AI-Enabled Marketing Campaign Analysis using Pandas

```
import pandas as pd
```

Introduction - Dataset Summary

```
df= pd.read_csv('/content/drive/MyDrive/Datasets/marketing_campaign_sample.csv') #reading dataset contains marketing campaign data


#Analyzing its structure and summary stats


print(df.head()) #head reads first 5 rows of dataset
```

```
      Campaign  Impressions  Clicks Channel  Spend
0  Campaign A        10000     500   Email    200
1  Campaign B        25000    1200  Social    450
2  Campaign C        15000     750  Search    300
3  Campaign D        12000     600   Email    250
4  Campaign E        30000    1000  Social    500
```

```
#campaign : Name of the marketing campaign
#impressions : Number of times the ad was shown
#clicks : Number of times the users clicked the ad
#channel : Platform where campaign ran (Email,social,search)
#spend : Total amount spent on campaign



df.columns #To find column names of dataframes
```

```
Index(['Campaign', 'Impressions', 'Clicks', 'Channel', 'Spend'], dtype='object')
```

```
df.shape  #prints number of rows and cloumns
```

```
(15, 5)
```

```
df.info() #To find Data type,nullvalues
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15 entries, 0 to 14
Data columns (total 5 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   Campaign     15 non-null     object
 1   Impressions  15 non-null     int64 
 2   Clicks       15 non-null     int64 
 3   Channel      15 non-null     object
 4   Spend        15 non-null     int64 
dtypes: int64(3), object(2)
memory usage: 732.0+ bytes
```

```
#df.describe() #summmary


df['Channel'].unique()
```

```
array(['Email', 'Social', 'Search'], dtype=object)
```

```
df['Channel'].value_counts() #To know which channel used most for marketing campaigns
```

Channel	count
Social	6
Search	5
Email	4

dtype: int64

#DAY 1 - Analyzed the data to understand what it represents, examined each column to identify its meaning, checked column names, detected any null values, verified data types, and calculated basic statistics such as mean and median

```
#DAY2
```

```
df.isnull().sum()   #it checks how many null values are present in each column
```

	0
Campaign	0
Impressions	0
Clicks	0
Channel	0
Spend	0

dtype: int64

```
df.duplicated().sum() #checks there is any duplicate values. 0 in the case of no duplicates
```

```
np.int64(0)
```

```
df.dtypes #checks the datatypes of each column
```

	0
Campaign	object
Impressions	int64
Clicks	int64
Channel	object
Spend	int64

dtype: object

```
df['CTR']=df['Clicks']/df['Impressions'] *100 #It adds new columns to the df
```

```
df.rename(columns={'Spend':'Spend (INR)'},inplace=True)
```

```
df
```

	Campaign	Impressions	Clicks	Channel	Spend (INR)	CTR
0	Campaign A	10000	500	Email	200	5.000000
1	Campaign B	25000	1200	Social	450	4.800000
2	Campaign C	15000	750	Search	300	5.000000
3	Campaign D	12000	600	Email	250	5.000000
4	Campaign E	30000	1000	Social	500	3.333333
5	Campaign F	5000	200	Search	100	4.000000
6	Campaign G	10191	362	Social	256	3.552154
7	Campaign H	5952	184	Search	291	3.091398
8	Campaign I	13064	269	Email	400	2.059094
9	Campaign J	13034	1099	Social	332	8.431794
10	Campaign K	14904	687	Search	180	4.609501
11	Campaign L	13885	1073	Social	251	7.727764
12	Campaign M	10374	662	Search	246	6.381338
13	Campaign N	5050	554	Email	196	10.970297
14	Campaign O	12816	652	Social	371	5.087391

Next steps: Generate code with df | View recommended plots | New interactive sheet

```
#No missing values, 0 duplicates, CTR column added
```

```
df.sort_values('CTR',ascending=False)
```

	Campaign	Impressions	Clicks	Channel	Spend (INR)	CTR
13	Campaign N	5050	554	Email	196	10.970297
9	Campaign J	13034	1099	Social	332	8.431794
11	Campaign L	13885	1073	Social	251	7.727764
12	Campaign M	10374	662	Search	246	6.381338
14	Campaign O	12816	652	Social	371	5.087391
2	Campaign C	15000	750	Search	300	5.000000
0	Campaign A	10000	500	Email	200	5.000000
3	Campaign D	12000	600	Email	250	5.000000
1	Campaign B	25000	1200	Social	450	4.800000
10	Campaign K	14904	687	Search	180	4.609501
5	Campaign F	5000	200	Search	100	4.000000
6	Campaign G	10191	362	Social	256	3.552154
4	Campaign E	30000	1000	Social	500	3.333333
7	Campaign H	5952	184	Search	291	3.091398
8	Campaign I	13064	269	Email	400	2.059094

```
df['CTR'].describe() #for insight
```

	CTR
count	15.000000
mean	5.269604
std	2.299783
min	2.059094
25%	3.776077
50%	5.000000
75%	5.734364
max	10.970297

dtype: float64

```
#DAY3
```

```
df.groupby('Channel')[['Impressions','Clicks','Spend (INR)','CTR']].mean()  #We grouped channels based on impressions,clicks,Spend(INR)
```

Channel	Impressions	Clicks	Spend (INR)	CTR
Email	10028.500000	480.750000	261.5	5.757348
Search	10246.000000	496.600000	223.4	4.616447
Social	17487.666667	897.666667	360.0	5.488739

```
df.groupby('Channel')['CTR'].mean().sort_values(ascending=False) #We grouped channels based on CTR
```

Channel	CTR
Email	5.757348
Social	5.488739
Search	4.616447

dtype: float64

```
df.groupby('Campaign')[['Impressions','Clicks','Spend (INR)','CTR']].sum() #Grouping campaign based on impressions,clicks,spend
```

Campaign	Impressions	Clicks	Spend (INR)	CTR
Campaign A	10000	500	200	5.000000
Campaign B	25000	1200	450	4.800000
Campaign C	15000	750	300	5.000000
Campaign D	12000	600	250	5.000000
Campaign E	30000	1000	500	3.333333
Campaign F	5000	200	100	4.000000
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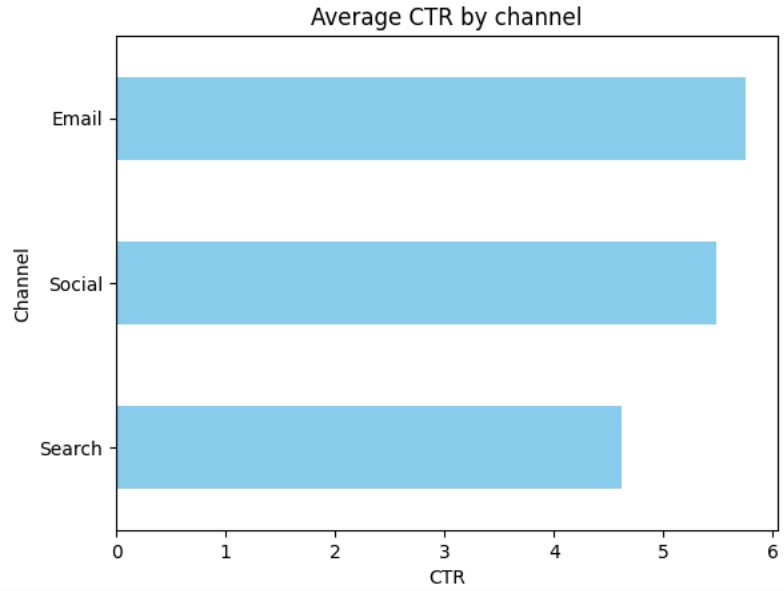
Campaign K	14904	687	180	4.609501
Campaign L	13885	1073	251	7.727764
Campaign M	10374	662	246	6.381338
Campaign N	5050	554	196	10.970297
Campaign O	12816	652	371	5.087391

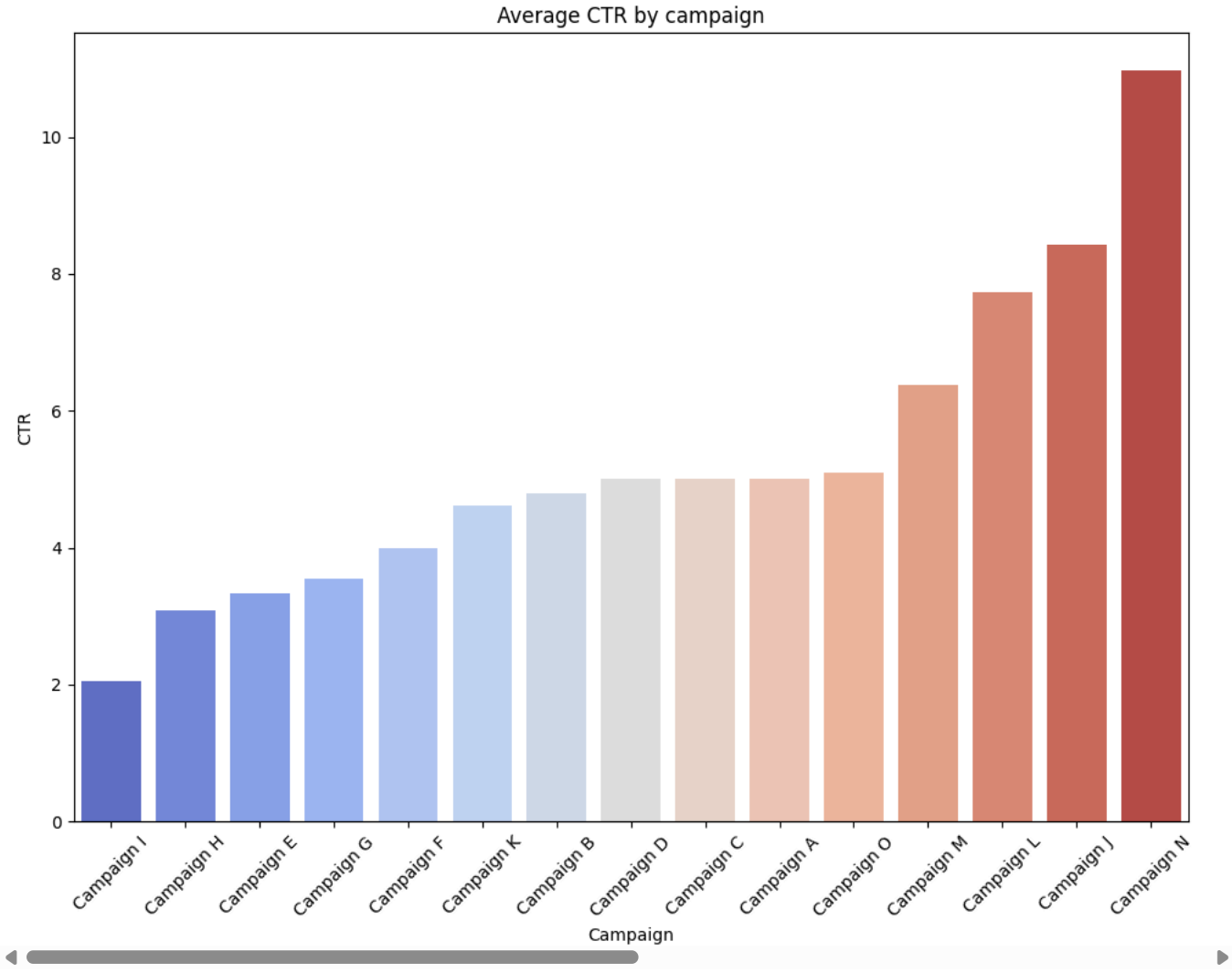
```
#VISUALISATION


import matplotlib.pyplot as plt
df.groupby('Channel')['CTR'].mean().sort_values().plot(kind='barh',color='skyblue',)
plt.title('Average CTR by channel')
plt.xlabel('CTR')
plt.ylabel('Channel')
plt.show()
```




```
#Email has highest CTR
#Based on money spend, Campaign E is on Top


#DAY 4


#Visualize and Communicate like a pro !


#1. BAR CHART AND CTR% By Campaign


import matplotlib.pyplot as plt
import seaborn as sns

campaign_ctr = df.groupby('Campaign')['CTR'].mean().sort_values()
```

```
#plot bar chart
plt.figure(figsize=(10,8))
sns.barplot(x=campaign_ctr.index,y=campaign_ctr.values,palette='coolwarm')
plt.title("Average CTR by campaign")
plt.xlabel("Campaign")
plt.ylabel("CTR")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```

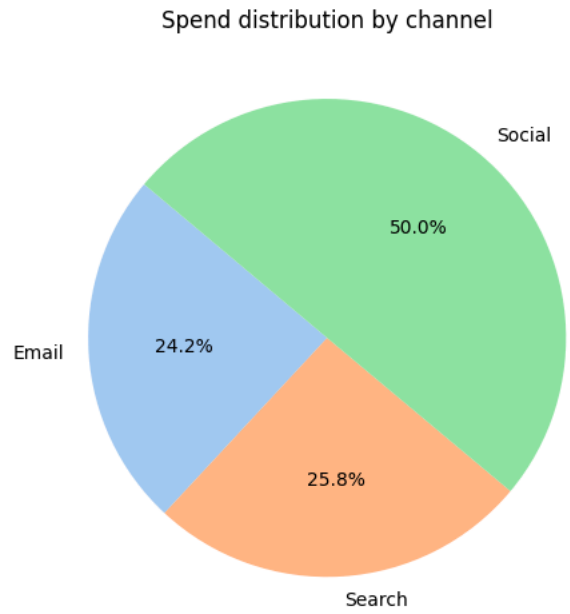
```
<ipython-input-69-1333971358>:8: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `le

  sns.barplot(x=campaign_ctr.index,y=campaign_ctr.values,palette='coolwarm')
```




```
#Campaign 'N' delivered the highest CTR,suggesting more effective targeting or messaging.
```

Total Spend By channel

```
channel_spend = df.groupby('Channel')['Spend (INR)'].sum().sort_values()

plt.figure(figsize=(8,5))
plt.pie(channel_spend,labels=channel_spend.index,autopct='%1.1f%%',startangle=140,colors=sns.color_palette('pastel'))
plt.title('Spend distribution by channel')
plt.tight_layout()
plt.show()
```




```
#"Social received the largest share of ad spend."
```

```
Start coding or generate with AI.
```

"Social is leading in Impressions, Clicks, and Spend, indicating that investing more in Social was a good decision. However, Email has the highest CTR, suggesting that focusing more on Email could yield excellent results due to its high ad click-through rate."

```
#FINAL INSIGHTS

#Camapaign N had the highest CTR (10.97%)
#Email channel had the best engagement (CTR 5.75%)
#Social had highest spend,but Email delivered better results

#-Tools used
#- Python, Pandas,Matplotlib,Seaborn
```