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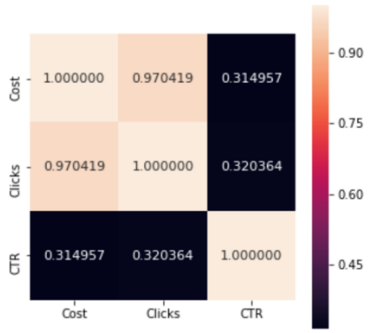
Google Analytics Explanation Using Python Programming (Data Visualizations)

1) Correlation Matrix:

```
In [6]: corr = df.corr()
        corr = (corr)
        plt.figure(figsize = (5,5))
        ax = sns.heatmap(corr, cbar = True, square = True, annot = True, fmt = '2f', annot_kws =
        {'size': 11},
                    xticklabels = corr.columns.values,
                    yticklabels = corr.columns.values)
        bottom, top = ax.get_ylim()
```

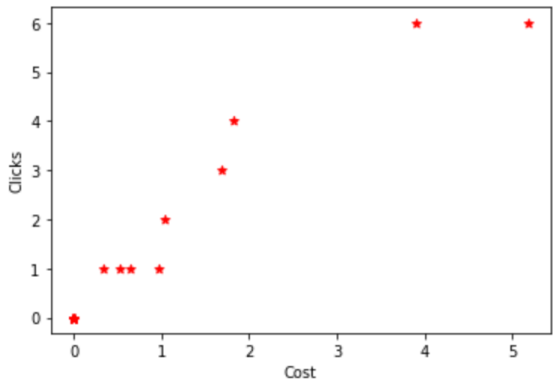


The above correlation diagram indicates that Cost and Clicks are highly correlated together. As such, if cost is high there will be movement in the number of clicks and vice versa. In the regression analysis below you will see that as cost increases (budget spending) the number of clicks will increase due to the number of displayed impressions for an advert online.

2) Scatter Plot (Cost vs. Clicks)

```
In [8]: #Clciks versus Cost Graph
        plt.scatter(df.Cost, df.Clicks, color = 'red', marker = '*')
        plt.xlabel("Cost")
        plt.ylabel("Clicks")
```

```
Out[8]: Text(0, 0.5, 'Clicks')
```



The above graph shows that as cost increases the number of clicks will increase. So a higher advertising budget to attract more customers is required to penetrate the segment you are

after. In the regression analysis below we will see what happens when we increase the advertising budget on the number of predicted clicks we will get.

3) Regression Analysis

```
In [26]: score = r2_score(y_test, y_predict)
         mae = mean_absolute_error(y_test, y_predict)
         mse = mean_squared_error(y_test, y_predict)
         print('r2_score:  ', score*100)
         print('mae:  ', mae)
         print('mse:  ', mse)

         r2_score:   83.08839605443478
         mae:   0.37400982991395604
         mse:   0.36172041772458957
```

```
In [27]: #A high R-Squared shows a high prediction for costs versus click rates.
         #Mean absolute error is 0.37 somewhat small.
         #Low MSE value of 0.36 indicates a small error and a better estimator for clicks.
```

A high R-Squared shows that 83% of the data fits the regression model. It is a high R-Squared. The mean-absolute error is a measure of errors. Currently it is about 0.37, which shows us that the prediction of the outputs generated from the regression model are good. A low mse (mean-squared error) of 0.36 shows as well that the model prediction outputs will be good.

4) Regression Outputs:

```
In [33]: #Prediction of click rates on cost spent
         #y = m*x+b / reg.coefficient * cost - reg.intercept
         1.36387155*10+0.10765681

Out[33]: 13.74637231

In [34]: 1.36387155*30+0.10765681

Out[34]: 41.023803310000005

In [35]: 1.36387155*100+0.10765681

Out[35]: 136.49481181000002

In [36]: #The higher the spending the higher the clicks made
         1.36387155*1000+0.10765681

Out[36]: 1363.97920681
```

As shown above from the regression coefficient (1.36387155) and regression intercept (0.10765681) we can predict the number of clicks that we would get if we spend a certain amount (budget) for our ads. I used $10, $30, $100, and $1,000 consecutively as examples to draw from. As can be depicted, the higher the budget the more the clicks on the item advertised online. Higher budgets will allow more impressions to be seen and therefore the

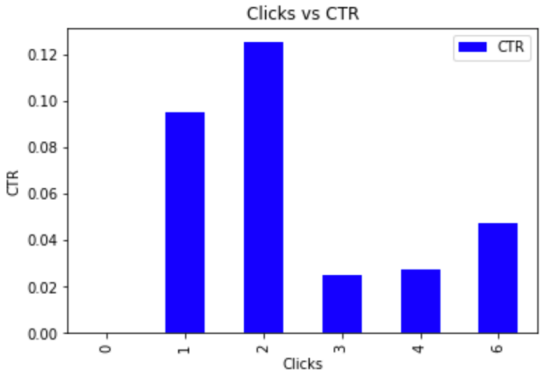
chance for someone clicking will be higher than that if the budget is smaller where the number of impressions will be lower.

Cost (Advertisement Budget)	Rounded - Clicks
$10	13
$30	41
$100	136
$1000	1363

5) Clicks vs Click Through Rate

```
In [44]: click_ctr_pivot.plot(kind = 'bar', color = 'blue')
         plt.title("Clicks vs CTR")
         plt.xlabel("Clicks")
         plt.ylabel("CTR")
```

```
Out[44]: Text(0, 0.5, 'CTR')
```




```
In [45]: #Higher click rates with low CTR's mean that the product is not appealing for the segment
         #that is being targeted. Something is missing that is not catching their attention.
```

The bar graph above shows higher click rates with low CTR which depicts that the product advertised online is not appealing to the segment that is being targeted. When people are clicking, they are expecting something that they are not getting. As such, this also explains the conversion rates below that are 0%, where clicks were not regarded as closed sales.

Searches(Search_2020.10.27-2020.11.06)

Search	Cost	Clicks	Impressions	Conversions
posture bra	$0.54	1	3	0.00
posture correction belt	$0.54	1	2	0.00
posture shirt womens	$0.95	1	2	0.00
belt for back pain	$0.95	1	1	0.00
posture perfect	$0.52	1	1	0.00
posture revival com	$0.96	1	1	0.00
posture support	$0.98	1	1	0.00
the brace lab	$0.53	1	1	0.00
the posture correcting neuroband shirt	$0.53	1	1	0.00

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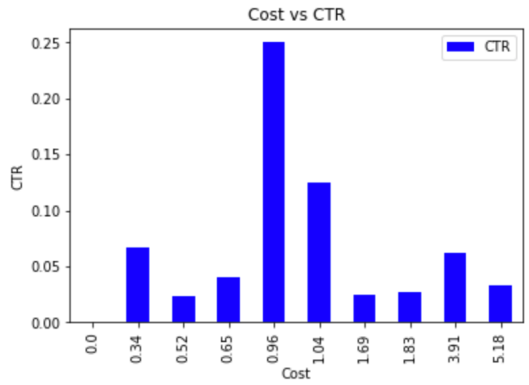
6) Click Through Rate vs. Cost

```
In [51]: cost_ctr_pivot.plot(kind = 'bar', color = 'blue')
         plt.title("Cost vs CTR")
         plt.xlabel("Cost")
         plt.ylabel("CTR")
```

```
Out[51]: Text(0, 0.5, 'CTR')
```




```
In [ ]: #The higher the cost the lower your click through rate!
        #Clicks / Impressions = CTR
        #The higher the CTR the better is your ranking and the lower your cost will be.
        #The lower the CTR the lower is your ranking and the higher your cost will be.
        #A low CTR means that your ads are not a good match for your audience.
```

A higher CTR will give you a better ranking in google ad words, which will in return will lower the cost of these ads. The lower the CTR the lower your ranking and the higher the cost of the ads will be. As such, you must maintain a high CTR to benefit from your advertised product. As can be seen above a higher CTR of 0.25 has a lower cost of $0.96. A lower CTR 0.0331 has a higher cost of $5.18.

Recommendations to benefit from your advertised product online

1) Make sure your keywords contain posture in them.
2) Make the keywords short and very precise.
3) Attract the person needing this product with a guarantee. Example, they can return it if they are not satisfied. This will give them an impression that the product will work and is backed up by you.
4) Ensure the content in the ads are relevant to your segment.
5) Make two types of ads and test them, one for males and one for females. Don't make it general (mass marketing). You have a potential to target both genders.
6) Marketing messages should be straightforward, include a benefit, provides a solution to the customer needs, contain a landing page where a customer can buy, whereby he/she can type in an email address to be targeted later.

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7) Your ad needs to generate leads. Go on the social networks. Create hashtags in million plus pages across twitter and Instagram, use your YouTube channel to promote your product and talk about it.