Exploratory Data Analysis (EDA) of Marketing Campaigns

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Introduction

- **Objective:** Perform exploratory data analysis (EDA) on a marketing dataset to uncover key insights.
- **Dataset:** Marketing Campaign Dataset
- **Key Metrics:** Campaign ID, ROI, Click-Through Rate (CTR), Cost Per Click (CPC), Conversion Rate

```python
df.info()
✓ 1.4s                                                    Python

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200005 entries, 0 to 200004
Data columns (total 15 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   Campaign_ID       200005 non-null  int64
 1   Company           200005 non-null  object
 2   Campaign_Type     200005 non-null  object
 3   Target_Audience   200005 non-null  object
 4   Duration          200005 non-null  object
 5   Channel_Used      200005 non-null  object
 6   Conversion_Rate   200005 non-null  float64
 7   Acquisition_Cost  200005 non-null  int64
 8   ROI               200005 non-null  float64
 9   Location          200005 non-null  object
 10  Date              200005 non-null  datetime64[ns]
 11  Clicks            200005 non-null  int64
 12  Impressions       200005 non-null  int64
 13  Engagement_Score  200005 non-null  int64
 14  Customer_Segment  200005 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(5), object(7)
memory usage: 22.9+ MB
```

- The code snippet shows summary of the marketing campaign dataset
- The data contains 200,005 entries and 15 columns

Data Insights & Key Findings

ROI and Conversion Rate: Skewed distribution showing a few high-performing campaigns.
Acquisition Cost and Clicks: The acquisition cost suggests the presence of outliers.Clicks also exhibit a wide range, indicating varying levels of audience engagement across campaigns.
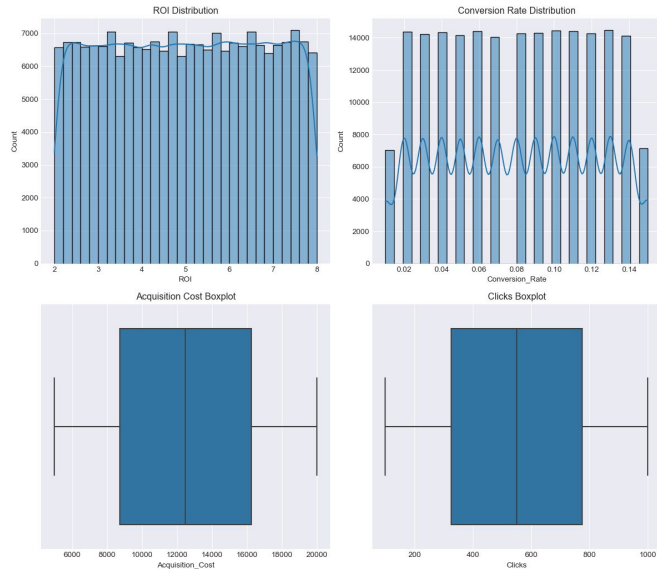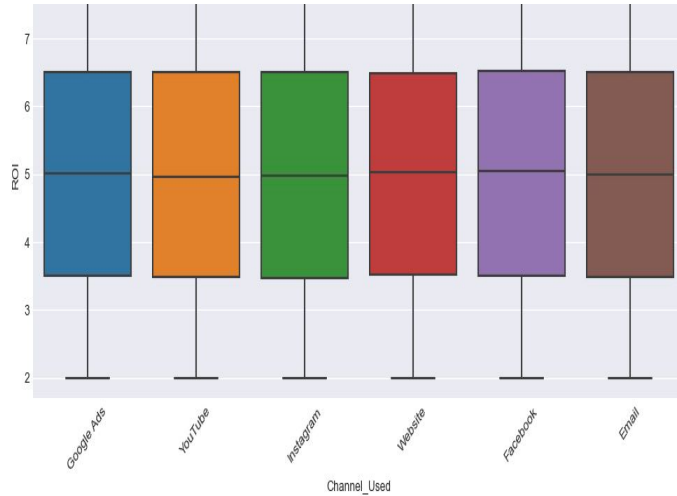
CTR & CPC Analysis: Higher CTR does not always correlate with lower CPC; channel selection is crucial.
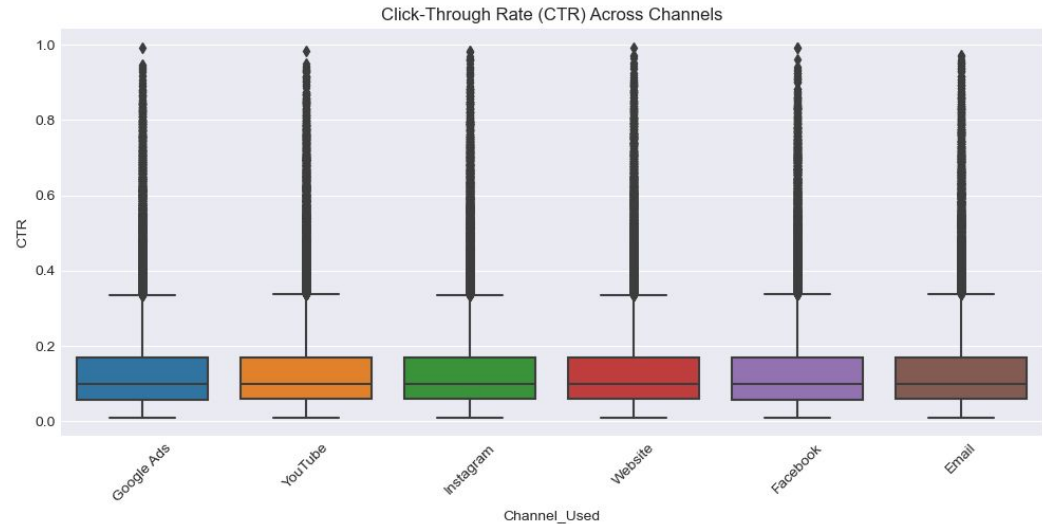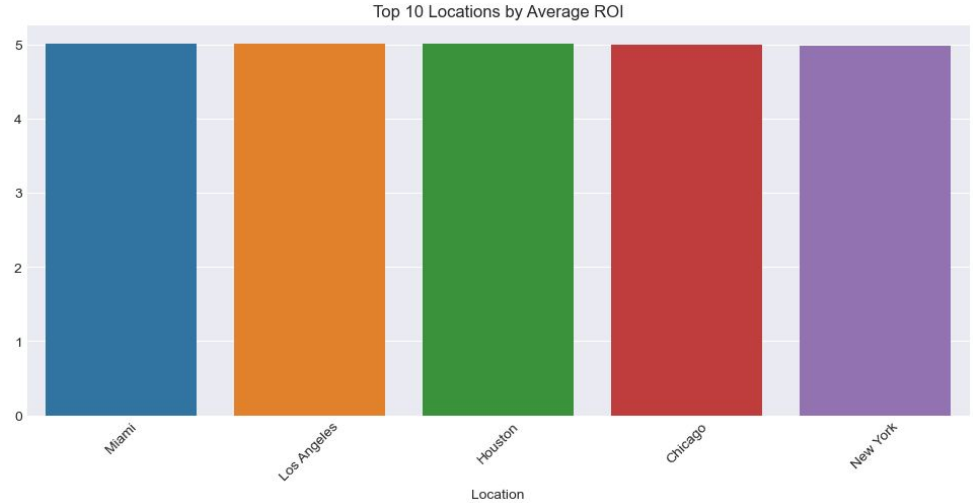
Data Insights & Key Findings

Channel Performance: Google Ads & YouTube show higher median ROI.

Location-Based Insights: Some locations exhibit significantly higher ROI than others, suggesting that geographical targeting can influence campaign success.

Top 10 Locations by Average ROI

Code & Methodology

- **Data Cleaning:** Handling missing values, removing inconsistencies.
- **Statistical Summary:** Mean, median, and standard deviation of key metrics.
- **Visualization Techniques:** scatter plots, heatmaps, density plots.

- The dataset has no missing values.

- Data visualization code snippet

2. Handling Missing Values

Checking for missing values and handling them appropriately.

```
df.isnull().sum()
✓ 1.9s
```

```
Campaign_ID          0
Company              0
Campaign_Type        0
Target_Audience      0
Duration             0
Channel_Used         0
Conversion_Rate      0
Acquisition_Cost     0
ROI                  0
Location             0
Date                 0
Clicks               0
Impressions          0
Engagement_Score     0
Customer_Segment     0
dtype: int64
```

5. Click-Through Rate (CTR) and Cost Per Click (CPC) Analysis

Evaluating the effectiveness of campaigns in driving engagement.

```python
# Calculate CTR and CPC
df['CTR'] = df['Clicks'] / df['Impressions']
df['CPC'] = df['Acquisition_Cost'] / df['Clicks']

# Plot CTR by channel
plt.figure(figsize=(12, 5))
sns.boxplot(x='Channel_Used', y='CTR', data=df)
plt.xticks(rotation=45)
plt.title("Click-Through Rate (CTR) Across Channels")
plt.show()
```

```
[29]  ✓ 3.2s
```

Recommendations

- **Optimize High-Performing Channels:** Allocate more budget to Google Ads & YouTube.
- **Target Audience Refinement:** Improve demographic targeting based on location-based trends.
- **Adjust Spending Strategy:** Avoid high-cost campaigns with low ROI.
- **A/B Testing:** Experiment with ad creatives to improve conversion rates.

Conclusion & Next Steps

- **Summary:** Key insights on campaign performance and channel effectiveness.
- **Next Steps:** Further segmentation analysis and campaign testing.
- **Final Thought:** Data-driven decision-making can enhance marketing efficiency.

THANK YOU