

Predicting Restaurant Tips Using Predictive Analytics on Excel.

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Problem Statement

Use Excel to build a model to predict restaurant tips given input values with the mathematical equation for predicting the value of the tips.

Dataset Description

- sex - Gender of the customer
- smoker - Indicates if the customer is a smoker or not
- day - Day of the restaurant visit
- Time - Indicates whether the tip was for lunch or dinner
- size - Number of members dining
- total bill - Bill amount in USD
- tip - Tip amount in USD

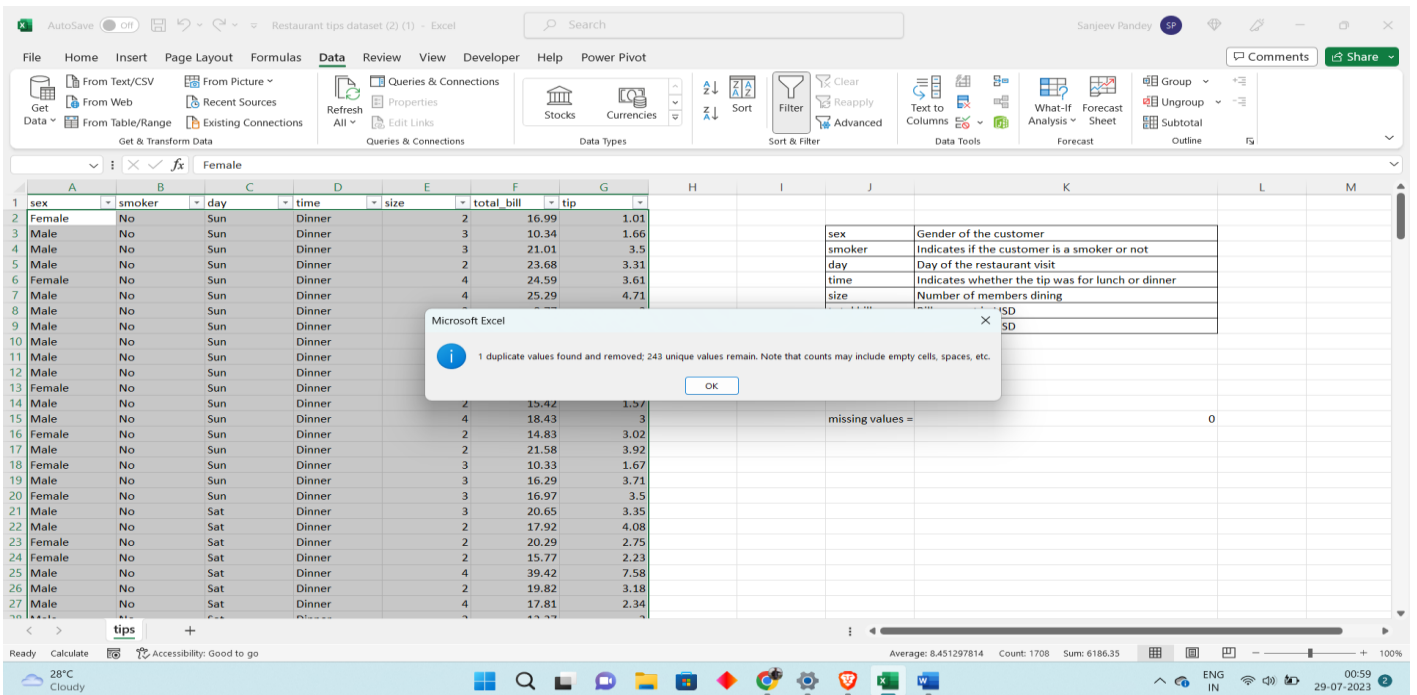
Tasks I Performed -

1. I checked for null values using Isblank() function. There were no null values in my dataset.

The screenshot displays the Microsoft Excel interface with a dataset titled "Restaurant tips dataset (2) (1)". The dataset is organized into columns: A (sex), B (Gender of the customer), C (Day of the restaurant visit), D (Time), E (size), F (total bill), and G (tip). The data spans from row 2 to row 28. A formula bar at the top shows the formula `=COUNTBLANK(A2:G245)`. A "Function Arguments" dialog box is open, showing the "COUNTBLANK" function with the range "A2:G245" entered. The dialog box indicates that the function counts the number of empty cells in the specified range and shows a formula result of 0. The status bar at the bottom indicates "tips" and "Accessibility: Good to go".

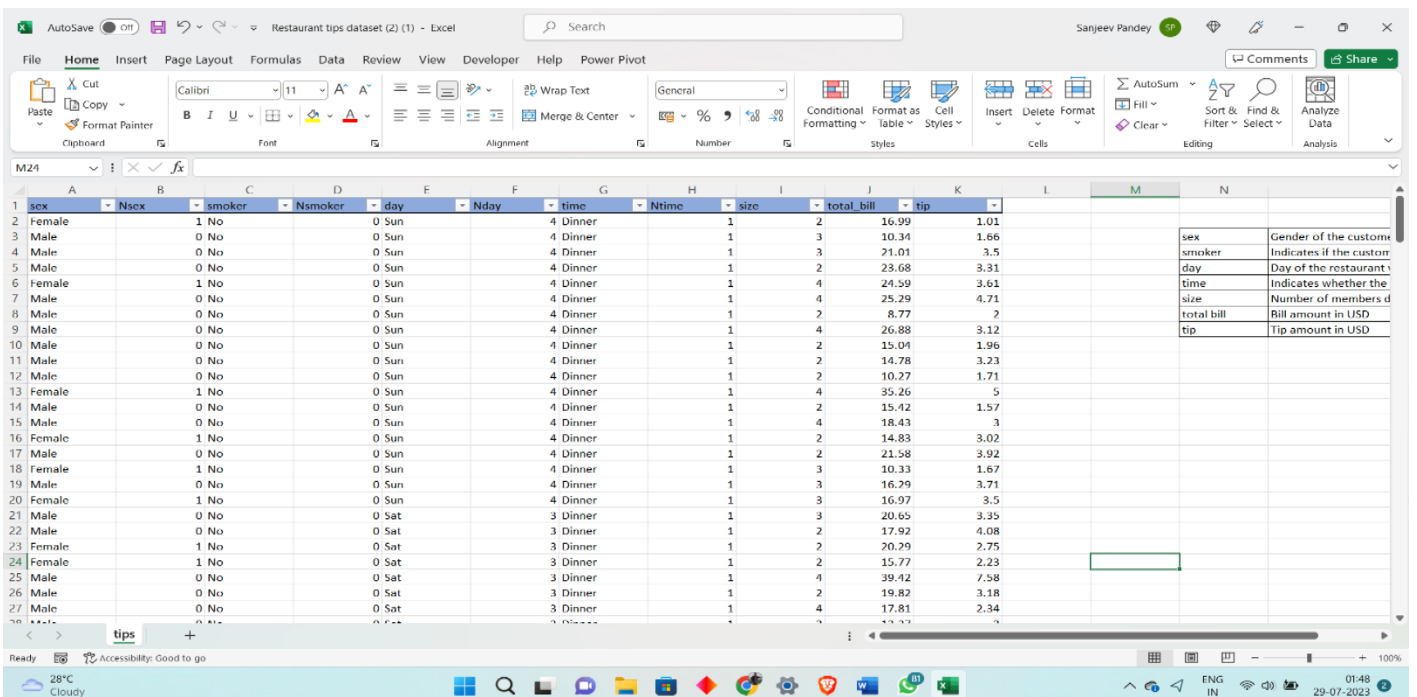
sex	Gender of the customer	Day of the restaurant visit	Time	size	total bill	tip
Female	No	Sun	Dinner	2	16.99	1.01
Male	No	Sun	Dinner	3	10.34	1.66
Male	No	Sun	Dinner	3	21.01	3.5
Male	No	Sun	Dinner	2	23.68	3.31
Female	No	Sun	Dinner	4	24.59	3.61
Male	No	Sun	Dinner	4	25.29	4.71
Male	No	Sun	Dinner	2	8.77	2
Male	No	Sun	Dinner	4	26.88	3.12
Male	No	Sun	Dinner	2	15.04	1.96
Male	No	Sun	Dinner	2	14.78	3.23
Male	No	Sun	Dinner	2	10.27	1.71
Female	No	Sun	Dinner	4	35.26	5
Male	No	Sun	Dinner	2	15.42	1.57
Male	No	Sun	Dinner	4	18.43	3
Female	No	Sun	Dinner	2	14.83	3.02
Male	No	Sun	Dinner	2	21.58	3.92
Female	No	Sun	Dinner	3	10.33	1.67
Male	No	Sun	Dinner	3	16.29	3.71
Female	No	Sun	Dinner	3	16.97	3.5
Male	No	Sat	Dinner	3	20.65	3.35
Male	No	Sat	Dinner	2	17.92	4.08
Female	No	Sat	Dinner	2	20.29	2.75
Female	No	Sat	Dinner	2	15.77	2.23
Male	No	Sat	Dinner	4	39.42	7.58
Male	No	Sat	Dinner	2	19.82	3.18
Male	No	Sat	Dinner	4	17.81	2.34
Male	No	Sat	Dinner	2	13.37	2

1. I Checked for duplicate values ,I only found one duplicate values which I removed successfully.



2. I categorised all the columns as independent and dependent values.
Independent features are = sex, smoker, day, time, size, total bill
Dependent feature = tip.
3. After understanding the data, I decided to use regression model for model prediction.
4. In order to use regression, I had to convert all the categorical values to numeric. I used these codes to convert all the column to numeric.

```
=IF(A2="Male", 0, IF(A2="Female", 1, ""))  
=IF(A2="Yes", 1, IF(A2="No", 0, ""))  
=IF(A2="thur", 1, IF(A2="fri", 2, IF(A2="sat", 3, IF(A2="sun", 4, ""))))  
=IF(A2="dinner", 1, IF(A2="lunch", 2, ""))
```



5. Correlation -

This image is showing the correlation between each independent variable to the dependent variable.

The screenshot shows an Excel spreadsheet with a dataset of restaurant tips. The columns are: Nday, time, Ntime, size, total_bill, and tip. The data is sorted by total_bill in descending order. A summary of correlations is shown in the right side of the spreadsheet.

Correlation	Value
corr - Sex and tip	-0.088862061
corr - smoker and tip	0.00592854
corr - day and tip	0.135498764
corr - time and tip	-0.088862061
corr - size and tip	0.489298775
corr - total bill and tip	0.675734109

Additional variables listed on the right:

Variable	Indicator
sex	Gender
smoker	Indicates
day	Day of the
time	Indicates
size	Number
total bill	Bill amount
tip	Tip amount

6. I have created a regression model by using excel add-ins.

All the p values are in appropriate limit so we will go with this model.

AutoSave Restaurant tips dataset (2) (1) - Excel

Search

Sanjeev Pandey

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Paste

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Calibri11

General

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Significance F

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	
1	SUMMARY OUTPUT																			
2																				
3	Regression Statistics																			
4	Multiple R	0.684980787																		
5	R Square	0.469198679																		
6	Adjusted R Square	0.455760671																		
7	Standard Error	1.020745565																		
8	Observations	244																		
9																				
10	ANOVA																			
11		df	SS	MS	F	Significance F														
12	Regression	6	218.2770796	36.37951327	34.91579067	4.09922E-30														
13	Residual	237	246.9353974	1.041921508																
14	Total	243	465.212477																	
15																				
16		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%											
17	Intercept	0.41166304	0.728190871	0.565322989	0.572388864	-1.02289046	1.84621654	-1.02289046	1.84621654											
18	Nsex	0.034644964	0.141081963	0.245566218	0.806230561	-0.24328989	0.312579818	-0.24328989	0.312579818											
19	Nsmoker	-0.075663089	0.140198277	-0.539686293	0.589920088	-0.351857061	0.200530884	-0.351857061	0.200530884											
20	Nday	0.05273982	0.120334639	0.4382763	0.661585219	-0.184322308	0.289801948	-0.184322308	0.289801948											
21	Ntime	0.112477769	0.307526134	0.365750277	0.714877667	-0.493356099	0.718311636	-0.493356099	0.718311636											
22	size	0.174819618	0.089187194	1.960142606	0.051150876	-0.000881295	0.350520531	-0.000881295	0.350520531											
23	total_bill	0.094325088	0.009538173	9.889219168	1.57818E-19	0.075534657	0.113115518	0.075534657	0.113115518											
24																				
25																				
26																				
27																				

< >

Sheet1

tips

+

Ready

Accessibility: Investigate

We're starting the add-ins runtime, just a moment...

100%

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Mostly cloudy

11:40
29-07-2023

7. Now, the regression model gave me the information about by coefficients and intercepts, using that I calculated the predicted values.
The root mean square error between the actual and predicted values is – 1.08841 which is well within range.

The screenshot shows an Excel spreadsheet titled "Restaurant tips dataset (2) (1) - Excel". The data is organized into columns: G (smoker), H (Numeric day), I (Numeric time), J (numeric size), K (total_bill), L (actual tip), and M (Predicted Tip). Rows 2 through 27 contain individual data points. A summary output section is located in columns N through R, starting from row 11. This section includes regression statistics (Multiple R, R Square, Adjusted R Square, Standard Error, Observations), ANOVA (df, SS, MS, F), and coefficients (Intercept, Standard Error, t Stat, P-value).

smoker	Numeric day	Numeric time	numeric size	total_bill	actual tip	Predicted Tip
0	4	1	2	16.99	1.01	2.72196753
0	4	1	3	10.34	1.66	1.857862275
0	4	1	3	21.01	3.5	2.754002909
0	4	1	2	23.68	3.31	2.959434184
0	4	1	4	24.59	3.61	3.489292162
0	4	1	4	25.29	4.71	3.583016609
0	4	1	2	8.77	2	1.594632393
0	4	1	4	26.88	3.12	3.55817388
0	4	1	2	15.04	1.96	2.091725606
0	4	1	2	14.78	3.23	2.067201083
0	4	1	2	10.27	1.71	1.641794937
0	4	1	4	35.26	5	4.38326308
0	4	1	2	15.42	1.57	2.127569139
0	4	1	4	18.43	3	2.761126889
0	4	1	2	14.83	3.02	2.106562301
0	4	1	2	21.58	3.92	2.708611679
0	4	1	3	10.33	1.67	1.856919024
0	4	1	3	16.29	3.71	2.384451583
0	4	1	3	16.97	3.5	2.483237607
0	3	1	3	20.65	3.35	2.742969145
0	3	1	2	17.92	4.08	2.310642038
0	3	1	2	20.29	2.75	2.56883746
0	3	1	2	15.77	2.23	2.142488063
0	3	1	4	39.42	7.58	4.688270661
0	3	1	2	19.82	3.18	2.489859705
0	3	1	4	17.81	2.34	2.649905514

SUMMARY OUTPUT				
Regression Statistics				
Multiple R	0.684980787			
R Square	0.469198679			
Adjusted R Square	0.455760671			
Standard Error	1.020745565			
Observations	244			
ANOVA				
	df	SS	MS	F
Regression	6	218.2770796	36.37951327	34.91
Residual	237	246.9353974	1.041921508	
Total	243	465.212477		
Coefficients				
	Standard Error	t Stat	P-value	
Intercept	0.41166304	0.728190871	0.565322989	0.572

So lastly, coming to the prediction part – If we enter any new entries in the column, it will automatically convert the values to numeric and give us the predicted tip.