tips-lr

March 25, 2024

```python
[1]: import pandas as pd
     import matplotlib.pyplot as plt
     from sklearn.metrics import mean_absolute_error,mean_squared_error
     import numpy as np
     tips_data=pd.read_csv("tips.csv")
     tips_data
```

```
[1]:      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]
```

```python
[16]: new_tips_data = tips_data.dropna()

      print(new_tips_data.to_string())
```

```
      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
5         25.29  4.71    Male     No   Sun  Dinner     4
6          8.77  2.00    Male     No   Sun  Dinner     2
7         26.88  3.12    Male     No   Sun  Dinner     4
8         15.04  1.96    Male     No   Sun  Dinner     2
9         14.78  3.23    Male     No   Sun  Dinner     2
10        10.27  1.71    Male     No   Sun  Dinner     2
```

11	35.26	5.00	Female	No	Sun	Dinner	4
12	15.42	1.57	Male	No	Sun	Dinner	2
13	18.43	3.00	Male	No	Sun	Dinner	4
14	14.83	3.02	Female	No	Sun	Dinner	2
15	21.58	3.92	Male	No	Sun	Dinner	2
16	10.33	1.67	Female	No	Sun	Dinner	3
17	16.29	3.71	Male	No	Sun	Dinner	3
18	16.97	3.50	Female	No	Sun	Dinner	3
19	20.65	3.35	Male	No	Sat	Dinner	3
20	17.92	4.08	Male	No	Sat	Dinner	2
21	20.29	2.75	Female	No	Sat	Dinner	2
22	15.77	2.23	Female	No	Sat	Dinner	2
23	39.42	7.58	Male	No	Sat	Dinner	4
24	19.82	3.18	Male	No	Sat	Dinner	2
25	17.81	2.34	Male	No	Sat	Dinner	4
26	13.37	2.00	Male	No	Sat	Dinner	2
27	12.69	2.00	Male	No	Sat	Dinner	2
28	21.70	4.30	Male	No	Sat	Dinner	2
29	19.65	3.00	Female	No	Sat	Dinner	2
30	9.55	1.45	Male	No	Sat	Dinner	2
31	18.35	2.50	Male	No	Sat	Dinner	4
32	15.06	3.00	Female	No	Sat	Dinner	2
33	20.69	2.45	Female	No	Sat	Dinner	4
34	17.78	3.27	Male	No	Sat	Dinner	2
35	24.06	3.60	Male	No	Sat	Dinner	3
36	16.31	2.00	Male	No	Sat	Dinner	3
37	16.93	3.07	Female	No	Sat	Dinner	3
38	18.69	2.31	Male	No	Sat	Dinner	3
39	31.27	5.00	Male	No	Sat	Dinner	3
40	16.04	2.24	Male	No	Sat	Dinner	3
41	17.46	2.54	Male	No	Sun	Dinner	2
42	13.94	3.06	Male	No	Sun	Dinner	2
43	9.68	1.32	Male	No	Sun	Dinner	2
44	30.40	5.60	Male	No	Sun	Dinner	4
45	18.29	3.00	Male	No	Sun	Dinner	2
46	22.23	5.00	Male	No	Sun	Dinner	2
47	32.40	6.00	Male	No	Sun	Dinner	4
48	28.55	2.05	Male	No	Sun	Dinner	3
49	18.04	3.00	Male	No	Sun	Dinner	2
50	12.54	2.50	Male	No	Sun	Dinner	2
51	10.29	2.60	Female	No	Sun	Dinner	2
52	34.81	5.20	Female	No	Sun	Dinner	4
53	9.94	1.56	Male	No	Sun	Dinner	2
54	25.56	4.34	Male	No	Sun	Dinner	4
55	19.49	3.51	Male	No	Sun	Dinner	2
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57	26.41	1.50	Female	No	Sat	Dinner	2
58	11.24	1.76	Male	Yes	Sat	Dinner	2

59	48.27	6.73	Male	No	Sat	Dinner	4
60	20.29	3.21	Male	Yes	Sat	Dinner	2
61	13.81	2.00	Male	Yes	Sat	Dinner	2
62	11.02	1.98	Male	Yes	Sat	Dinner	2
63	18.29	3.76	Male	Yes	Sat	Dinner	4
64	17.59	2.64	Male	No	Sat	Dinner	3
65	20.08	3.15	Male	No	Sat	Dinner	3
66	16.45	2.47	Female	No	Sat	Dinner	2
67	3.07	1.00	Female	Yes	Sat	Dinner	1
68	20.23	2.01	Male	No	Sat	Dinner	2
69	15.01	2.09	Male	Yes	Sat	Dinner	2
70	12.02	1.97	Male	No	Sat	Dinner	2
71	17.07	3.00	Female	No	Sat	Dinner	3
72	26.86	3.14	Female	Yes	Sat	Dinner	2
73	25.28	5.00	Female	Yes	Sat	Dinner	2
74	14.73	2.20	Female	No	Sat	Dinner	2
75	10.51	1.25	Male	No	Sat	Dinner	2
76	17.92	3.08	Male	Yes	Sat	Dinner	2
77	27.20	4.00	Male	No	Thur	Lunch	4
78	22.76	3.00	Male	No	Thur	Lunch	2
79	17.29	2.71	Male	No	Thur	Lunch	2
80	19.44	3.00	Male	Yes	Thur	Lunch	2
81	16.66	3.40	Male	No	Thur	Lunch	2
82	10.07	1.83	Female	No	Thur	Lunch	1
83	32.68	5.00	Male	Yes	Thur	Lunch	2
84	15.98	2.03	Male	No	Thur	Lunch	2
85	34.83	5.17	Female	No	Thur	Lunch	4
86	13.03	2.00	Male	No	Thur	Lunch	2
87	18.28	4.00	Male	No	Thur	Lunch	2
88	24.71	5.85	Male	No	Thur	Lunch	2
89	21.16	3.00	Male	No	Thur	Lunch	2
90	28.97	3.00	Male	Yes	Fri	Dinner	2
91	22.49	3.50	Male	No	Fri	Dinner	2
92	5.75	1.00	Female	Yes	Fri	Dinner	2
93	16.32	4.30	Female	Yes	Fri	Dinner	2
94	22.75	3.25	Female	No	Fri	Dinner	2
95	40.17	4.73	Male	Yes	Fri	Dinner	4
96	27.28	4.00	Male	Yes	Fri	Dinner	2
97	12.03	1.50	Male	Yes	Fri	Dinner	2
98	21.01	3.00	Male	Yes	Fri	Dinner	2
99	12.46	1.50	Male	No	Fri	Dinner	2
100	11.35	2.50	Female	Yes	Fri	Dinner	2
101	15.38	3.00	Female	Yes	Fri	Dinner	2
102	44.30	2.50	Female	Yes	Sat	Dinner	3
103	22.42	3.48	Female	Yes	Sat	Dinner	2
104	20.92	4.08	Female	No	Sat	Dinner	2
105	15.36	1.64	Male	Yes	Sat	Dinner	2
106	20.49	4.06	Male	Yes	Sat	Dinner	2

107	25.21	4.29	Male	Yes	Sat	Dinner	2
108	18.24	3.76	Male	No	Sat	Dinner	2
109	14.31	4.00	Female	Yes	Sat	Dinner	2
110	14.00	3.00	Male	No	Sat	Dinner	2
111	7.25	1.00	Female	No	Sat	Dinner	1
112	38.07	4.00	Male	No	Sun	Dinner	3
113	23.95	2.55	Male	No	Sun	Dinner	2
114	25.71	4.00	Female	No	Sun	Dinner	3
115	17.31	3.50	Female	No	Sun	Dinner	2
116	29.93	5.07	Male	No	Sun	Dinner	4
117	10.65	1.50	Female	No	Thur	Lunch	2
118	12.43	1.80	Female	No	Thur	Lunch	2
119	24.08	2.92	Female	No	Thur	Lunch	4
120	11.69	2.31	Male	No	Thur	Lunch	2
121	13.42	1.68	Female	No	Thur	Lunch	2
122	14.26	2.50	Male	No	Thur	Lunch	2
123	15.95	2.00	Male	No	Thur	Lunch	2
124	12.48	2.52	Female	No	Thur	Lunch	2
125	29.80	4.20	Female	No	Thur	Lunch	6
126	8.52	1.48	Male	No	Thur	Lunch	2
127	14.52	2.00	Female	No	Thur	Lunch	2
128	11.38	2.00	Female	No	Thur	Lunch	2
129	22.82	2.18	Male	No	Thur	Lunch	3
130	19.08	1.50	Male	No	Thur	Lunch	2
131	20.27	2.83	Female	No	Thur	Lunch	2
132	11.17	1.50	Female	No	Thur	Lunch	2
133	12.26	2.00	Female	No	Thur	Lunch	2
134	18.26	3.25	Female	No	Thur	Lunch	2
135	8.51	1.25	Female	No	Thur	Lunch	2
136	10.33	2.00	Female	No	Thur	Lunch	2
137	14.15	2.00	Female	No	Thur	Lunch	2
138	16.00	2.00	Male	Yes	Thur	Lunch	2
139	13.16	2.75	Female	No	Thur	Lunch	2
140	17.47	3.50	Female	No	Thur	Lunch	2
141	34.30	6.70	Male	No	Thur	Lunch	6
142	41.19	5.00	Male	No	Thur	Lunch	5
143	27.05	5.00	Female	No	Thur	Lunch	6
144	16.43	2.30	Female	No	Thur	Lunch	2
145	8.35	1.50	Female	No	Thur	Lunch	2
146	18.64	1.36	Female	No	Thur	Lunch	3
147	11.87	1.63	Female	No	Thur	Lunch	2
148	9.78	1.73	Male	No	Thur	Lunch	2
149	7.51	2.00	Male	No	Thur	Lunch	2
150	14.07	2.50	Male	No	Sun	Dinner	2
151	13.13	2.00	Male	No	Sun	Dinner	2
152	17.26	2.74	Male	No	Sun	Dinner	3
153	24.55	2.00	Male	No	Sun	Dinner	4
154	19.77	2.00	Male	No	Sun	Dinner	4

155	29.85	5.14	Female	No	Sun	Dinner	5
156	48.17	5.00	Male	No	Sun	Dinner	6
157	25.00	3.75	Female	No	Sun	Dinner	4
158	13.39	2.61	Female	No	Sun	Dinner	2
159	16.49	2.00	Male	No	Sun	Dinner	4
160	21.50	3.50	Male	No	Sun	Dinner	4
161	12.66	2.50	Male	No	Sun	Dinner	2
162	16.21	2.00	Female	No	Sun	Dinner	3
163	13.81	2.00	Male	No	Sun	Dinner	2
164	17.51	3.00	Female	Yes	Sun	Dinner	2
165	24.52	3.48	Male	No	Sun	Dinner	3
166	20.76	2.24	Male	No	Sun	Dinner	2
167	31.71	4.50	Male	No	Sun	Dinner	4
168	10.59	1.61	Female	Yes	Sat	Dinner	2
169	10.63	2.00	Female	Yes	Sat	Dinner	2
170	50.81	10.00	Male	Yes	Sat	Dinner	3
171	15.81	3.16	Male	Yes	Sat	Dinner	2
172	7.25	5.15	Male	Yes	Sun	Dinner	2
173	31.85	3.18	Male	Yes	Sun	Dinner	2
174	16.82	4.00	Male	Yes	Sun	Dinner	2
175	32.90	3.11	Male	Yes	Sun	Dinner	2
176	17.89	2.00	Male	Yes	Sun	Dinner	2
177	14.48	2.00	Male	Yes	Sun	Dinner	2
178	9.60	4.00	Female	Yes	Sun	Dinner	2
179	34.63	3.55	Male	Yes	Sun	Dinner	2
180	34.65	3.68	Male	Yes	Sun	Dinner	4
181	23.33	5.65	Male	Yes	Sun	Dinner	2
182	45.35	3.50	Male	Yes	Sun	Dinner	3
183	23.17	6.50	Male	Yes	Sun	Dinner	4
184	40.55	3.00	Male	Yes	Sun	Dinner	2
185	20.69	5.00	Male	No	Sun	Dinner	5
186	20.90	3.50	Female	Yes	Sun	Dinner	3
187	30.46	2.00	Male	Yes	Sun	Dinner	5
188	18.15	3.50	Female	Yes	Sun	Dinner	3
189	23.10	4.00	Male	Yes	Sun	Dinner	3
190	15.69	1.50	Male	Yes	Sun	Dinner	2
191	19.81	4.19	Female	Yes	Thur	Lunch	2
192	28.44	2.56	Male	Yes	Thur	Lunch	2
193	15.48	2.02	Male	Yes	Thur	Lunch	2
194	16.58	4.00	Male	Yes	Thur	Lunch	2
195	7.56	1.44	Male	No	Thur	Lunch	2
196	10.34	2.00	Male	Yes	Thur	Lunch	2
197	43.11	5.00	Female	Yes	Thur	Lunch	4
198	13.00	2.00	Female	Yes	Thur	Lunch	2
199	13.51	2.00	Male	Yes	Thur	Lunch	2
200	18.71	4.00	Male	Yes	Thur	Lunch	3
201	12.74	2.01	Female	Yes	Thur	Lunch	2
202	13.00	2.00	Female	Yes	Thur	Lunch	2

| 203	16.40	2.50	Female	Yes	Thur	Lunch	2
204	20.53	4.00	Male	Yes	Thur	Lunch	4
205	16.47	3.23	Female	Yes	Thur	Lunch	3
206	26.59	3.41	Male	Yes	Sat	Dinner	3
207	38.73	3.00	Male	Yes	Sat	Dinner	4
208	24.27	2.03	Male	Yes	Sat	Dinner	2
209	12.76	2.23	Female	Yes	Sat	Dinner	2
210	30.06	2.00	Male	Yes	Sat	Dinner	3
211	25.89	5.16	Male	Yes	Sat	Dinner	4
212	48.33	9.00	Male	No	Sat	Dinner	4
213	13.27	2.50	Female	Yes	Sat	Dinner	2
214	28.17	6.50	Female	Yes	Sat	Dinner	3
215	12.90	1.10	Female	Yes	Sat	Dinner	2
216	28.15	3.00	Male	Yes	Sat	Dinner	5
217	11.59	1.50	Male	Yes	Sat	Dinner	2
218	7.74	1.44	Male	Yes	Sat	Dinner	2
219	30.14	3.09	Female	Yes	Sat	Dinner	4
220	12.16	2.20	Male	Yes	Fri	Lunch	2
221	13.42	3.48	Female	Yes	Fri	Lunch	2
222	8.58	1.92	Male	Yes	Fri	Lunch	1
223	15.98	3.00	Female	No	Fri	Lunch	3
224	13.42	1.58	Male	Yes	Fri	Lunch	2
225	16.27	2.50	Female	Yes	Fri	Lunch	2
226	10.09	2.00	Female	Yes	Fri	Lunch	2
227	20.45	3.00	Male	No	Sat	Dinner	4
228	13.28	2.72	Male	No	Sat	Dinner	2
229	22.12	2.88	Female	Yes	Sat	Dinner	2
230	24.01	2.00	Male	Yes	Sat	Dinner	4
231	15.69	3.00	Male	Yes	Sat	Dinner	3
232	11.61	3.39	Male	No	Sat	Dinner	2
233	10.77	1.47	Male	No	Sat	Dinner	2
234	15.53	3.00	Male	Yes	Sat	Dinner	2
235	10.07	1.25	Male	No	Sat	Dinner	2
236	12.60	1.00	Male	Yes	Sat	Dinner	2
237	32.83	1.17	Male	Yes	Sat	Dinner	2
238	35.83	4.67	Female	No	Sat	Dinner	3
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

```python
[18]: x=tips_data['total_bill']
      y=tips_data['tip']
      plt.scatter(x,y)
      plt.xlabel('total_bill')
      plt.ylabel('tip')
```

[18]: Text(0, 0.5, 'tip')
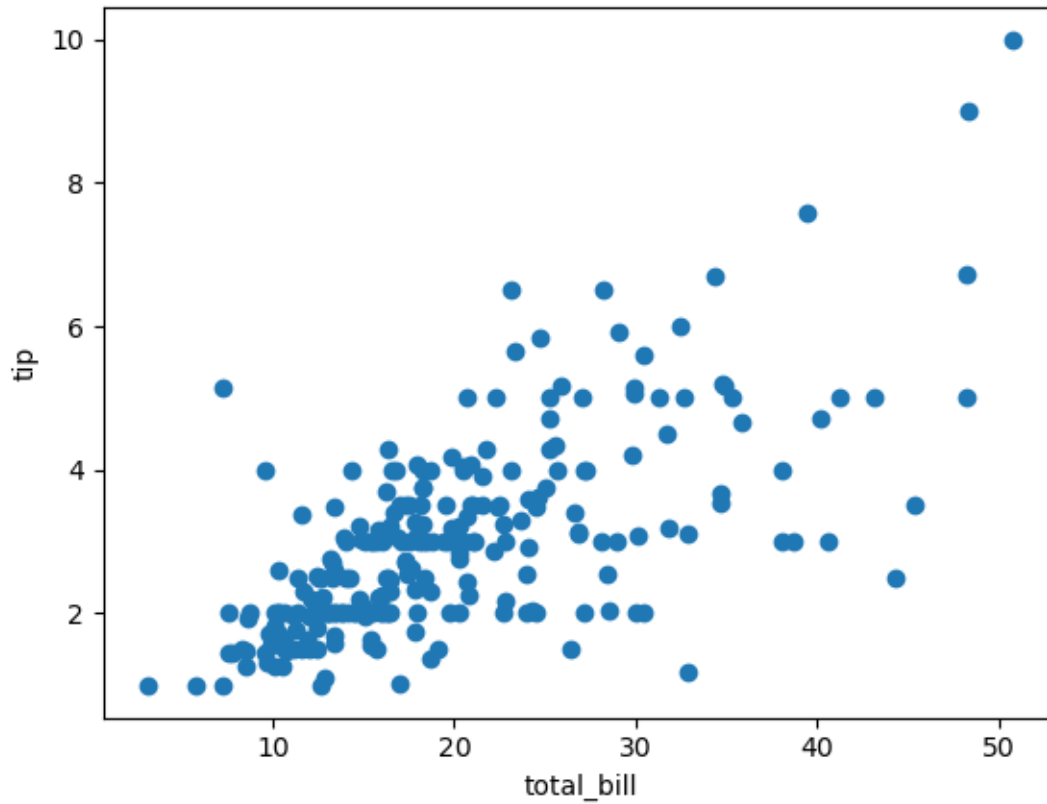
[19]:
```python
from sklearn.linear_model import LinearRegression
x=tips_data['total_bill'].values.reshape(-1,1)
y=tips_data['tip']
lr_model=LinearRegression()
lr_model.fit(x,y)
y_pred=lr_model.predict(x)
plt.scatter(x,y)
plt.xlabel('total_bill')
plt.ylabel('tip')
plt.plot(x,y_pred)
```

[19]: [<matplotlib.lines.Line2D at 0x1cab1dcfcd0>]
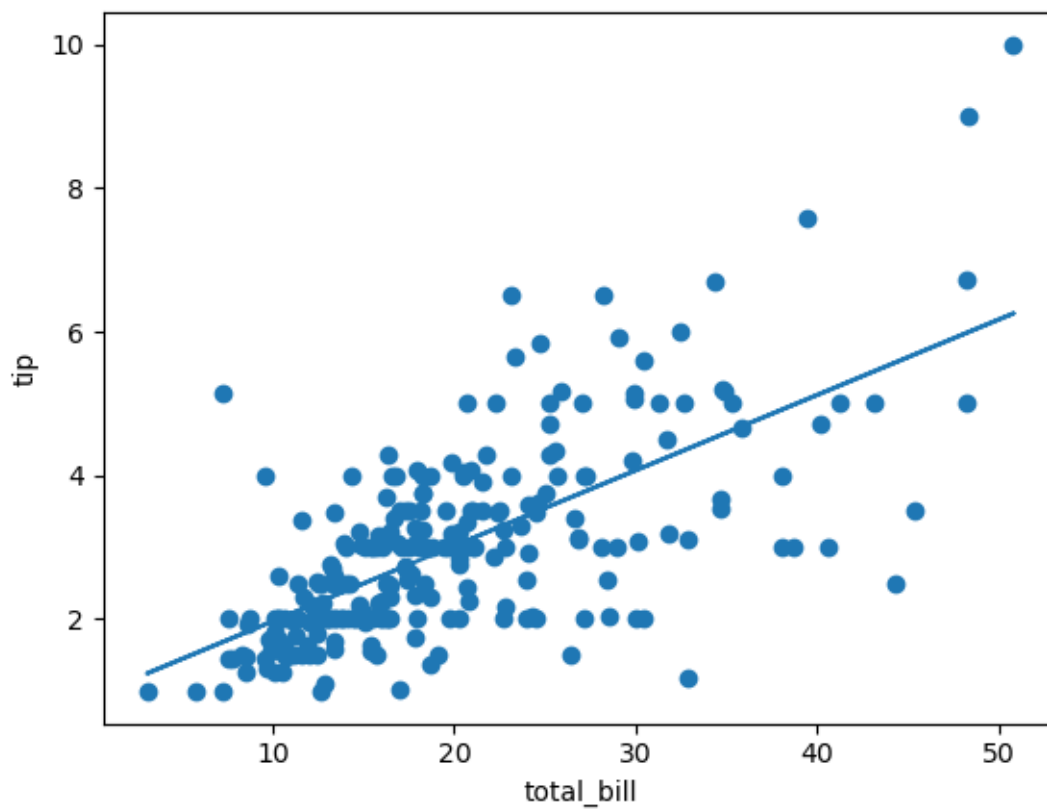
```
[20]: y=y.values.reshape(-1,1)
      y
```

```
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```

[21]:
```
beta_0=lr_model.intercept_
beta_1=lr_model.coef_
beta_0,beta_1
```

[21]: (0.920269613554674, array([0.10502452]))

[ ]:

13

```python
[10]: y_pred=lr_model.predict(np.array([32]).reshape(1,1))
      y_pred
```

```
[10]: array([4.28105417])
```

```python
[11]: y_pred
```

```
[11]: array([4.28105417])
```

```python
[22]: mae=mean_absolute_error(y,y_pred)
      print("Mean Absolute Error:",mae)
```

```
Mean Absolute Error: 0.7458253894586339
```

```python
[23]: mse=mean_squared_error(y,y_pred)
      print("Mean Squared Error:",mse)
```

```
Mean Squared Error: 1.036019442011377
```

```python
[24]: rmse=np.sqrt(mse)
      print("Root Mean Squared Error:",rmse)
```

```
Root Mean Squared Error: 1.0178504025697377
```