
YearsExperience    0
Salary             0
dtype: int64
```

[17]:
```
df.isna().sum()
```

[17]:
```
Unnamed: 0         0
YearsExperience    0
Salary             0
dtype: int64
```

[18]:
```
x = df[['YearsExperience']]
x
y = df[['Salary']]
y
```

[18]:

	Salary
0	39344.0
1	46206.0
2	37732.0
3	43526.0
4	39892.0
5	56643.0
6	60151.0

```
7    54446.0
8    64446.0
9    57190.0
10   63219.0
11   55795.0
12   56958.0
13   57082.0
14   61112.0
15   67939.0
16   66030.0
17   83089.0
18   81364.0
19   93941.0
20   91739.0
21   98274.0
22  101303.0
23  113813.0
24  109432.0
25  105583.0
26  116970.0
27  112636.0
28  122392.0
29  121873.0
```

[19]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3,␣
↪random_state=101)
```

[20]:
```
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model
```

[20]:
```
LinearRegression()
```

[21]:
```
model.fit(x_train, y_train)
```

[21]:
```
LinearRegression()
```

[22]:
```
y_pred = model.predict(x_test)
y_pred
```

[22]:
```
array([[ 91101.58255782],
       [109298.20888234],
       [ 56623.76425873],
       [ 82482.12798305],
       [ 40342.57228416],
       [117917.66345711],
```

```
       [116959.94628213],
       [ 74820.39058325],
       [112171.36040726]])
```

[23]:
```
import numpy as np
y_test
```

[23]:
```
      Salary
20   91739.0
24  109432.0
7    54446.0
18   81364.0
2    37732.0
27  112636.0
26  116970.0
16   66030.0
25  105583.0
```

[24]:
```
inputdata = [[14.5]]
prediction = model.predict(inputdata)
prediction
```

```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py:464: UserWarning: X
does not have valid feature names, but LinearRegression was fitted with feature
names
  warnings.warn(
```

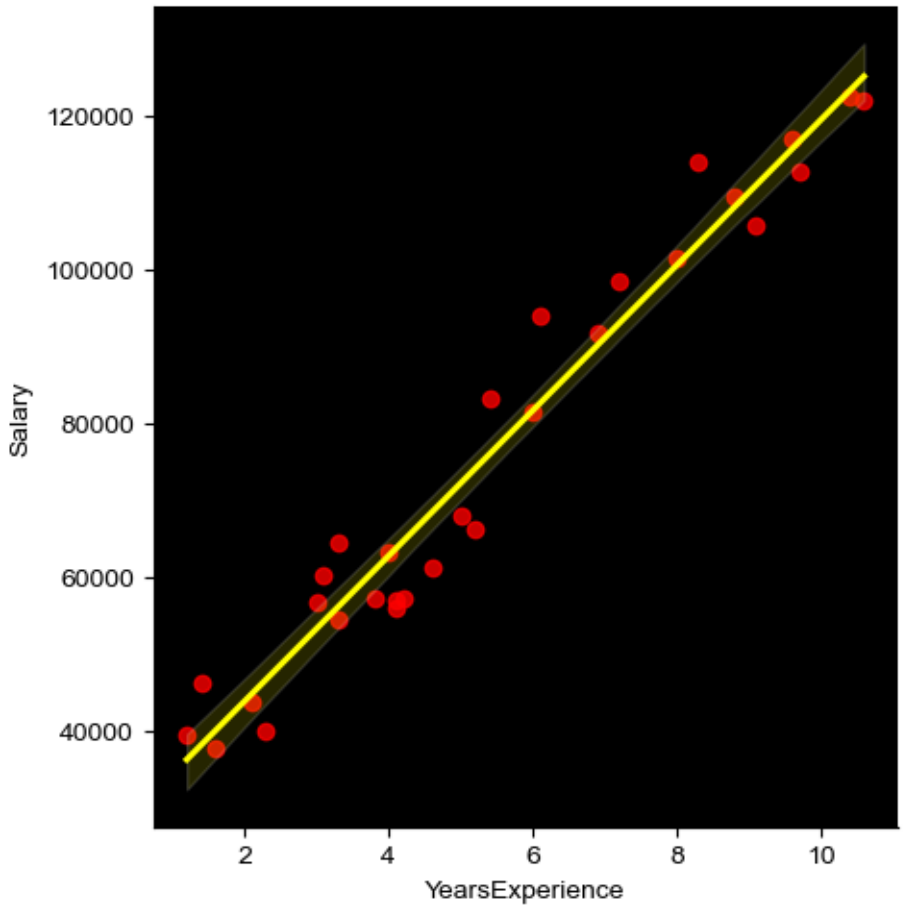
[24]:
```
array([[163888.08785589]])
```

[25]:
```
from sklearn.metrics import mean_squared_error
mse = mean_squared_error(y_test, y_pred)
mse
```

[25]:
```
17978409.497344103
```

[26]:
```
import seaborn as sns
import matplotlib.pyplot as plt
sns.lmplot(x='YearsExperience', y='Salary', data=df, line_kws={"color":
 ↪"yellow"}, scatter_kws={"color":"red"})
sns.set_style("darkgrid")
# ax.tick_params(axis='x', colors='white')
# ax.tick_params(axis='y', colors='white')
ax = plt.gca().set_facecolor("black")
```

```
C:\ProgramData\anaconda3\Lib\site-packages\seaborn\axisgrid.py:118: UserWarning:
The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```



[27]:
```
# Project-2
df = pd.read_csv("LR_Student_Performance.csv")
df.head()
```

[27]:

	Hours Studied	Previous Scores	Extracurricular Activities	Sleep Hours	\
0	7	99	Yes	9	
1	4	82	No	4	
2	8	51	Yes	7	
3	5	52	Yes	5	
4	7	75	No	8	

	Sample Question Papers Practiced	Performance Index
0	1	91.0
1	2	65.0
2	2	45.0
3	2	36.0
4	5	66.0

[28]:
```
df.shape
```

[28]:
```
(10000, 6)
```

[29]:
```
df.isnull().sum()
```

[29]:
```
Hours Studied                       0
Previous Scores                     0
Extracurricular Activities          0
Sleep Hours                         0
Sample Question Papers Practiced    0
Performance Index                   0
dtype: int64
```

[30]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 6 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Hours Studied                     10000 non-null  int64
 1   Previous Scores                   10000 non-null  int64
 2   Extracurricular Activities        10000 non-null  object
 3   Sleep Hours                       10000 non-null  int64
 4   Sample Question Papers Practiced  10000 non-null  int64
 5   Performance Index                 10000 non-null  float64
dtypes: float64(1), int64(4), object(1)
memory usage: 468.9+ KB
```

[31]:
```
# To check duplicate values
duplicate_rows = df.duplicated()
duplicate_rows.sum()
print("Before dropping duplicates", df.shape)
df.drop_duplicates(inplace = True)
print("After dropping duplicates", df.shape)
```

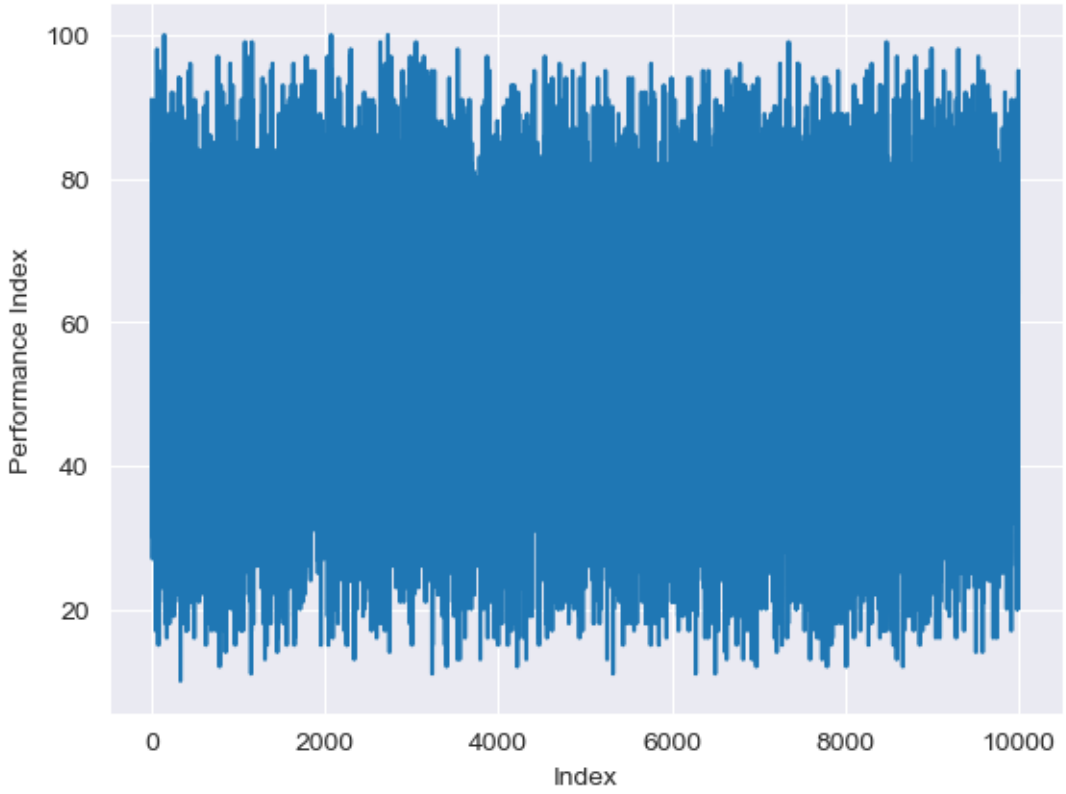
```
Before dropping duplicates (10000, 6)
After dropping duplicates (9873, 6)
```

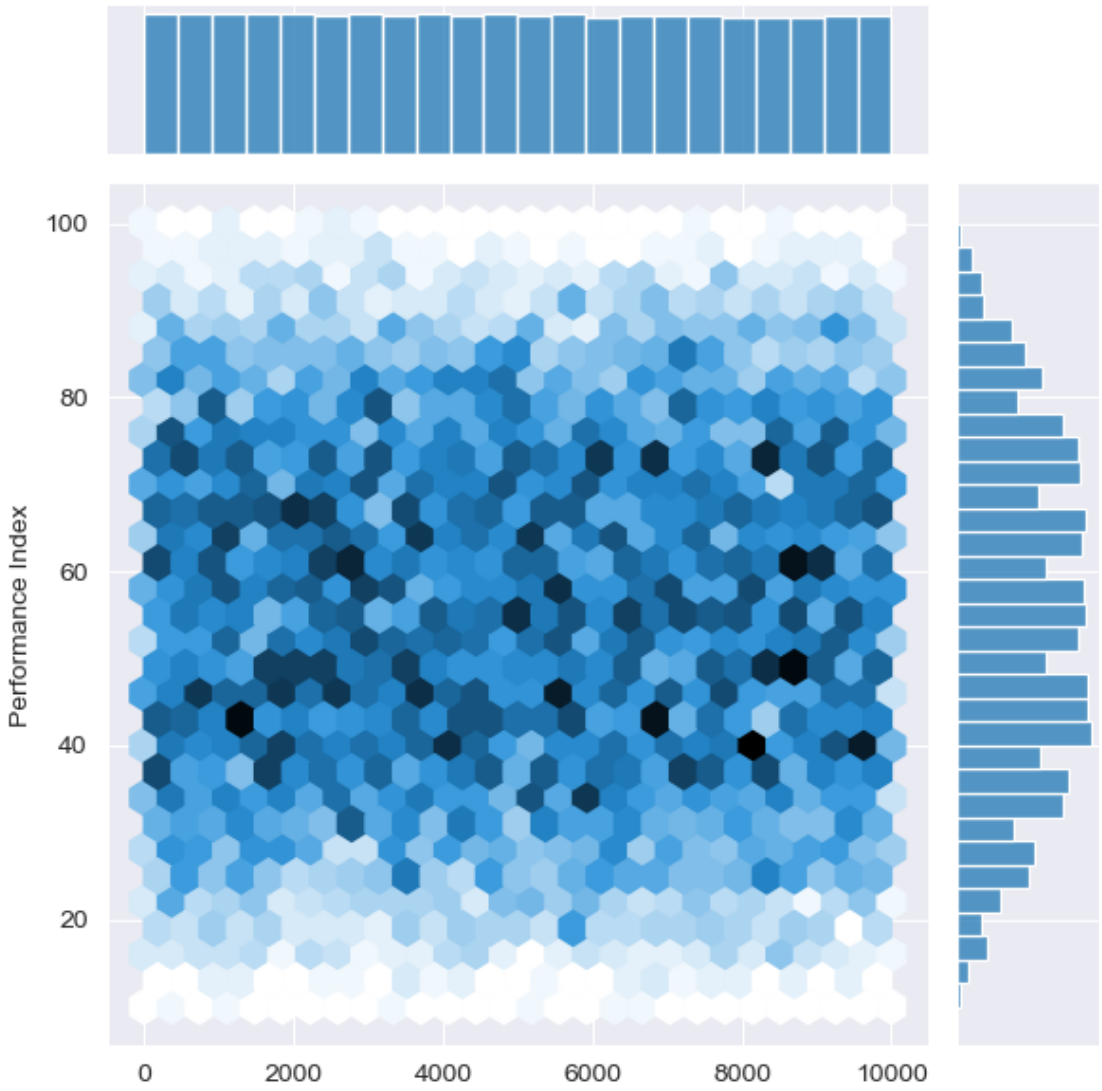
[32]:
```
# Based on index value try to check the performance
response = df["Performance Index"]
response.dtype
```

[32]:
```
dtype('float64')
```

[33]:
```
plt.plot(response.index, response)
plt.xlabel("Index")
plt.ylabel("Performance Index")
sns.jointplot(x=response.index,y="Performance Index", data=df, kind="hex")
```

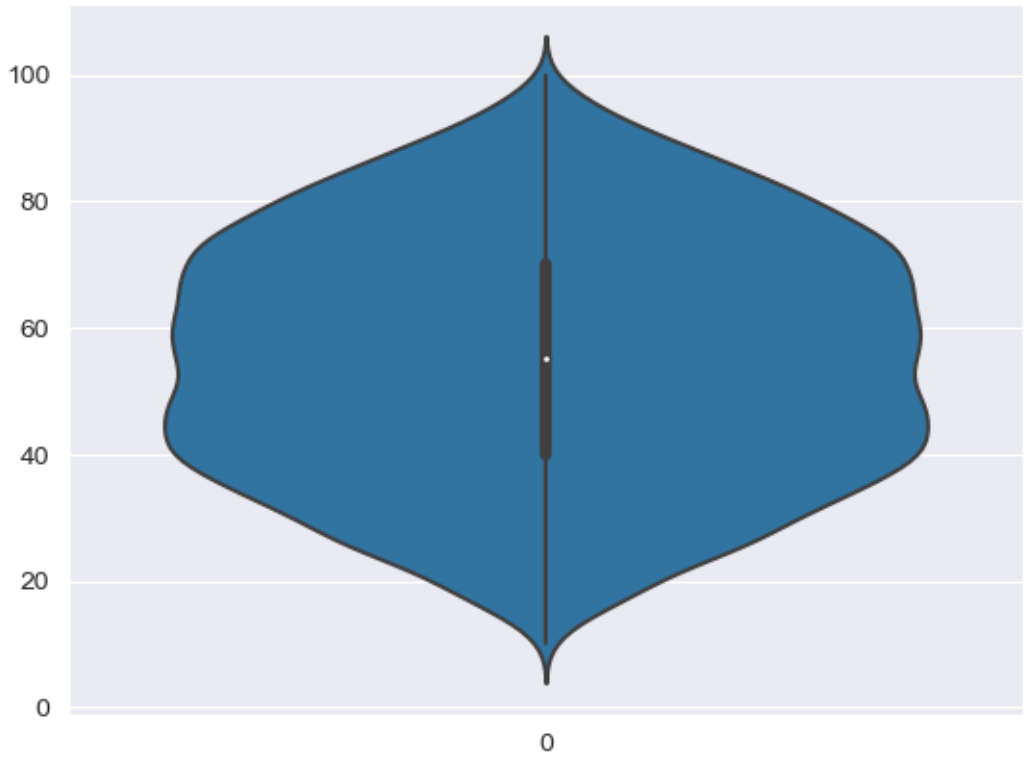
[33]: <seaborn.axisgrid.JointGrid at 0x267cf0e97d0>





[34]:
```
sns.violinplot(response)
```

[34]: <Axes: >



[35]:
```
(df['Performance Index']==min(response)).sum()
(df['Performance Index']==max(response)).sum()
```

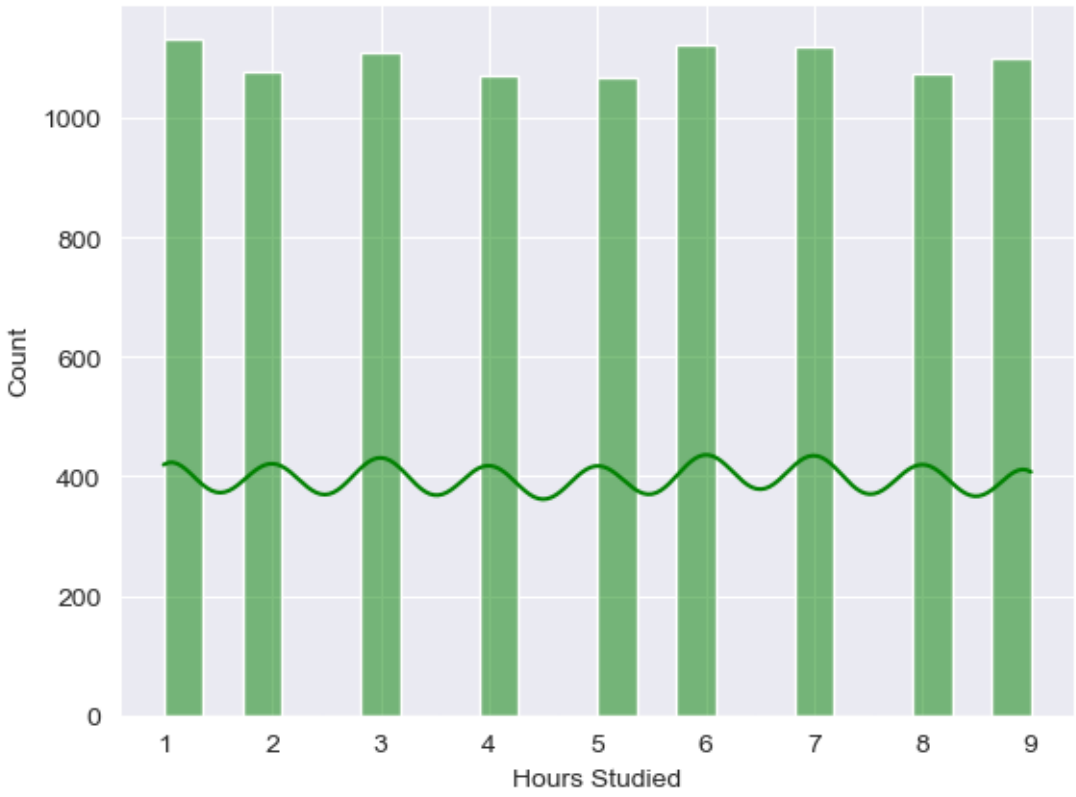
[35]: 3

[36]:
```
(df["Hours Studied"].max())
(df["Hours Studied"].min())
(df["Hours Studied"].sum())
df["Hours Studied"].value_counts()
df["Hours Studied"].unique()
```

[36]: array([7, 4, 8, 5, 3, 6, 2, 1, 9], dtype=int64)

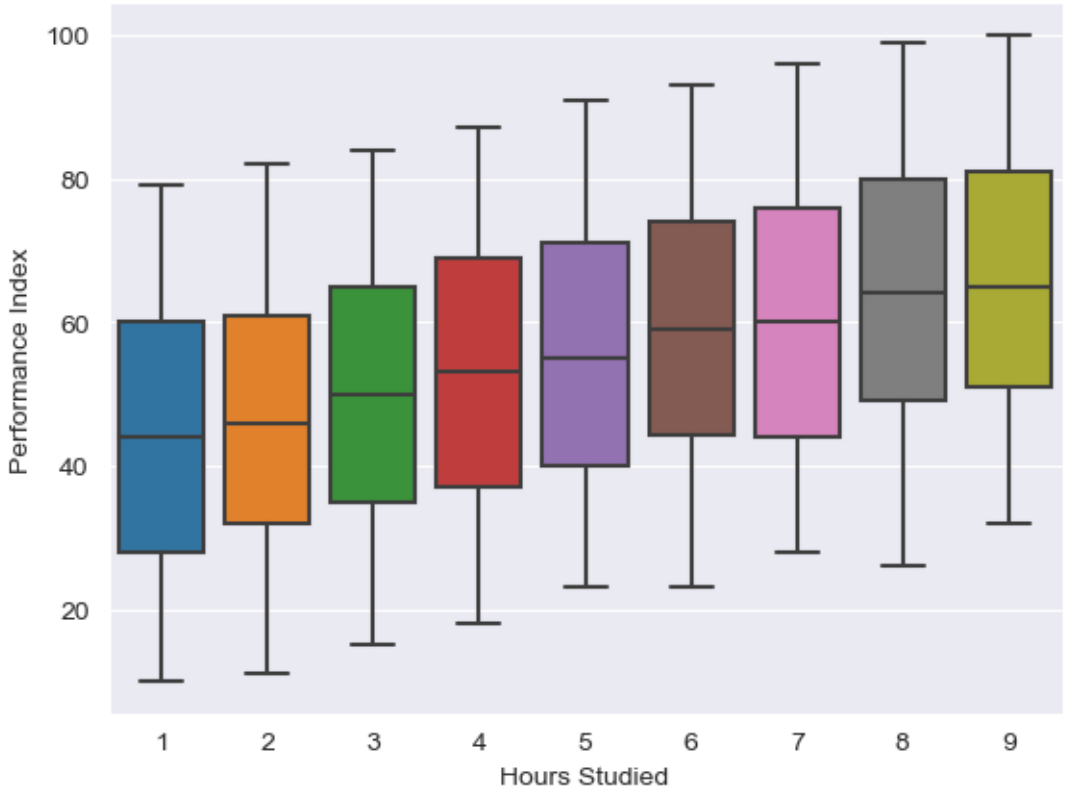
[39]:
```
# To know how many students studied in each hours
sns.histplot(df["Hours Studied"], kde=True, color="green")
```

[39]: <Axes: xlabel='Hours Studied', ylabel='Count'>



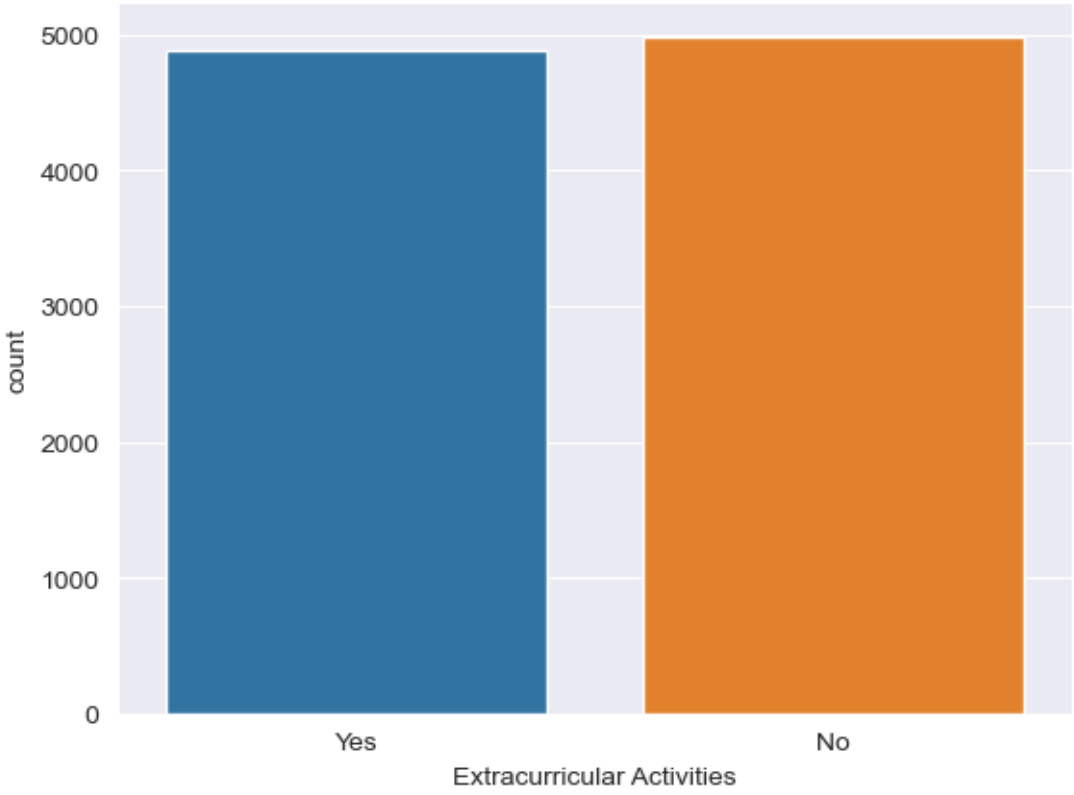
[40]:
```
sns.boxplot(x=df["Hours Studied"], y=df["Performance Index"])
```

[40]: <Axes: xlabel='Hours Studied', ylabel='Performance Index'>



[41]:
```
sns.countplot(x="Extracurricular Activities", data=df)
```

[41]: <Axes: xlabel='Extracurricular Activities', ylabel='count'>



[42]:
```
df.columns
```

[42]:
```
Index(['Hours Studied', 'Previous Scores', 'Extracurricular Activities',
       'Sleep Hours', 'Sample Question Papers Practiced', 'Performance Index'],
      dtype='object')
```

[43]:
```
df['Extracurricular Activities'] = df['Extracurricular Activities'].map({'Yes':
 ↪1, 'No':0})
df
```

[43]:

	Hours Studied	Previous Scores	Extracurricular Activities	Sleep Hours	\
0	7	99	1	9	
1	4	82	0	4	
2	8	51	1	7	
3	5	52	1	5	
4	7	75	0	8	
…	…	…	…	…	
9995	1	49	1	4	
9996	7	64	1	8	
9997	6	83	1	8	
9998	9	97	1	7	

```
9999              7               74                            0              8

      Sample Question Papers Practiced  Performance Index
0                                    1               91.0
1                                    2               65.0
2                                    2               45.0
3                                    2               36.0
4                                    5               66.0
…                                  …                 …
9995                                 2               23.0
9996                                 5               58.0
9997                                 5               74.0
9998                                 0               95.0
9999                                 1               64.0

[9873 rows x 6 columns]
```

[44]:
```
x = df[['Hours Studied', 'Previous Scores', 'Extracurricular Activities',␣
 ↪'Sleep Hours', 'Sample Question Papers Practiced']]
y = df[['Performance Index']]
```

[45]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3,␣
 ↪random_state=101)
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(x_train, y_train)
```

[45]:
```
LinearRegression()
```

[46]:
```
# Prediction
y_pred = model.predict(x_test)
y_pred
```

[46]:
```
array([[31.73833038],
       [64.02696941],
       [59.58675416],
       …,
       [61.72624559],
       [45.61901033],
       [65.47859095]])
```

[47]:
```
from sklearn.metrics import accuracy_score
acc = accuracy_score(y_test, np.round(y_pred))
acc
```

[47]:
```
0.20729237002025658
```

[48]:
```
inputdata = [[14.5, 13, 16, 20, 17]]
pred = model.predict(inputdata)
pred
```

```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py:464: UserWarning: X
does not have valid feature names, but LinearRegression was fitted with feature
names
  warnings.warn(
```

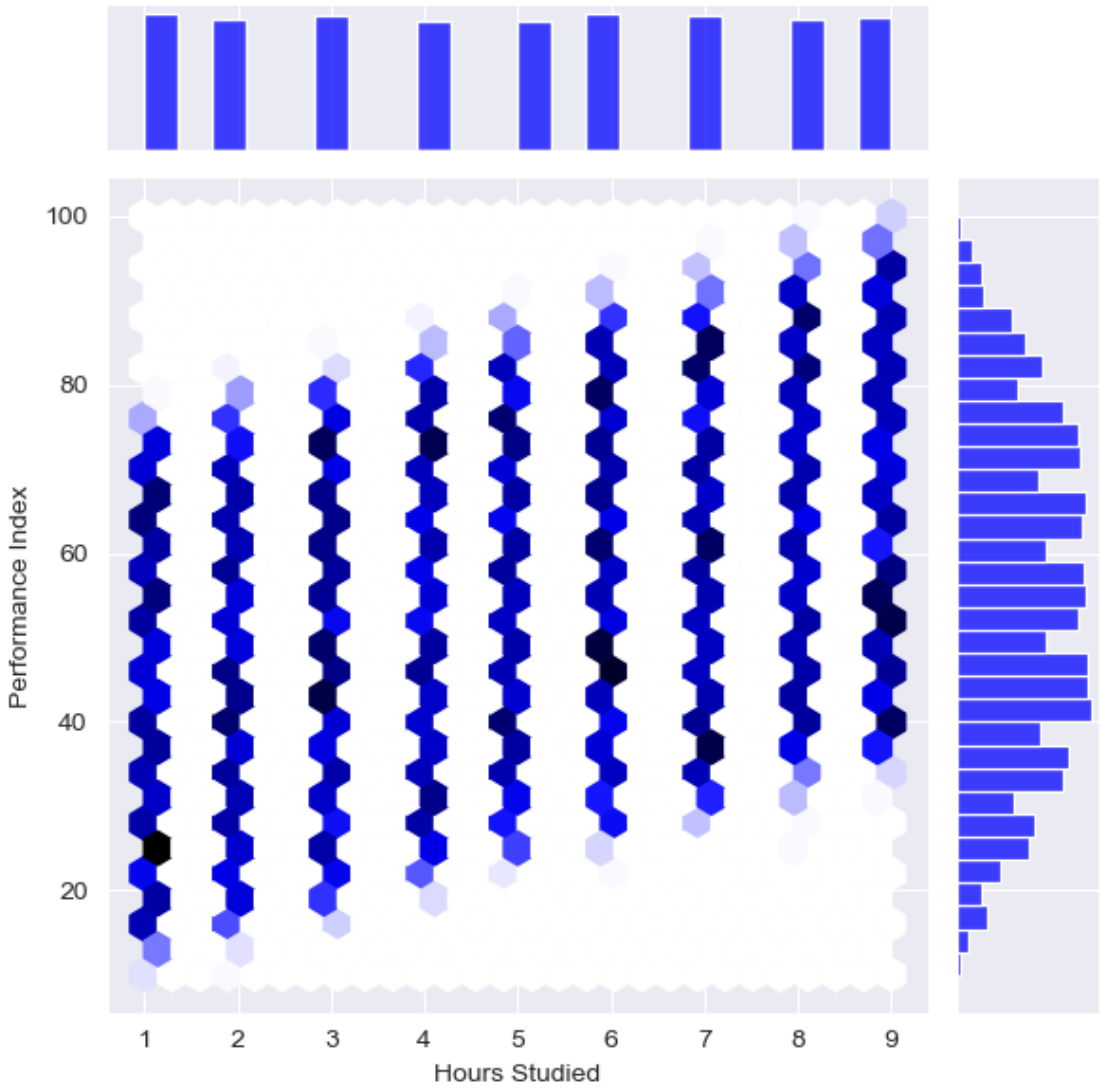
[48]:
```
array([[43.23442314]])
```

[49]:
```
from sklearn.metrics import mean_squared_error
mse = mean_squared_error(y_test, y_pred)
mse
```

[49]:
```
4.218166715267655
```

[50]:
```
sns.jointplot(x="Hours Studied", y="Performance Index", data=df, kind="hex",␣
↪color="blue")
```

[50]:
```
<seaborn.axisgrid.JointGrid at 0x267d20917d0>
```



[51]:
```
# Instead of Linear Regression
from sklearn.linear_model import Ridge
```

[52]:
```
clf = Ridge()
```

[53]:
```
clf.fit(x_train, y_train)
```

[53]:
```
Ridge()
```

[54]:
```
y_pred = clf.predict(x_test)
y_pred
```

[54]:
```
array([[31.73864699],
       [64.02668957],
       [59.58709948],
       …,
       [61.72633893],
       [45.61936081],
       [65.4789566 ]])
```

[55]:
```
clf.score(x_test, y_test)
```

[55]:
```
0.9886367029756433
```