**📊 Marketing Campaign EDA Project Summary**

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**1. Project Objective**

The purpose of this project is to analyze the effectiveness of different marketing campaigns conducted through various channels and targeted at different audience segments. Using Python, Pandas, and visualization libraries, the aim is to identify patterns, assess ROI and conversion efficiency, and ultimately help optimize marketing decisions.

**2. Dataset Overview**

The dataset includes campaign information such as:

* Campaign\_ID
* Campaign\_Type
* Channel\_Used
* Customer\_Segment
* Target\_Audience
* Cost
* Clicks
* Conversions
* ROI
* Date

A derived column Conversion\_Rate was also created as:

python

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Conversion\_Rate = (Conversions / Clicks) \* 100

**3. Data Cleaning and Preparation**

* Handled missing values
* Converted Date to datetime
* Extracted Month from the Date for time trend analysis
* Created Conversion\_Rate column

**4. Exploratory Data Analysis (EDA)**

* **Univariate Analysis**:  
  Examined distribution and outliers in Cost, ROI, Clicks, and Conversions using histograms and boxplots.
* **Bivariate Analysis**:
  + Used scatter plots for Cost vs ROI by Campaign\_Type
  + Boxplots for Conversions by Channel\_Used
  + Violin plots for ROI distribution by Campaign\_Type
* **Time Series Analysis**:  
  Monthly line plots showed trends in ROI, Clicks, and Conversions. Identified seasonal patterns.

**5. Campaign Ranking and Strategy Analysis**

* Used groupby() and rank() functions to identify:
  + Top-performing Campaign\_Type and Channel\_Used per Target\_Audience
  + Best Customer\_Segment combinations for campaign effectiveness
* Sorted by Conversion\_Rate and ROI to rank campaigns and extract best strategies.

**6. Visualizations**

Types of charts used:

* **Histograms**: Distributions of Cost, ROI, Clicks, and Conversions
* **Boxplots**: Channel-based comparison of conversions and ROI
* **Violin plots**: Variance and density of ROI per campaign type
* **Scatter plots**: Cost vs ROI across campaigns
* **Line plots**: Monthly trends in performance
* **Bar plots**: Top 5 campaigns by ROI and Conversion Rate

**7. Strategic Insights**

* Email and Organic Search campaigns performed best in terms of ROI.
* Some high-budget campaigns underperformed.
* Certain audience segments had significantly higher conversion rates.
* Specific months (e.g., festive or sale periods) consistently delivered better results.
* Influencer campaigns showed high variation — either very effective or not at all.

**8. Recommendations**

1. Allocate higher budgets to high-ROI channels like Email and Organic Search.
2. Customize campaigns per Customer Segment and Target Audience.
3. Launch major campaigns in high-performance months.
4. Pause or revise high-cost, low-return campaigns.

**9. Tools and Libraries Used**

| **Tool/Library** | **Purpose** |
| --- | --- |
| pandas | Data cleaning, aggregation, transformation |
| matplotlib | Static plots for trend and distribution |
| seaborn | Advanced statistical visualization |
| Jupyter Notebook | Interactive data exploration |

**10. Final Deliverables**

* Fully cleaned and annotated Pandas analysis notebook
* Ranked strategies per audience and segment
* ssBusiness-ready insights and optimization plans

**11. Conclusion**

This Pandas-based EDA project successfully identified high-ROI marketing strategies, effective audience-channel combinations, and optimized timing for campaign deployment. These insights empower marketers to make smarter data-driven decisions, leading to improved conversion rates, better resource allocation, and maximized return on investment.