 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in python on random dataset.

IDE: Excel, Tableau, Spyder IDE

Theory:

Heat Map plot

A Heat Map in Excel is a visual representation that quickly shows you a comparative view of a dataset. For example, in the dataset below, I can easily spot which are the months when the sales were low (highlighted in red) as compared with other months.

	A	B	C	D
1		2014	2015	2016
2	January	600	708	594
3	February	607	984	749
4	March	901	886	908
5	April	608	615	835
6	May	715	833	734
7	June	520	663	618
8	July	731	521	950
9	August	709	663	987
10	September	633	863	979
11	October	533	651	841
12	November	996	958	749
13	December	792	717	875

In the above dataset, the colours are assigned based on the value in the cell. The colour scale is Green to Yellow to Red with high values getting the green colour and low values getting the red colour.


Creating a Heat Map in Excel

While you can create a heat map in Excel by manually color coding the cells. However, you will have to redo it when the values changes. Instead of the manual work, you can use conditional formatting to highlight cells based on the value. This way, in case you change the values in the cells, the color/format of the cell would automatically update the heat map based on the pre-specified rules in conditional formatting.

In this experiment, you'll learn how to:

Quickly create a heat map in Excel using conditional formatting.

Create a dynamic heat map in Excel.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Creating a Heat Map in Excel Using Conditional Formatting

If you have a dataset in Excel, you can manually highlight data points and create a heat map.

However, that would be a static heat map as the colour would not change when you alter the value in a cell.


Hence, conditional formatting is the right way to go as it makes the color in a cell change when you change the value in it.

Suppose you have a dataset as shown below:

	A	B	C	D
1		2014	2015	2016
2	January	600	708	594
3	February	607	984	749
4	March	901	886	908
5	April	608	615	835
6	May	715	833	734
7	June	520	663	618
8	July	731	521	950
9	August	709	663	987
10	September	633	863	979
11	October	533	651	841
12	November	996	958	749
13	December	792	717	875

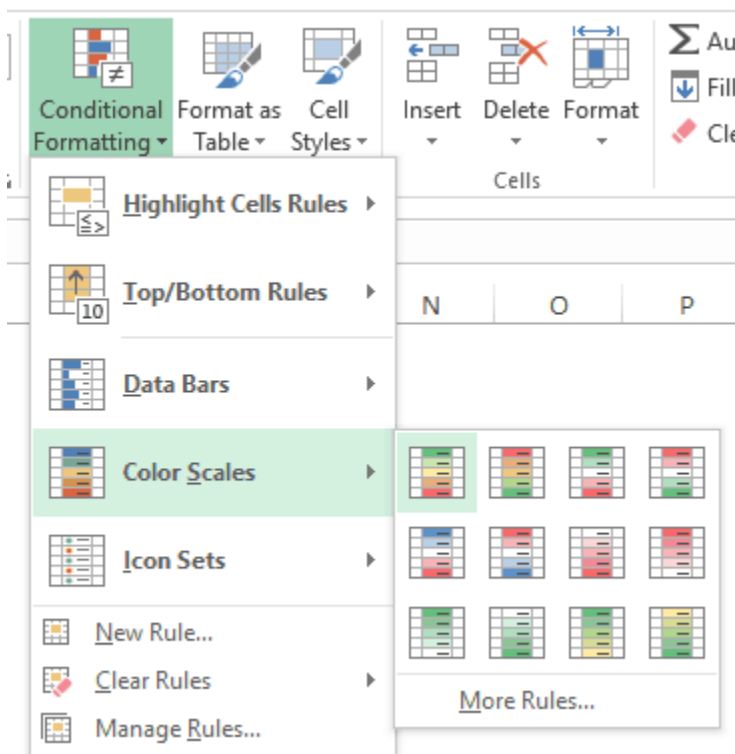
Here are the steps to create a heat map using this data:

Select the dataset. In this example, it would be B2:D13.


 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

	A	B	C	D
1		2014	2015	2016
2	January	600	708	594
3	February	607	984	749
4	March	901	886	908
5	April	608	615	835
6	May	715	833	734
7	June	520	663	618
8	July	731	521	950
9	August	709	663	987
10	September	633	863	979
11	October	533	651	841
12	November	996	958	749
13	December	792	717	875

Go to Home → Conditional Formatting → Color Scales. It shows various color combinations that can be used to highlight the data. The most common color scale is the first one where cells with high values are highlighted in green and low in red. Note that as you hover the mouse over these color scales, you can see the live preview in the data set.



The screenshot shows the Excel ribbon with the 'Conditional Formatting' dropdown menu open. The 'Color Scales' option is highlighted, and a sub-menu is displayed showing various color scale options. The first color scale, which uses a red-to-green gradient, is selected. The sub-menu also includes options for 'Highlight Cells Rules', 'Top/Bottom Rules', 'Data Bars', 'Icon Sets', 'New Rule...', 'Clear Rules', and 'Manage Rules...'. The background shows a portion of the data table from the previous image.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

This will give you a heat map as shown below:


	A	B	C	D
1		2014	2015	2016
2	January	600	708	594
3	February	607	984	749
4	March	901	886	908
5	April	608	615	835
6	May	715	833	734
7	June	520	663	618
8	July	731	521	950
9	August	709	663	987
10	September	633	863	979
11	October	533	651	841
12	November	996	958	749
13	December	792	717	875

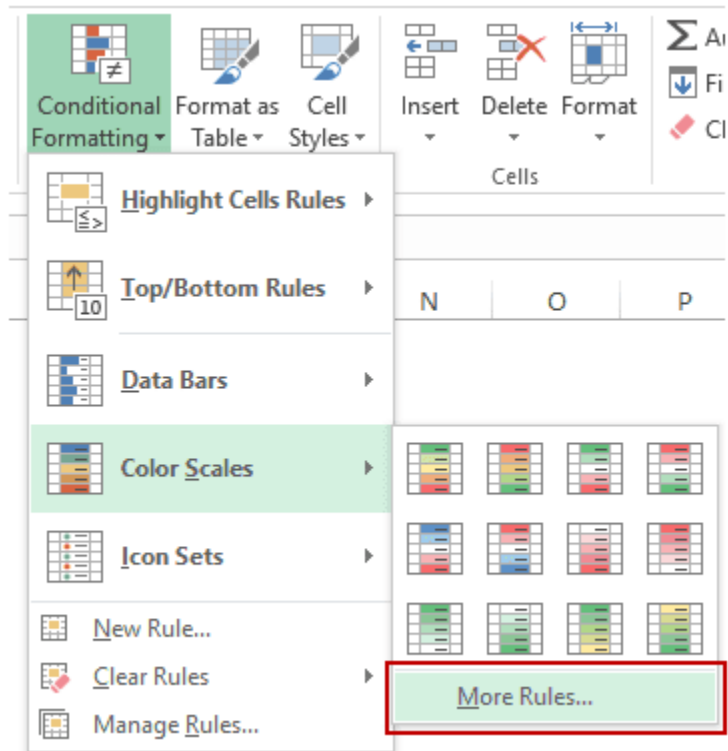
By default, Excel assigns red color to the lowest value and the green color to the highest value, and all the remaining values get a color based on the value. So there is a gradient with different shades of the three colors based on the value.

Now, what if don't want a gradient and only want to show red, yellow, and green. For example, you want to highlight all the values less than say 700 in red, irrespective of the value. So 500 and 650 both gets the same red color since it's less than 700.


To do this:

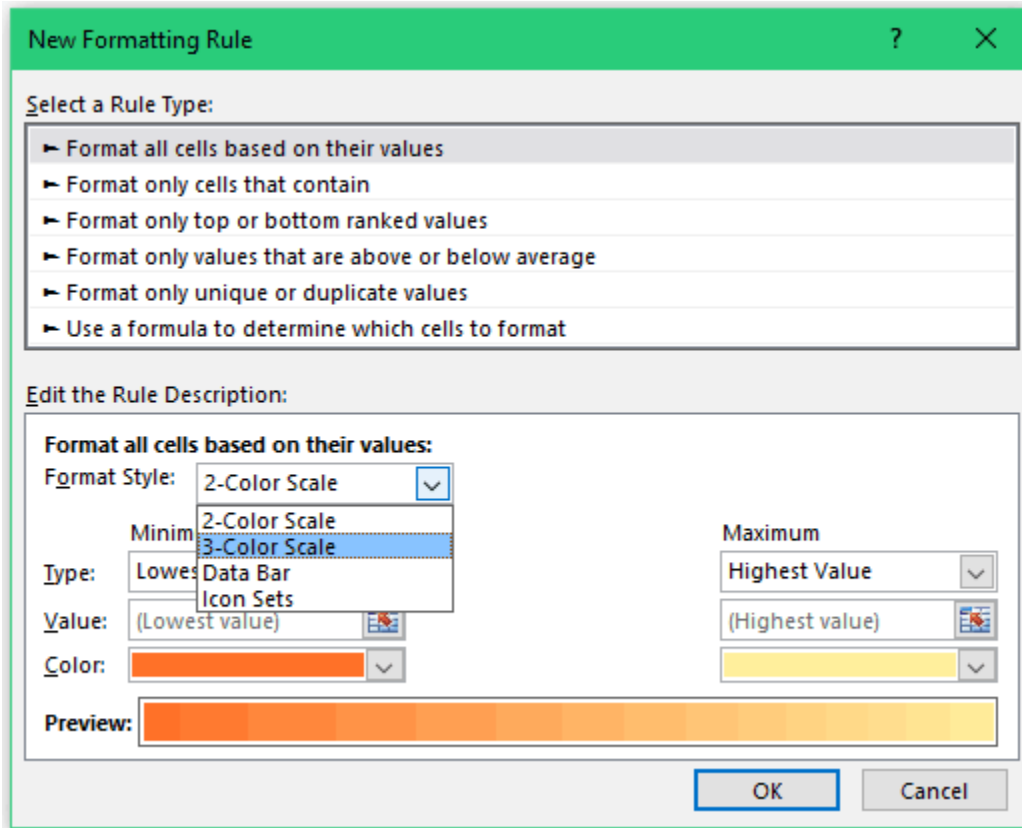
Go to Home → Conditional Formatting → Color Scales → More Options.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030



In the New Formatting Rule dialog box, select '3-Color scale' from the Format Style drop down.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030



New Formatting Rule

Select a Rule Type:

- Format all cells based on their values
- Format only cells that contain
- Format only top or bottom ranked values
- Format only values that are above or below average
- Format only unique or duplicate values
- Use a formula to determine which cells to format

Edit the Rule Description:

Format all cells based on their values:

Format Style: 2-Color Scale

Type: Lowest

Value: (Lowest value)

Color: Red

Maximum: Highest Value


Value: (Highest value)

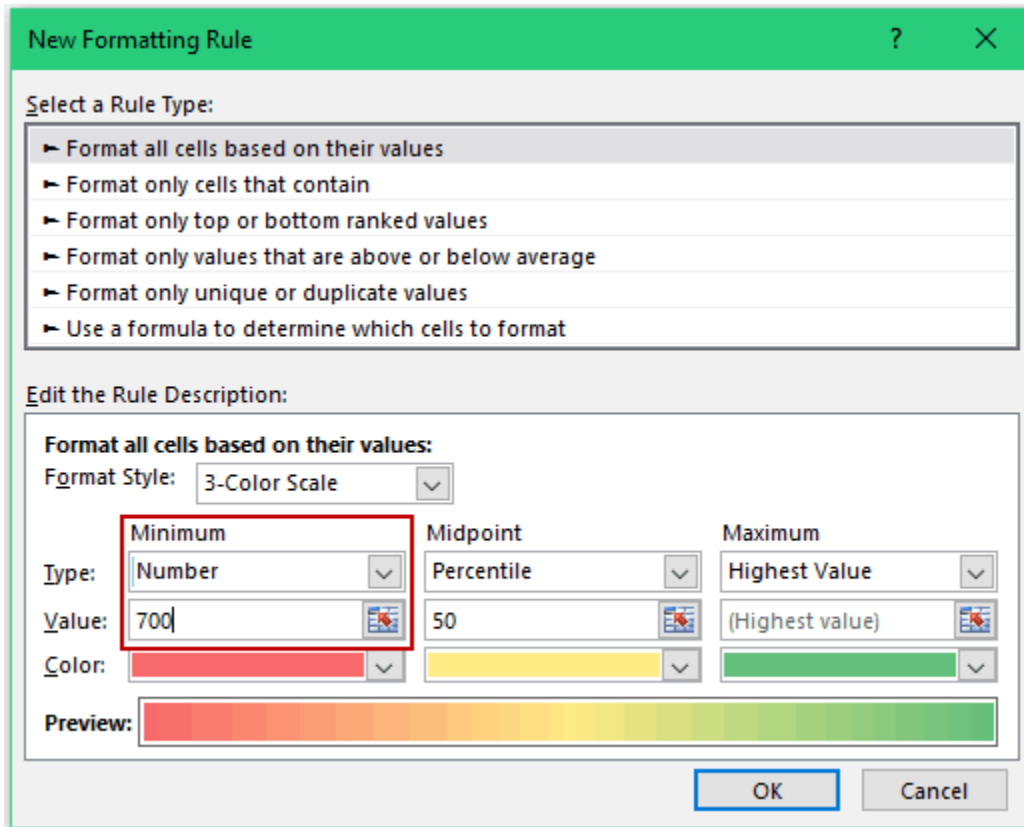
Color: Yellow

Preview: [Color gradient bar]

OK Cancel

Now you can specify the minimum, midpoint, and the maximum value and assign the color to it. Since we want to highlight all the cells with a value below 700 in red, change the type to Number and value to 700.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030



New Formatting Rule

Select a Rule Type:

- Format all cells based on their values
- Format only cells that contain
- Format only top or bottom ranked values
- Format only values that are above or below average
- Format only unique or duplicate values
- Use a formula to determine which cells to format

Edit the Rule Description:

Format all cells based on their values:

Format Style: 3-Color Scale

Type	Value	Color
Minimum	Number: 700	Red
Midpoint	Percentile: 50	Yellow
Maximum	Highest Value: (Highest value)	Green


Preview: [Color gradient bar]

OK Cancel

Click OK.

Now you will get the result as shown below. Note that all the values below 700 get the same shade of red color.

	A	B	C	D
1		2014	2015	2016
2	January	600	708	594
3	February	607	984	749
4	March	901	886	908
5	April	608	615	835
6	May	715	833	734
7	June	520	663	618
8	July	731	521	950
9	August	709	663	987
10	September	633	863	979
11	October	533	651	841
12	November	996	958	749
13	December	792	717	875

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Creating a Dynamic Heat Map in Excel

Since conditional formatting is dependent on the value in a cell, as soon as you change the value, conditional formatting recalculates and changes. This makes it possible to make a dynamic heat map. Let’s look at two examples of creating heat maps using interactive controls in Excel.

Example 1: Heat Map using Scroll Bar


Here is an example where the heat map changes as soon as you use the scroll bar to change the year.

	A	B	C	D	E
1		2010	2011	2012	
2	January	758	869	955	
3	February	690	761	841	
4	March	935	932	918	
5	April	604	907	850	
6	May	953	545	516	
7	June	941	523	775	
8	July	730	621	519	
9	August	714	579	871	
10	September	569	884	867	
11	October	878	575	747	
12	November	551	962	547	
13	December	590	537	615	
14	<div> < <div></div> > </div>				
15					

This type of dynamic heat maps can be used in dashboards where you have space constraints but still want the user to access the entire data set.

How to create this dynamic heat map?

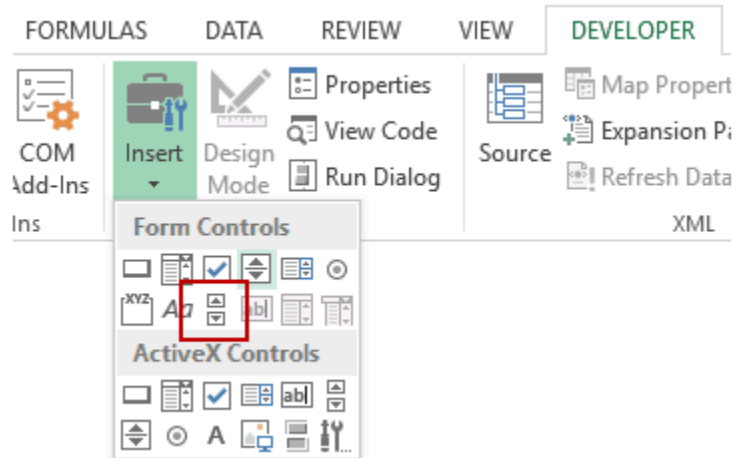
Here is the complete data set that is used to create this dynamic heat map.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030


	A	B	C	D	E	F	G	H
1		2010	2011	2012	2013	2014	2015	2016
2	January	758	869	955	614	681	643	642
3	February	690	761	841	835	892	748	970
4	March	935	932	918	935	708	708	850
5	April	604	907	850	550	957	600	667
6	May	953	545	516	574	533	936	706
7	June	941	523	775	720	606	816	946
8	July	730	621	519	913	796	877	765
9	August	714	579	871	572	839	735	653
10	September	569	884	867	664	623	654	859
11	October	878	575	747	758	799	738	646
12	November	551	962	547	750	612	885	822
13	December	590	537	615	861	874	524	740

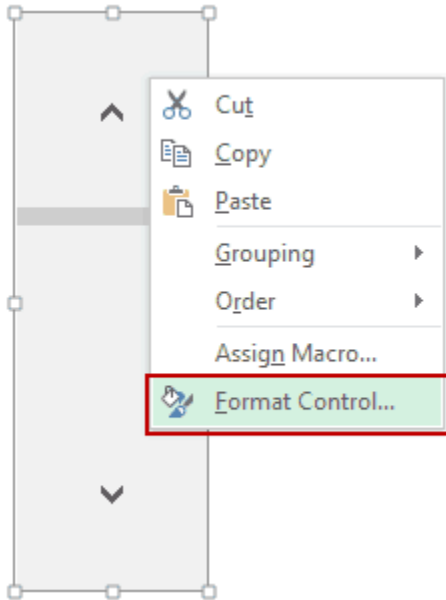
Here are the steps:

- In a new sheet (or in the same sheet), enter the [month names](#) (simply copy paste it from the original data).
- Go to Developer → Controls → Insert → Scroll Bar. Now click anywhere in the worksheet, and it will insert a scroll bar. (click here if you can't find the [developer tab](#)).




Right-click on the scroll bar and click on Format Control.

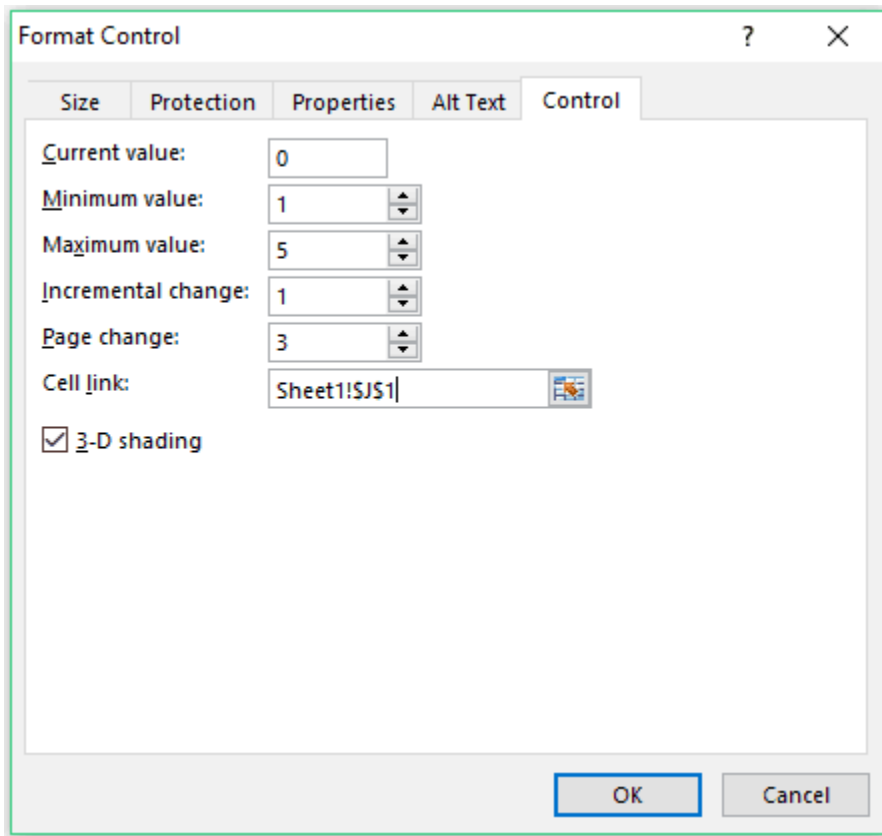
 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030



In the Format Control dialog box, make the following changes:


- Minimum Value: 1
- Maximum Value 5
- Cell Link: Sheet1!\$J\$1 (You can click on the icon in the right and then manually select the cell you want to link to the scroll bar).

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030



- Click OK.
- In cell B1, enter the formula: `=INDEX(Sheet1!B1:H13,ROW(),Sheet1!J1+COLUMNS(Sheet2!B1:B1)-1)`
- Resize and place the scroll bar at the bottom of the data set.

Now when you change the scroll bar, the value in Sheet1!\$J\$1 would change, and since the formulas are linked to this cell, it would update to show the correct values.

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

	A	B	C	D	E
1		2010	2011	2012	
2	January	758	869	955	
3	February	690	761	841	
4	March	935	932	918	
5	April	604	907	850	
6	May	953	545	516	
7	June	941	523	775	
8	July	730	621	519	
9	August	714	579	871	
10	September	569	884	867	
11	October	878	575	747	
12	November	551	962	547	
13	December	590	537	615	
14	< >				
15					

Also, since conditional formatting is volatile, as soon as the value changes, it gets updated as well.

Example 2: Creating a Dynamic Heat Map in Excel using Radio Buttons


Here is another example where you can change the heat map by making a radio button selection:

	A	B	C	D	E	F	G
1		2014	2015	2016			
2	January	681	643	642			
3	February	892	748	970			
4	March	708	708	850			
5	April	957	600	667			
6	May	533	936	706			
7	June	606	816	946			
8	July	796	877	765			
9	August	839	735	653			
10	September	623	654	859			
11	October	799	738	646			
12	November	612	885	822			
13	December	874	524	740			
14							

☒ Top 10

☐ Bottom 10

In this example, you can highlight top/bottom 10 values based on the radio/option button selection.


 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Pre Lab Exercise:

a. What is a heatmap?

b. What is a website heatmap

c. How is a heat map calculated?

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Pre – Lab Tasks:

Perform the following tasks using Excel:

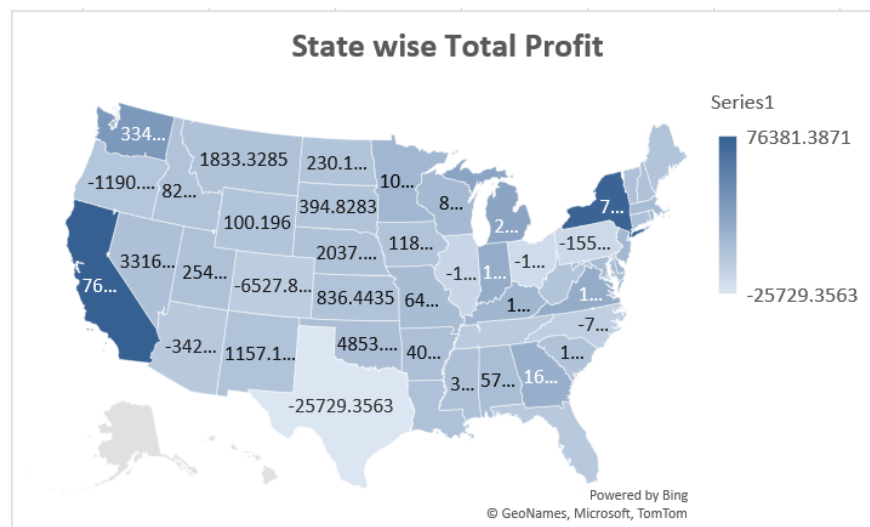
Task 1: To create a highlight table to explore how profit varies across regions, product sub-categories, and customer segments in the Superstore dataset


Results:-

	3743.3859	5240.0783	2788.3072	8964.1511	1462.9337	2933.5911	3085.4777	5225.478	2045.311	3022.195	1130.7575	2294.9692		
	-3775.6065	5008.7579	1455.2632	4293.5136	-459.2306	2607.2872	2543.8218	2738.0168	1596.2196	775.3683	124.8546	1229.7395		
	605.5615	989.0642	648.4543	1211.2211	343.9693	566.1716	264.2543	830.2525	245.6283	344.7085	145.878	332.6234		
	1832.321	6740.6697	1583.9285	7838.678	-4420.425	2833.0034	2496.2001	5468.5415	1544.467	1694.2615	-179.4646	2789.5821		
	-1497.126	-2192.0672	1220.012	-1966.457	-382.7121	964.963	68.3666	-12.1673	-118.0662	59.4724	51.1132	332.1126		
	2920.9013	4917.3952	4017.0347	1380.0007	3206.8837	2720.5878	1183.9545	1233.2305	464.9371	1719.7876	1411.1001	1414.3531		
	1482.9616	8657.9325	1783.9452	12158.871	12789.904	1134.9765	1874.9615	3190.4366	1335.9754	7229.9328		3977.9272		
	912.6616	881.8797	503.4307	966.4406	483.6642	663.5852	643.3798	780.5998	381.2025	266.9441	318.6665	161.722		
	128.1477	149.173	114.2714	185.2087	78.5563	76.4704	27.5699	69.3064	29.9146	38.3474	31.8768	20.6756		
	-1454.0524	3021.137	1957.1855	4395.1526	-1209.358	1956.2306	1087.9331	1673.4023	-1242.806	904.0395	397.5643	1572.7155		
	334.2023	733.529	840.9038	1167.3533	487.17	218.6299	150.4372	904.5902	251.7071	177.1211	49.4313	231.1788		
	-1667.028	-1296.085	2910.5588	2193.616	-361.5044	2624.6023	-2520.118	960.039	542.4658	5600.1256	-1829.3339	-3772.5814		
	2914.6377	3917.3307	3085.3364	5617.3388	2399.2305	2668.9582	1410.0633	3883.2948	1658.0323	2429.0821	1451.6617	2618.6028		
	6416.0196	7328.2536	5623.9118	4468.9297	2391.2797	3129.6183	3680.212	2565.1096	3515.7274	1856.8141	1463.1515	2076.7033		
	413.3101	1973.9242	888.6697	3828.2964	1084.5102	3836.4565	718.5711	3491.4869	472.0162	2578.9905	667.0557	1325.5389		
	-782.0922	-1171.6357	69.8592	226.3174	101.8498	-12.8974	-111.6379	361.6119	18.3543	29.3979	43.656	38.1172		
	-3964.1571	-3708.3528	-2577.5	521.9717	707.1806	-5299.6557	-1388.224	1074.2004	-302.6739	-2017.372	-657.3344	-113.5648		

Task 2: To build a simple map, using Superstore dataset with location data (for example, location names or latitude and longitude coordinates (Region & State)).

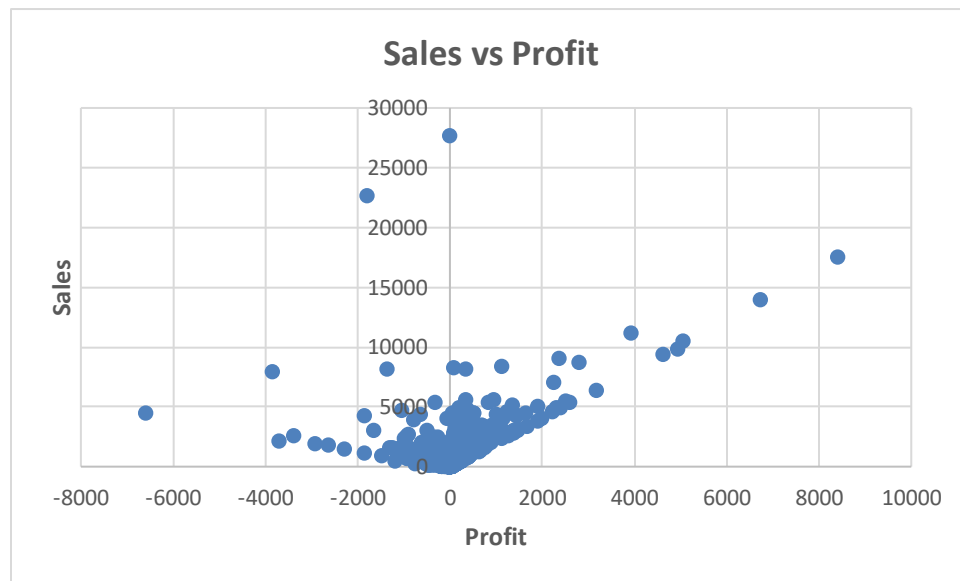
Results:-




 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Task 3: To create a density heat map using the sample dataset pertaining to sales in an electronics store.

Results:



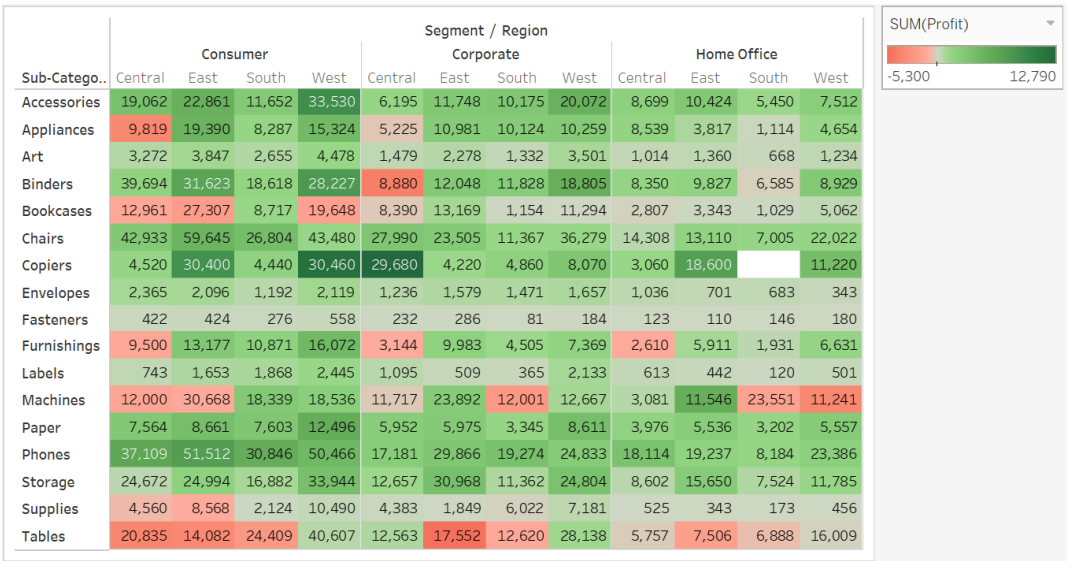
 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

In – Lab Tasks:

Perform the following tasks using Tableau:

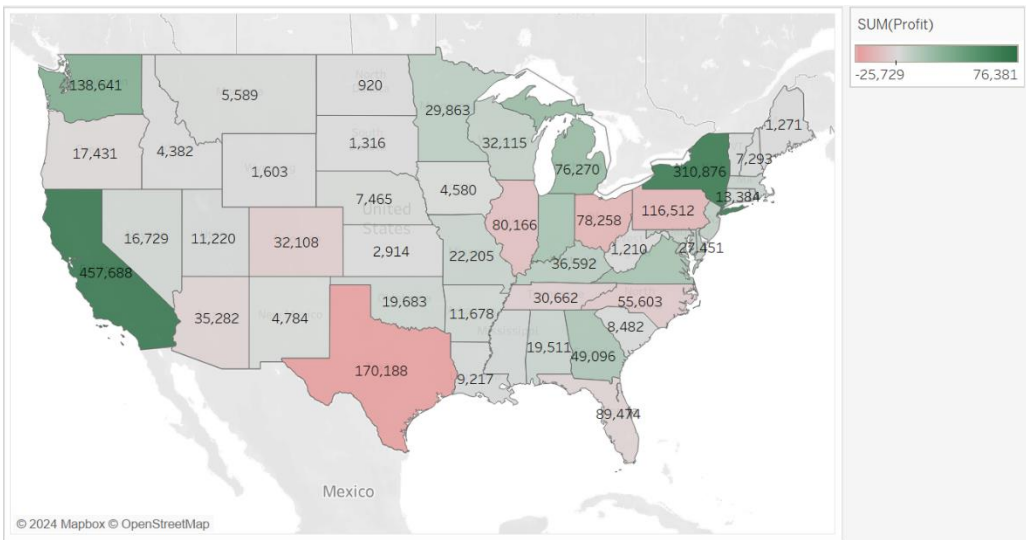
Task 1: To create a highlight table to explore how profit varies across regions, product sub-categories, and customer segments in the Superstore dataset


Results:-



Task 2: To build a simple map, using Superstore dataset with location data (for example, location names or latitude and longitude coordinates (Region & State)).

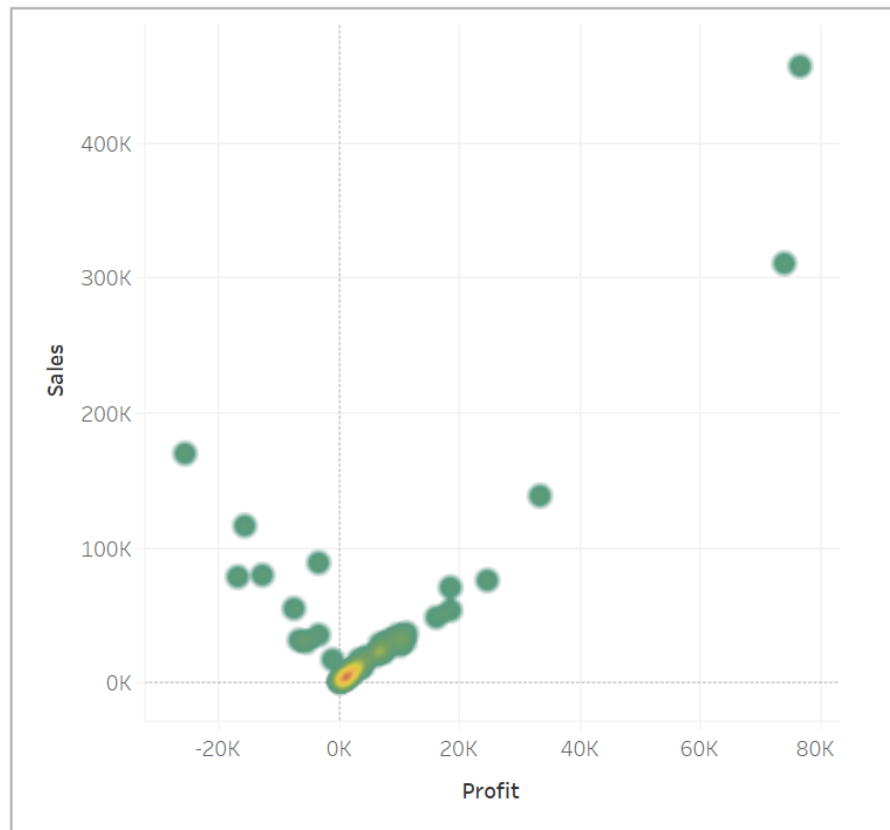
Results:-



 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Task 3: To create a density heat map using the sample dataset pertaining to sales in an electronics store.

Results:-




Reference Link: https://help.tableau.com/current/pro/desktop/en-us/buildexamples_highlight.htm
<https://data-flair.training/blogs/tableau-heat-map/>

Observation and Result Analysis:

Write the final observation and process corresponding to each task

1. _____

2. _____

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

3. _____

Post Lab Exercise:

Python Implementation

Reference Link: <https://www.kaggle.com/code/suyashpratapsingh/eda-on-sample-superstore-dataset>

Perform the following tasks using Python:

Pre- Requisites:-


```
import pandas as pd
import seaborn as sns
import plotly.graph_objects as go
from plotly.offline import plot
from matplotlib.colors import LinearSegmentedColormap
import matplotlib.pyplot as plt
```

```
Dataset = pd.read_excel("./Sample - Superstore.xlsx", "Orders")
```

Task 1: To create a highlight table to explore how profit varies across regions, product sub-categories, and customer segments in the Superstore dataset

Code:-

```
Pivot_Table = pd.pivot_table(Dataset, values='Sales', columns=['Segment', 'Region'], index='Sub-Category',
aggfunc='sum')
colors = [(1, 0, 0), (0, 1, 0)]
cmap_name = 'custom_colormap'
cm = LinearSegmentedColormap.from_list(cmap_name, colors, N=256)
plt.figure(figsize=(16, 8))
sns.heatmap(data=Pivot_Table, annot=True, cmap=cm, fmt='0.1f')
plt.title("Profit Analysis")
plt.xlabel("Region")
plt.ylabel("Sub-Category")
plt.show()
```

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Results:-




Task 2: To build a simple map, using Superstore dataset with location data (for example, location names or latitude and longitude coordinates (Region & State)).

Code:-

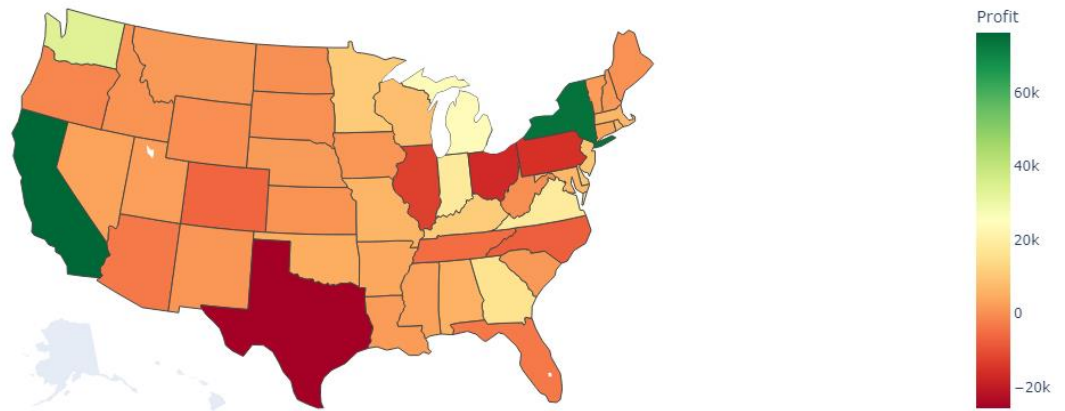
```
state_wise_profit = Dataset.groupby("State")["Profit"].sum().reset_index()
new_Dataset = pd.read_excel("./Sample - Superstore.xlsx", "Sheet6")
Map_Dataset = pd.DataFrame(
    { "State": state_wise_profit["State"],"Profit": state_wise_profit["Profit"],"State_Code":
new_Dataset["State_Code"],})

Data = dict(type="choropleth",locations=Map_Dataset["State_Code"],locationmode="USA-
states",colorscale="RdYlGn",text=Map_Dataset["State"],z=Map_Dataset["Profit"],colorbar={"title": "Profit"},)
layout = dict(geo={"scope": "usa"})

chmap = go.Figure(data=[Data], layout=layout)
plotly_html = plot(chmap, filename="choropleth_map.html", auto_open=True)
```

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030


Results:-



Task 3: To create a density heat map using the sample dataset pertaining to sales in an electronics store.

Code:-

```
New_Dataset = Dataset.groupby("State")[["Profit", "Sales"]].sum()
New_Dataset = pd.DataFrame(New_Dataset)
sns.kdeplot(data=New_Dataset, x="Profit", y="Sales", cmap="RdYlGn_r", fill=True)
plt.xlabel("Profit")
plt.ylabel("Sales")
plt.title("Density Heatmap of Sales and Profit")
plt.show()
```

 Marwadi University	Marwadi University Faculty of Engineering and Technology Department of Information and Communication Technology	
Subject: Data Visualization and Dashboard (01CT0410)	Aim: Draw the heat map plot using plotly, matplotlib and seaborn libraries in Python on random dataset.	
Experiment No: 08	Date: 14-02-2024	Enrollment No: 92200133030

Results:-

