

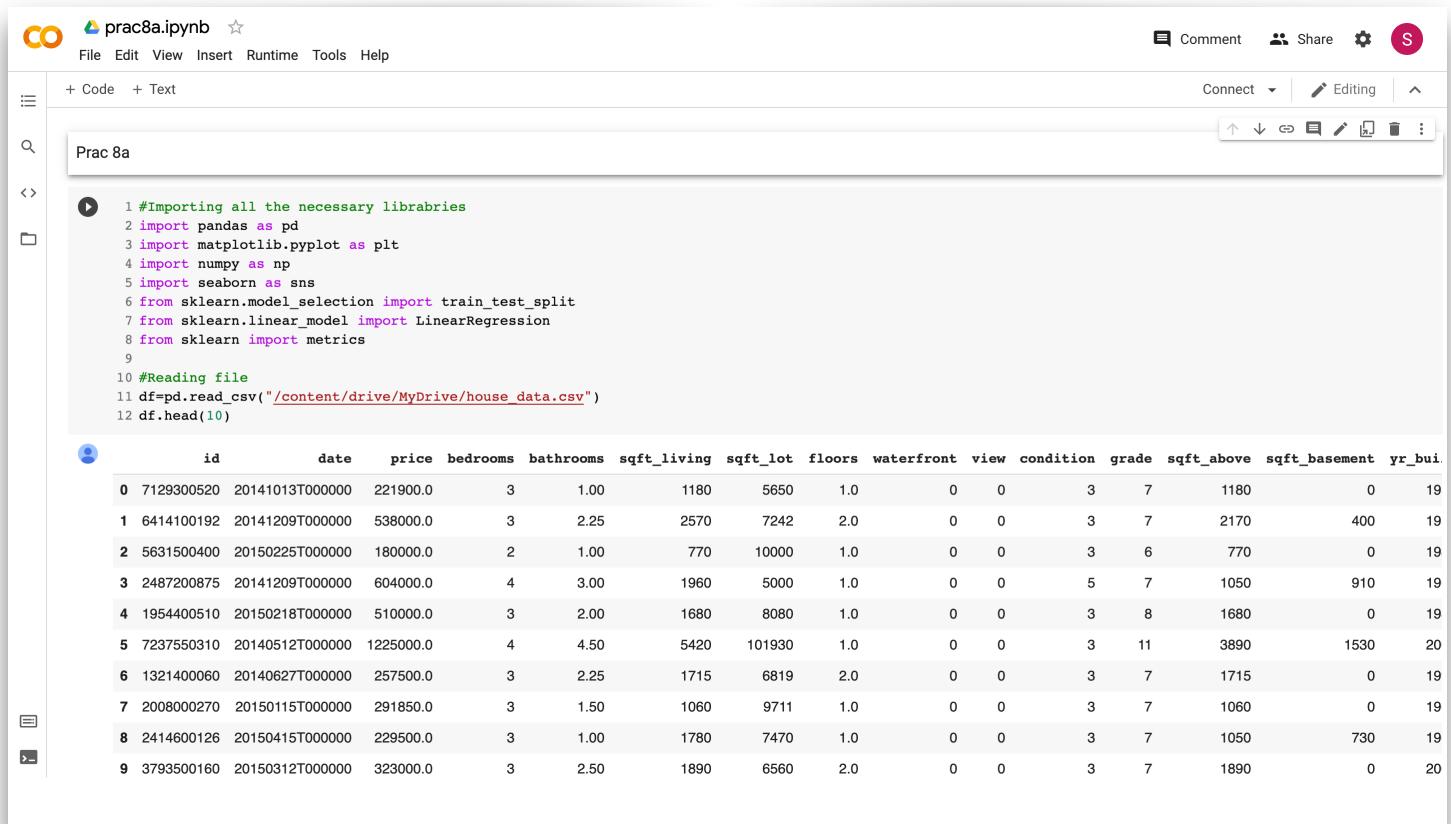
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D1 - 19BCE245
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Practical 8

Statistical data analysis

- Design a python program which performs the linear regression operation on the given data to predict the house price. Also, visualize the data for different attributes.
- Design a python program which implements the bisection and false positioning method.
- Design a python program that generates the 100 random variables and finds out the mean, median and mode for the same.

8a Code and output :



The screenshot shows a Google Colab notebook titled "prac8a.ipynb". The code cell contains Python code for importing libraries, reading a CSV file, and displaying the first 10 rows of the dataset. The output cell displays a table with 10 rows of house price data.

```

#Importing all the necessary libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn import metrics

#Reading file
df=pd.read_csv("/content/drive/MyDrive/house_data.csv")
df.head(10)

```

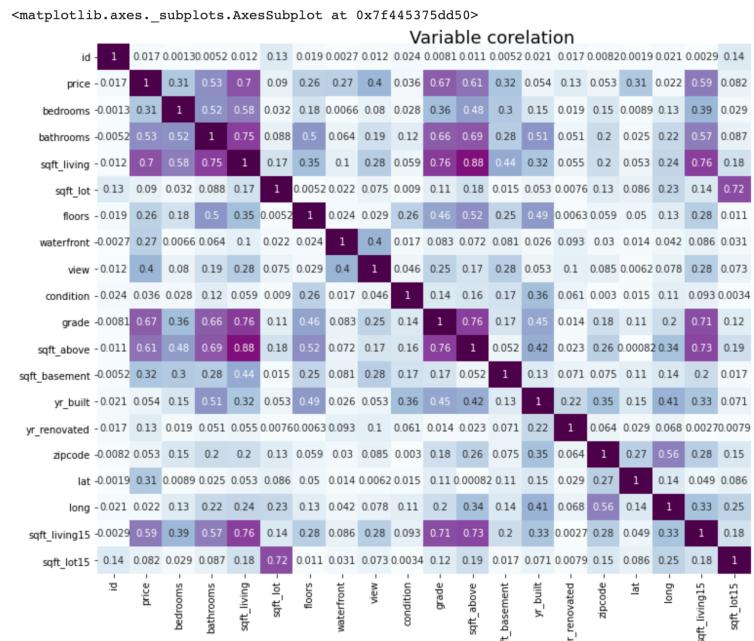
	id	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	grade	sqft_above	sqft_basement	yr_bui.
0	7129300520	20141013T000000	221900.0	3	1.00	1180	5650	1.0	0	0	3	7	1180	0	19
1	6414100192	20141209T000000	538000.0	3	2.25	2570	7242	2.0	0	0	3	7	2170	400	19
2	5631500400	20150225T000000	180000.0	2	1.00	770	10000	1.0	0	0	3	6	770	0	19
3	2487200875	20141209T000000	604000.0	4	3.00	1960	5000	1.0	0	0	5	7	1050	910	19
4	1954400510	20150218T000000	510000.0	3	2.00	1680	8080	1.0	0	0	3	8	1680	0	19
5	7237550310	20140512T000000	1225000.0	4	4.50	5420	101930	1.0	0	0	3	11	3890	1530	20
6	1321400060	20140627T000000	257500.0	3	2.25	1715	6819	2.0	0	0	3	7	1715	0	19
7	2008000270	20150115T000000	291850.0	3	1.50	1060	9711	1.0	0	0	3	7	1060	0	19
8	2414600126	20150415T000000	229500.0	3	1.00	1780	7470	1.0	0	0	3	7	1050	730	19
9	3793500160	20150312T000000	323000.0	3	2.50	1890	6560	2.0	0	0	3	7	1890	0	20

```
[ ] 1 #Printing datatypes of all columns
2 print(df.dtypes)
3 #plotting a pairplot between all variables to check which variables have a good linear regression curve
4 sns.pairplot(df)
```

```
id          int64
date        object
price       float64
bedrooms    int64
bathrooms   float64
sqft_living int64
sqft_lot    int64
floors      float64
waterfront  int64
view        int64
condition   int64
grade       int64
sqft_above  int64
sqft_basement int64
yr_built    int64
yr_renovated int64
zipcode     int64
lat         float64
long        float64
sqft_living15 int64
sqft_lot15  int64
dtype: object
<seaborn.axisgrid.PairGrid at 0x7f446d8ebc90>
```



```
[ ] 1 #Plotting a heatmap
2 c=df.corr().abs()
3 figure, axes=plt.subplots(figsize=(15,10))
4 figure.suptitle('Variable corelation', fontsize=18,y=.90)
5 heatmap=sns.heatmap(c,cmap="BuPu",annot=True)
6 heatmap
```



```
[ ] 1 #aliasing model for Linear Regression
2 from sklearn import linear_model
3
4 # aliasing x and y
5 df = pd.read_csv('kc_house_data.csv')
6 X = df.drop(['price'], axis=1)
7 y = df['price']
8
9 # fitting the model
10 lr = linear_model.LinearRegression()
11 lr.fit(X, y)
12
13 # accuracy score
14 print("Accuracy score: ", lr.score(X, y))
15
16 #Total number of Samples",X.shape[0])
17 "Number of test samples : ", X_te.shape[0])
18 "Number of training samples: ", X_tr.shape[0])
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21 Accuracy score:  0.6998463505666741
22 Total number of Samples 21613
23 Number of test samples :  2162
24 Number of training samples:  19451
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6.    return sum([float(a)*pow(float(x),float(b)) for a,b in
      zip(coeff_list,power_list)])
7.
8. def bisection(a,b):
9.     if calculate_value(a)*calculate_value(b)>=0:
10.        return False,0
11.
12.    c = a
13.    while (b-a)>=0.01:
14.        c = (a+b)/2
15.        if calculate_value(c)==0.0:
16.            return True,c
17.        if calculate_value(c)*calculate_value(a)<0:
18.            b=c
19.        else:
20.            a=c
21.    return True,c
22.
23.number_of_terms = int(input("How many terms are there in
   the equation : "))
24.coeff_list = []
25.power_list = []
26.for index in range(number_of_terms):
27.    coeff = float(input(f"\n\tEnter coefficient for term
   {index+1} : "))
28.    power = float(input(f"\tEnter power for term {index+1} :
   "))
29.    coeff_list.append(coeff)
30.    power_list.append(power)
31.print("\nEnterd formula : ",end="")
32.for index in range(number_of_terms-1):
33.    print(f"{coeff_list[index]}x^{power_list[index]}",end=
   + )
34.print(f"{coeff_list[number_of_terms-1]}
   x^{power_list[number_of_terms-1]}")
35.
36.while True:
37.    a = float(input("Enter a : "))
38.    b = float(input("Enter b : "))
39.
40.    choice,answer = bisection(a, b)
41.    if choice:
42.        print("Solution is :",round(answer,5))

```

```
43.         break
44. else:
45.     print("You have not assumed right a and b")
46.     a = float(input("Enter a : "))
47.     b = float(input("Enter b : "))
48.
49.
50.
51.
52.

53.#def calculate_value(x,coeff_list,power_list):
54.# counter = 0
55.# for i in range(len(coeff_list)):
56.#     counter += coeff_list[index] *
      pow(float(x),float(power_list[index])))
57.# return counter
```

Output :

```
How many terms are there in the equation : 3
```

```
Enter coefficient for term 1 : 1
Enter power for term 1 : 3
```

```
Enter coefficient for term 2 : -1
Enter power for term 2 : 2
```

```
Enter coefficient for term 3 : 2
Enter power for term 3 : 0
```

```
Entered formula : 1.0x^(3.0) + -1.0x^(2.0) + 2.0x^(0.0)
Enter a : -200
Enter b : 300
Solution is : -1.0025
```

Run Succeeded | Time 74 ms | Peak Memory 7.5M Symbol | Tabs: 4 | 58 Lines, 1513 Characters

False Position :

```

1. #!/usr/bin/env python3
2.
3. # Design a python program which implements the bisection and
   false positioning method.
4.
5. def calculate_value(x):
6.     return sum([float(a)*pow(float(x),float(b)) for a,b in
      zip(coeff_list,power_list)])
7.
8. def false_position(a,b):
9.     if calculate_value(a)*calculate_value(b)>=0:
10.        return False,0
11.
12.    for i in range(MAX_ITER=1000000):
13.        c = (a * calculate_value(b) - b *
   calculate_value(a))/(calculate_value(b) -
   calculate_value(a))
14.
15.        if calculate_value(c)==0:
16.            return True,c
17.        elif calculate_value(c)*calculate_value(a)<0:
18.            b = c
19.        else:
20.            a = c
21.
22.    return True,c
23.
24.number_of_terms = int(input("How many terms are there in
   the equation : "))
25.coeff_list = []
26.power_list = []
27.for index in range(number_of_terms):
28.    coeff = float(input(f"\n\tEnter coefficient for term
   {index+1} : "))
29.    power = float(input(f"\tEnter power for term {index+1} :
   "))
30.    coeff_list.append(coeff)
31.    power_list.append(power)
32.print("\nEnterd formula : ",end="")
33.for index in range(number_of_terms-1):

```

```

34. print(f"{coeff_list[index]}x^{power_list[index]}", end="")
    + ")
35.print(f"{coeff_list[number_of_terms-1]}
    x^{power_list[number_of_terms-1]}")
36.
37.while True:
38.    a = float(input("Enter a : "))
39.    b = float(input("Enter b : "))
40.
41.    choice,answer = false_position(a, b)
42.    if choice:
43.        print("Solution is :",round(answer,5))
44.        break
45.    else:
46.        print("You have not assumed right a and b")
47.        a = float(input("Enter a : "))
48.        b = float(input("Enter b : "))
49.
50.#def calculate_value(x,coeff_list,power_list):
51.# counter = 0
52.# for i in range(len(coeff_list)):
53.#     counter += coeff_list[index] *
      pow(float(x),float(power_list[index])))
54.# return counter

```

Output :

```

How many terms are there in the equation : 3

Enter coefficient for term 1 : 1
Enter power for term 1 : 3

Enter coefficient for term 2 : -1
Enter power for term 2 : 2

Enter coefficient for term 3 : 2
Enter power for term 3 : 0

Entered formula : 1.0x^(3.0) + -1.0x^(2.0) + 2.0x^(0.0)
Enter a : -200
Enter b : 300
Solution is : -1.0

```

(✓) Run Succeeded | Time 0:00:12 | Peak Memory 7.3M |  false_position | Tabs: 4 | Line 42, Column 11

8c Code :

```

1.#!/usr/bin/env python3
2.
3. # Design a python program that generates the 100 random
   variables and finds out the mean, median and mode for the
   same.
4. import random
5. import statistics
6.
7. randomlist = random.sample(range(100000000), 100)
8. print("Random generated list : ",randomlist)
9. print("Mean : ",statistics.mean(randomlist))
10.print("Median : ",statistics.median(randomlist))
11.print("Mode : ",statistics.mode(randomlist))

```

Output :

```

Random generated list : [11027479, 83648441, 8249896, 33281212,
94374492, 2813753, 65113437, 35565492, 30878045, 64428301,
4424312, 36275609, 23806164, 73508951, 35792559, 59349840,
43944462, 6488383, 8778659, 30840269, 31633674, 60097610,
43740373, 42763567, 24017123, 36083891, 24235888, 92458400,
7398595, 59266034, 96344322, 46629309, 61023809, 20837426,
48739260, 13477024, 71825963, 29211485, 91041226, 44350520,
29739931, 73844047, 86223589, 7107940, 8267147, 90416258,
70217114, 868910, 48700957, 1382113, 58286691, 21617708,
92420575, 74178352, 77375490, 37171277, 61672382, 90533917,
2417581, 78156340, 1892024, 84210522, 71626341, 99486759,
37521917, 40567425, 98863612, 3674578, 25080083, 85057254,
16246447, 30320895, 45901780, 37932328, 29151680, 76277622,
68014433, 51666125, 20501113, 67891369, 72872380, 49250712,
83081930, 41463753, 43359038, 13818538, 49127335, 55353921,
82438971, 55222911, 79514559, 71568902, 2466083, 57846271,
86152139, 64801101, 61454459, 24959512, 90437140, 19937683]
Mean : 48053752.19
Median : 46265544.5
Mode : 11027479

```

Run Succeeded | Time 75 ms | Peak Memory 7.8M | Symbol | Tabs: 4 | 12 Lines, 410 Characters

Conclusion :

Here we have learned about Linear Regression, Bisection and false Position method for finding roots of an equation and some statistical data analysis from mean, median and mode.

- **Linear Regression :** which is a linear approach to modelling the relationship between a scalar response and one or more explanatory variables.
- **Bisection :** The method is also called the interval halving method, the binary search method or the dichotomy method. This method is used to find root of an equation in a given interval that is value of ‘x’ for which $f(x) = 0$.
- **False Position :**
 - This method is also known as Regula Falsi or The Method of Chords. It is somewhat similar to bisection method like
 - Same Assumptions: This method also assumes that function is continuous in $[a, b]$ and given two numbers ‘a’ and ‘b’ are such that $f(a) * f(b) < 0$.
 - Always Converges: like Bisection, it always converges, usually considerably faster than Bisection—but sometimes very much more slowly than Bisection.
 - But It differs in the fact that
 - we make a chord joining the two points $[a, f(a)]$ and $[b, f(b)]$. We consider the point at which the chord touches the x axis and named it as c.