Business Analysis Report

Project Title: Ad Spend Optimization

1. Introduction

In the current competitive landscape, businesses invest heavily in digital marketing campaigns to capture consumer attention and drive conversions. However, not all campaigns yield a favorable return on investment (ROI). This project analyzes campaign data to uncover key performance drivers and recommend optimal strategies for maximizing ROI.

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2. Problem Statement

Marketers lack clear insights into which combinations of channels, durations, audience segments, and timing deliver the highest ROI. The goal is to:

- Predict ROI using campaign features.
- Identify the best-performing channels, customer segments, and timings.
- Provide actionable recommendations to optimize future campaigns.

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3. Dataset Overview

The dataset contains details of multiple digital marketing campaigns with the following attributes:
Channel_Used, Target_Audience, Customer_Segment
Duration, Acquisition_Cost, Conversion_Rate, CTR, Engagement_Score
Date, Clicks, Impressions, and the target ROI

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4. Tech Stack and Tools

- **Language**: Python
- **Libraries**: Pandas, Seaborn, Matplotlib, Scikit-learn
- **Model**: Random Forest Regressor
- **Environment**: Google Colab.

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5. Recommendations

- **Ad Timing:** Schedule ads primarily on Tuesdays and in October.
- **Duration:** Keep ad durations between 30-60 seconds for better engagement.
- **Channel Focus:** Invest more in Email Marketing and reduce spending on underperforming channels.
- **Targeting:** Focus more on Premium Subscribers as they bring higher ROI.
- **Engagement Strategy:** Enhance Engagement_Score by testing interactive content.

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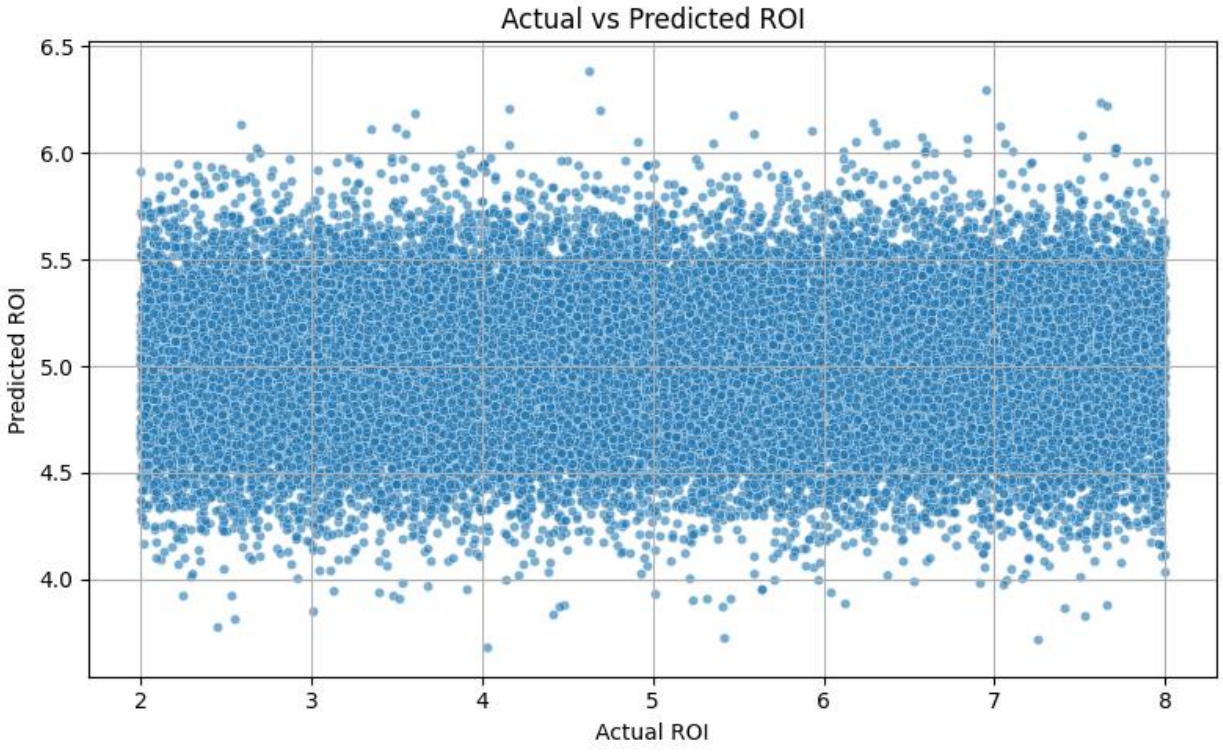
6. Final Use of the Project

- This project empowers marketers to:
- Predict and improve ROI using machine learning.
- Strategically allocate budgets for maximum returns.
- Uncover actionable insights based on historical campaign data.

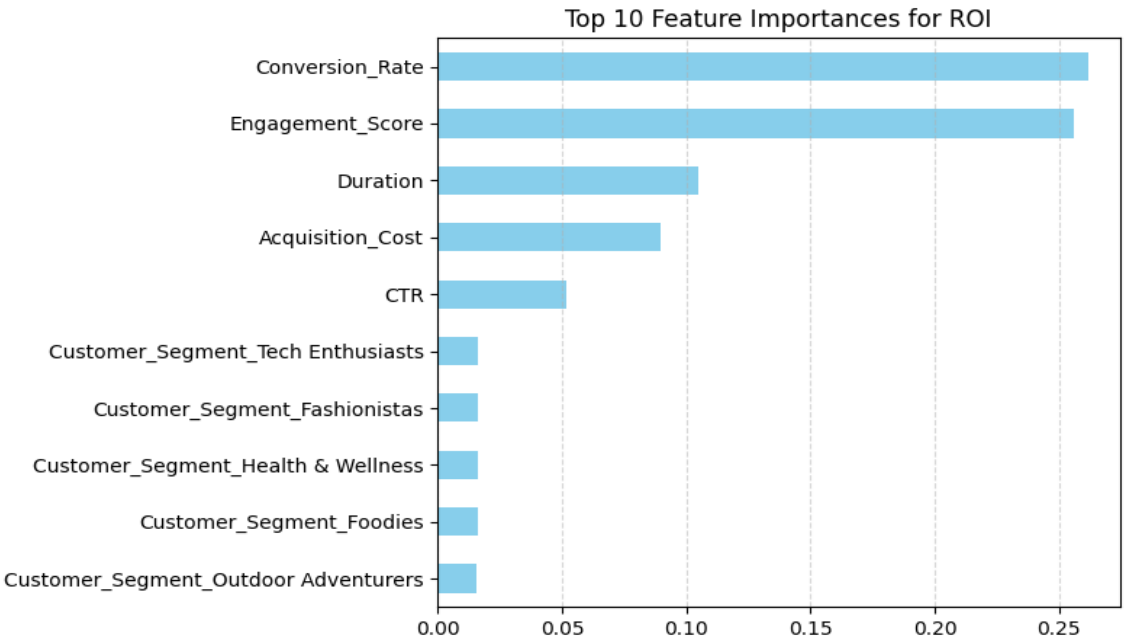
Actual vs Predicted ROI:

- This scatter plot compares the actual ROI with the model's predicted ROI values.
- It helps visualize how well the model is performing — ideally, points should lie close to a diagonal line. This is crucial to assess prediction accuracy.



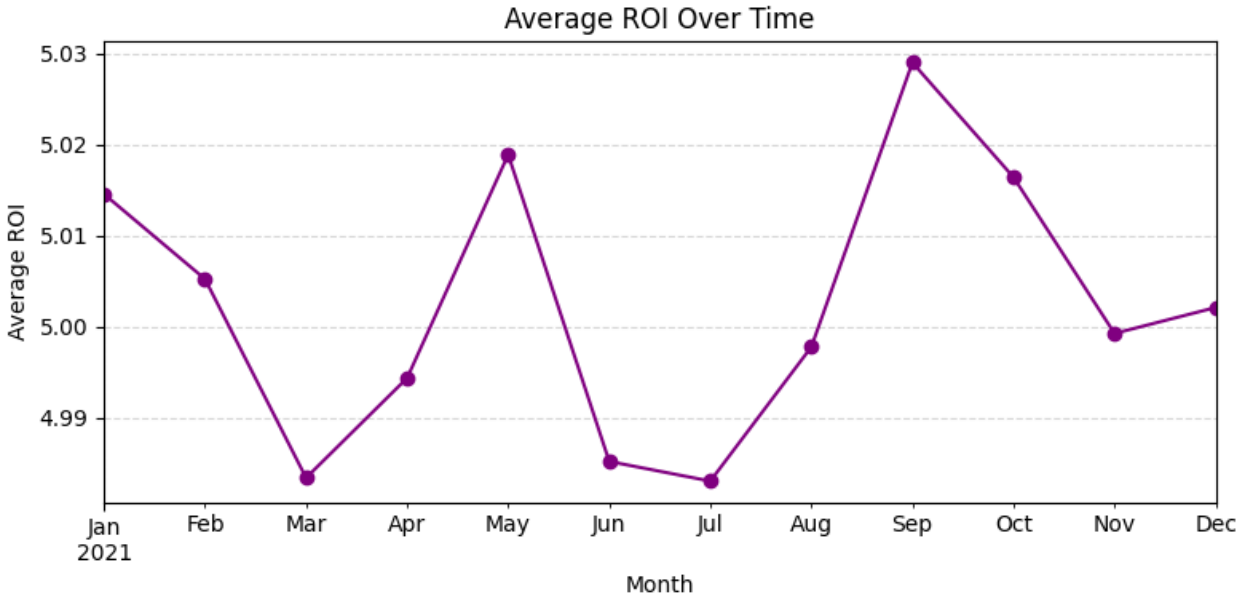
Feature Importance's:

- This bar chart highlights the top features influencing ROI predictions in the model.
- It helps marketers identify which campaign attributes (like acquisition cost or engagement score) have the most impact on ROI.



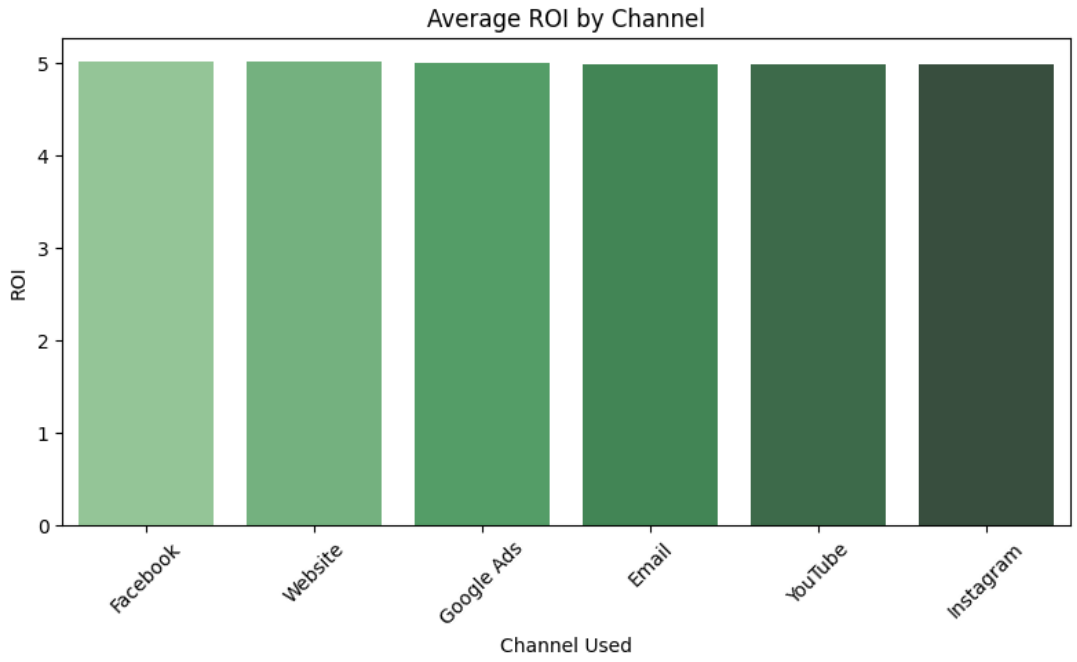
ROI Over Time

- This line chart shows how average ROI has varied month-by-month over time.
- It reveals seasonal trends or periods of high/low campaign performance, guiding future budget planning.



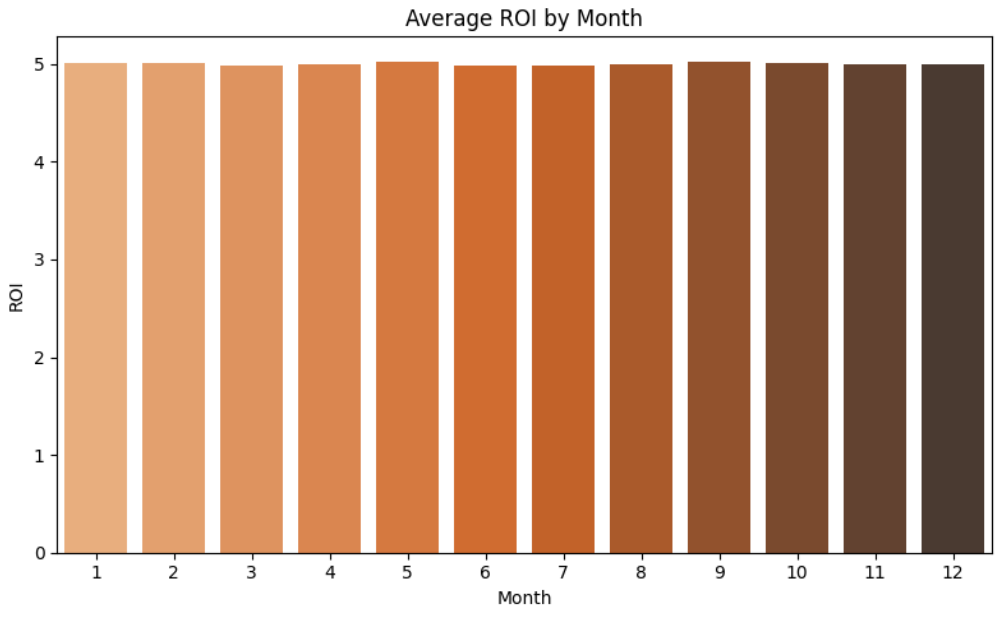
ROI by Channel:

- This bar chart compares average ROI across different ad channels (e.g., Social Media, Email, etc.).
- It helps decide which marketing channels deliver better returns and deserve more investment.



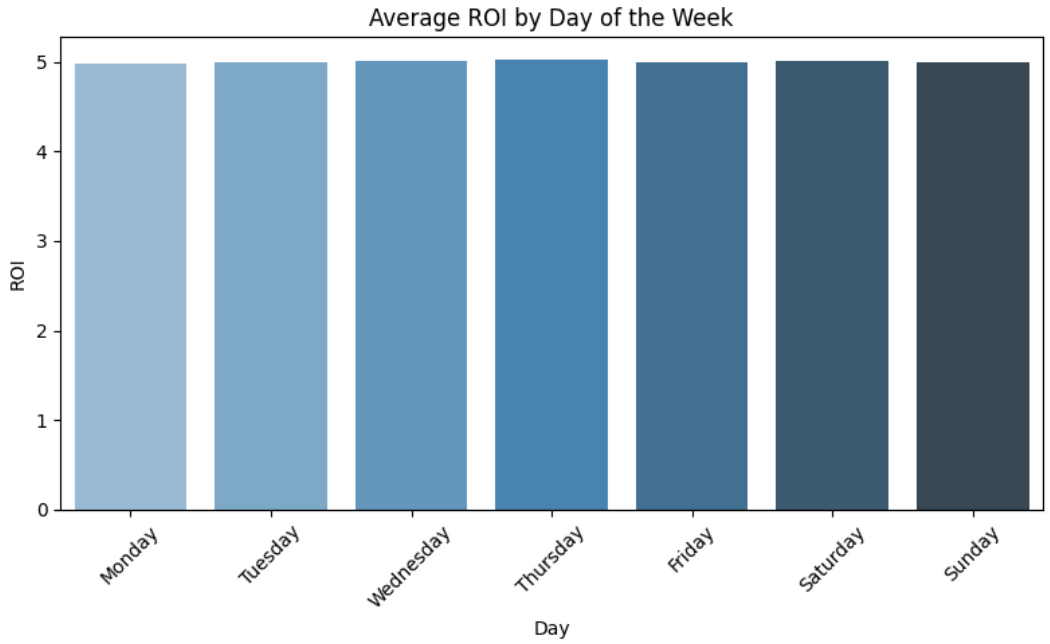
ROI by Month:

- This visualization shows the average ROI for each month of the year.
- It helps uncover the most effective times of year to run campaigns, supporting seasonal planning.



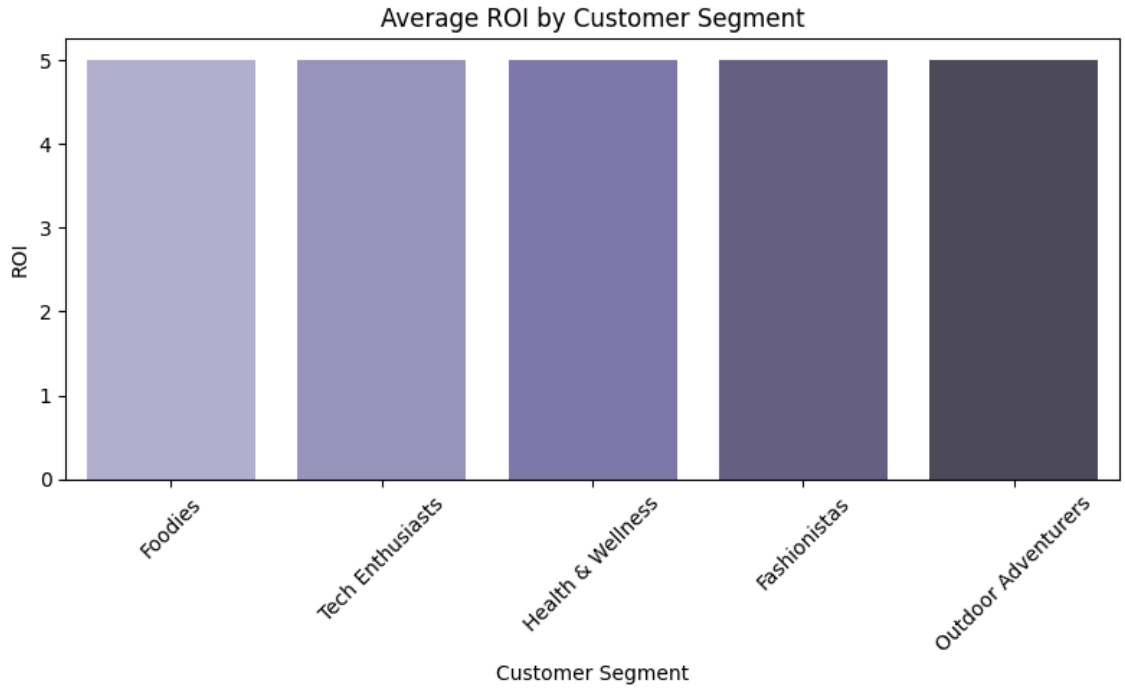
ROI by Day:

- This bar chart shows the average ROI by day of the week.
- It's useful to identify which day yields the best campaign results — helpful for scheduling ad launches.



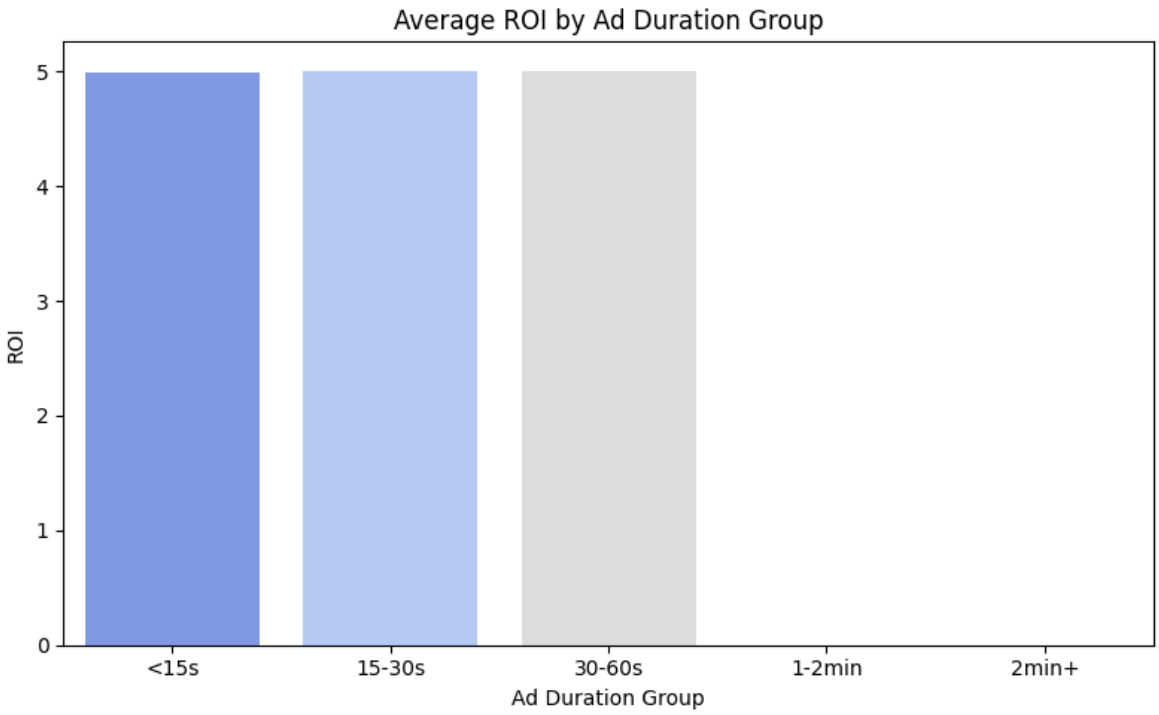
ROI by Segment:

- This chart shows average ROI for different customer segments (like students, professionals, etc.).
- It helps in understanding which audience groups respond best, guiding targeted advertising strategies.



ROI by Duration:

- This chart groups campaigns by ad duration (e.g., <15s, 15–30s) and shows their average ROI.
- It helps identify the optimal ad length for maximizing ROI.



Conclusion:

This project successfully developed a machine learning model to predict the Return on Investment (ROI) of marketing campaigns and provided actionable insights through visual analysis. The model's predictions were validated against actual ROI values, and key features influencing performance were identified.

Data visualizations revealed important patterns, such as high-performing ad channels, optimal campaign durations, and customer segments with the best returns. Additionally, time-based analysis (monthly, daily) highlighted seasonal trends and strategic opportunities for future campaigns.

Overall, this project provides a data-driven foundation for marketing optimization, enabling better budget allocation, improved targeting, and increased ROI through informed decision-making.