AB Testing - New Menu Launched

The Business Problem

Round Roasters is an upscale coffee chain with locations in the western United States of America. The past few years have resulted in stagnant growth at the coffee chain, and a new management team was put in place to reignite growth at their stores.

The first major growth initiative is to introduce gourmet sandwiches to the menu, along with limited wine offerings. The new management team believes that a television advertising campaign is crucial to drive people into the stores with these new offerings.

However, the television campaign will require a significant boost in the company's marketing budget, with an unknown return on investment (ROI). Additionally, there is concern that current customers will not buy into the new menu offerings.

To minimize risk, the management team decides to test the changes in two cities with new television advertising. Denver and Chicago cities were chosen to participate in this test because the stores in these two cities (or markets) perform similarly to all stores across the entire chain of stores; performance in these two markets would be a good proxy to predict how well the updated menu performs.

The test ran for a period of **12 weeks (2016-April-29 to 2016-July-21)** where five stores in each of the test markets offered the updated menu along with television advertising.

The comparative period is the test period, but for last year (2015-April-29 to 2015-July-21).

Analyze the results of the experiment to determine whether the menu changes should be applied to all stores. The predicted impact to profitability should be enough to justify the increased marketing budget: **at least 18% increase in profit growth** compared to the comparative period while compared to the control stores; otherwise known as incremental lift. In the data, profit is represented in the gross_margin variable.

> As we know that the volume of oberservation is fairly-low for this business case, hence we will design this test on **`Match-Pair Experiment design.`**

1- Plan The Analysis

> What is the performance metric you'll use to evaluate the results of your test?

For this test we are taking **gross margin** as performance metric to evaluate the results.

> What is the test period?

The test ran for a period of **12 weeks (2016-April-29 to 2016-July-21)**

> > At what level (day, week, month, etc.) should the data be aggregated?

We are planning to aggreate the data on the **week** level.

2- Clean Up Your Data

In this step, the data is prepared for steps 3 and 4. The transaction data is agreegated at the appropriate level and filter on the appropriate data ranges. We make sure there are no missing, incomplete, duplicate, or dirty data. Move on to the next step when you have weekly transaction data for all stores.

Prepare Data from the raw data files:

- Round Roster Store Data
- Round Roster Transaction Data
- Treatment Stores Data

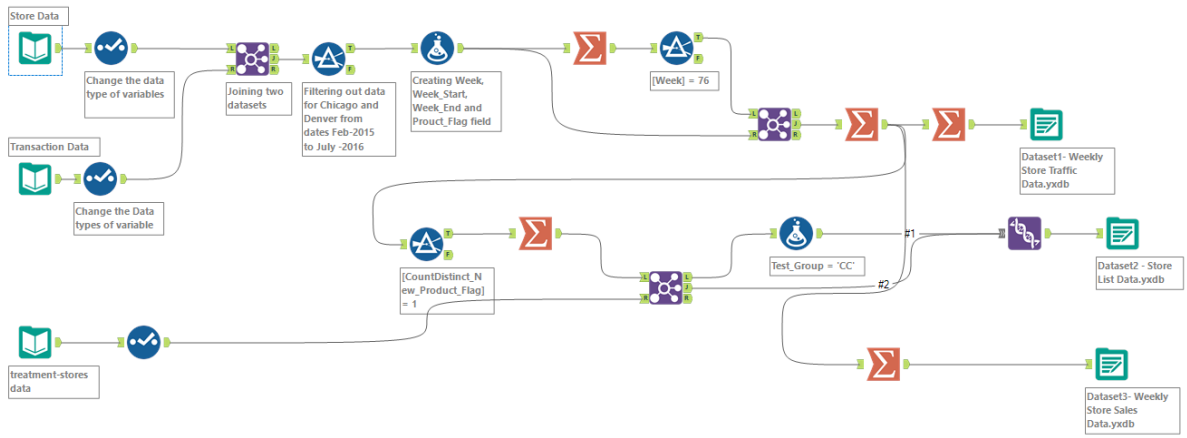
We create three data files:

- `Weekly store traffic data` -> Produces our seasonality and trend indices to help us match our treatment and control stores
- `Store list data` -> Produces which control stores to match with our treatment stores along with results from the A/B Trend Tool
- `Sales data` -> Produces the final results

The data for analysis is aggregated on the `Weekly` level and date ranges is from `2015-02-06 to 2016-07-29`

In [11]:
```
from IPython.display import display, Image, SVG, Math, YouTubeVideo
dataflow_image=Image(filename="DataPrep_Workflow_Image.PNG")
dataflow_image
```

Out[11]:



3- Match Treatment and Control Units

> What control variables should be considered?

The control variable should be consider is *Average Month Sale*.

> What is the correlation between your each potential control variable and your performance metric?

In [12]:
```
correlation=Image(filename="Pearson_CorreleationPNG.PNG")
correlation
```

Out[12]:

Record	FieldName	Sq_Ft	AvgMonthSales	Invoice Number	SKU	Gross Margin	Sales
1	Sq_Ft	1	-0.09899	0.013992	0.006797	-0.006913	-0.008894
2	AvgMonthSales	-0.09899	1	-0.016872	0.008352	0.008306	0.00974
3	Invoice Number	0.013992	-0.016872	1	0.024246	0.038402	0.039439
4	SKU	0.006797	0.008352	0.024246	1	-0.20666	-0.069376
5	Gross Margin	-0.006913	0.008306	0.038402	-0.20666	1	0.959188
6	Sales	-0.008894	0.00974	0.039439	-0.069376	0.959188	1

What control variables will you use to match treatment and control stores?

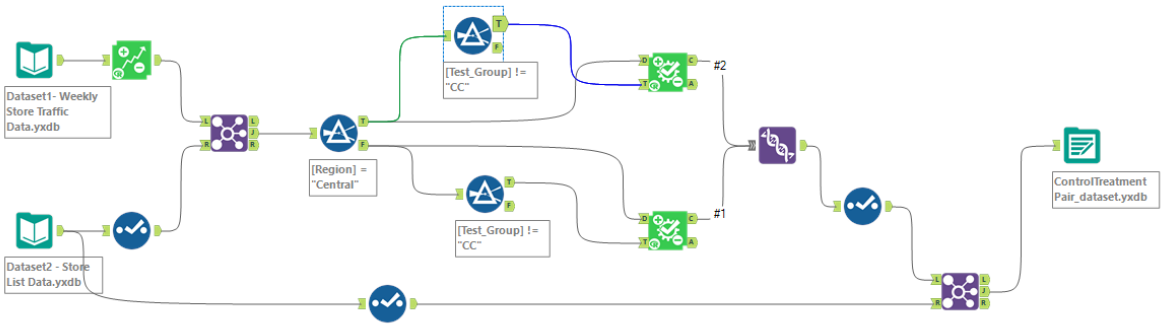
Average Month Sale , *Trend* , *Seasonality* will be use to match treatment and control stores.

Treatment and Control stores pairs

Treatment Store	Control Store 1	Control Store 2
1664	1857	7484
1675	2114	8562
1696	1964	7584
1700	1508	7384
1712	7284	8212
2288	9081	12069
2293	12219	11568
2301	10018	10468
2322	2409	3102
2241	2333	11368

In [13]:
```
ControlTreatmentPai=Image(filename="ControlTreatmentPair_Workflow.PNG")
ControlTreatmentPai
```

Out[13]:



4- Analysis and Writeup

What is your recommendation - Should the company roll out the updated menu to all stores?

From the analysis of the result it is clear that making changes in the menu will definately going to increase the profit margin by more than 18%, hence company should make this changes to all of there stores.

> What is the lift from the new menu for West and Central regions (include statistical significance)?

From the analysis shown in below, we can see that for `Central Region`

- **Lift**: 43.5
- **Significance Level**: 99.6

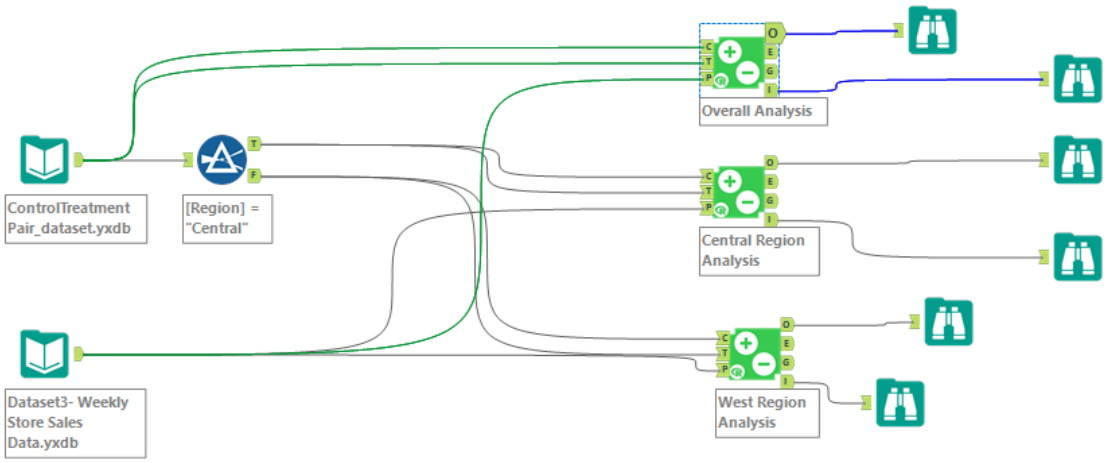
for `West Region`

- **Lift** : 37.9
- **Significance Level**: 99.5

Workflow

In [14]:
```
AB_Result=Image(filename="AB_Analysis_Result_Workflow.PNG")
AB_Result
```

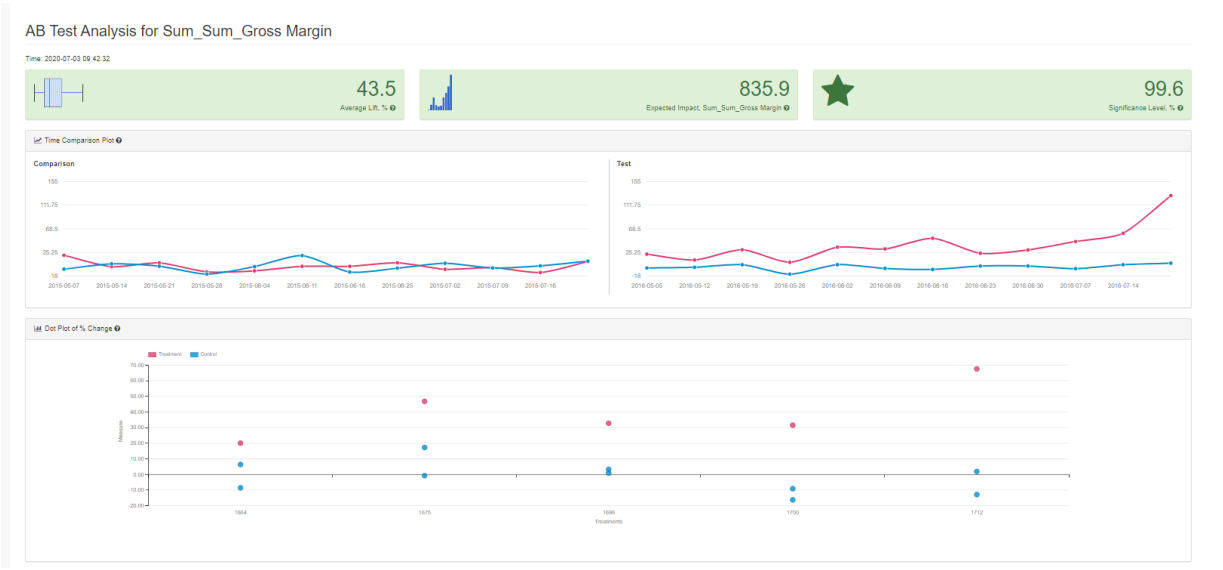
Out[14]:



Central Region Analysis

In [15]:
```
central=Image(filename="Central_Region1.PNG")
central
```

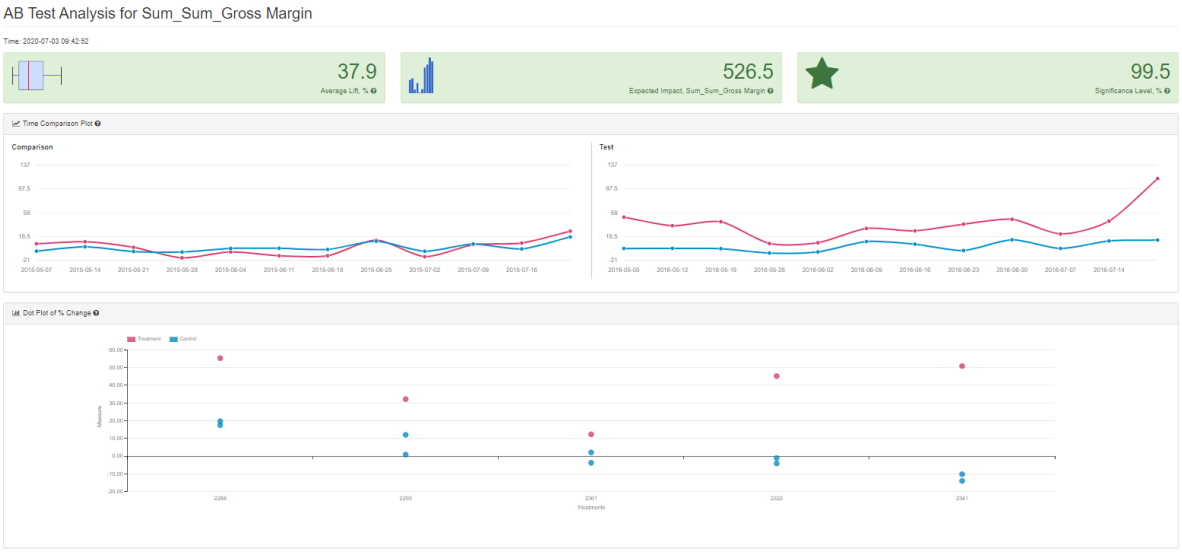
Out[15]:



West Region Analysis

In [16]:
```
west=Image(filename="West_Region1.PNG")
west
```

Out[16]:



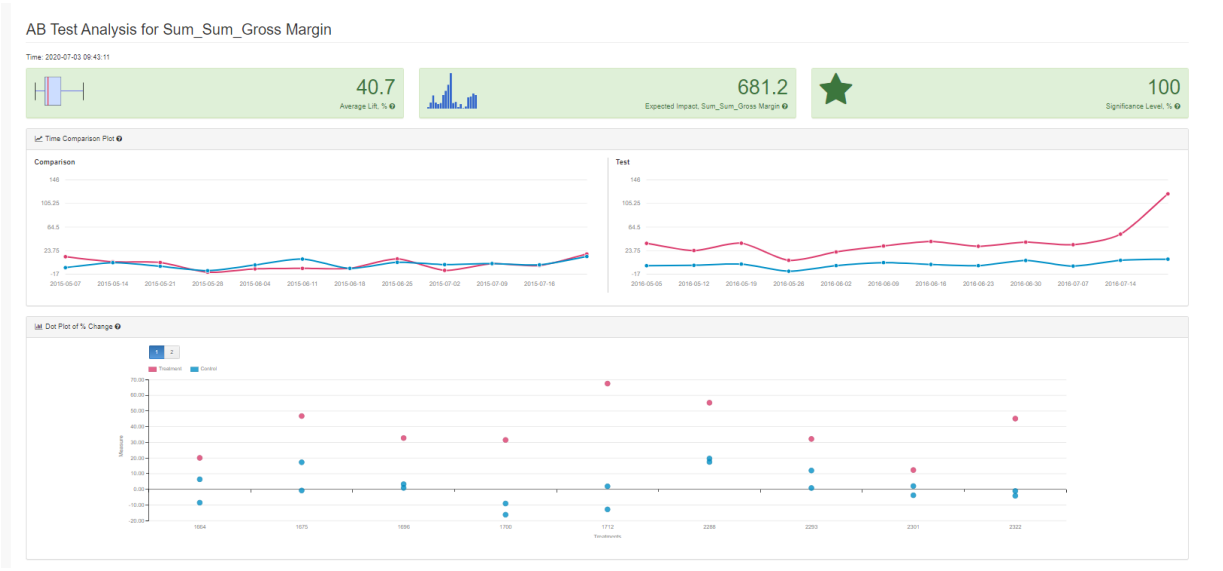
What is the lift from the new menu overall?

From the analysis shown in below, `Overall Performance`

- **Lift**: 40.7
- **Significance Level**: 100

In [17]:
```
overall=Image(filename="Overall1.PNG")
overall
```

Out[17]:



In [ ]:
```

```