Marketing Campaign Optimization Using Sentiment Analysis and Machine Learning

Project Report

Submitted by: Charan Vamshi

Department: Computer Science (Data Science Specialization)

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# 1. Abstract

This project presents an intelligent system that enhances the effectiveness of marketing campaigns using sentiment analysis and machine learning. By combining structured campaign data with unstructured customer feedback, we build a predictive model that forecasts campaign performance (ROI) and recommends optimization strategies.

# 2. Introduction

Marketing campaigns play a crucial role in customer acquisition, brand visibility, and revenue growth. Traditional performance tracking focuses only on structured metrics (ROI, conversions, impressions), ignoring qualitative feedback. This project proposes a smarter system using natural language processing (NLP) to quantify customer sentiment and integrate it with machine learning models to optimize future campaigns.

# 3. Existing System and Disadvantages

Traditional marketing analysis relies on basic metrics such as conversion rate, ROI, and impressions.

Disadvantages:

* - No customer sentiment included
* - Manual decision-making based on past trends
* - No forecasting model for ROI
* - No prescriptive feedback for future campaigns

# 4. Proposed System and Features

The proposed system addresses the above issues by:

* - Adding sentiment analysis using TextBlob
* - Predicting ROI using machine learning (Random Forest)
* - Generating actionable insights and recommendations

# 5. Objectives

* - Enhance marketing performance analysis using sentiment insights
* - Predict ROI with campaign and sentiment features
* - Deliver actionable strategies to improve future campaigns

# 6. Methodology

Step 1: Data Collection - Used real-world campaign data (duration, channel, performance).

Step 2: Data Cleaning - Handled missing values and formatted data.

Step 3: Sentiment Analysis - Applied TextBlob to customer feedback to get sentiment polarity.

Step 4: Feature Engineering - Selected features for modeling (channel, duration, sentiment, etc.).

Step 5: Model Training - Trained RandomForestRegressor to predict ROI.

Step 6: Insights & Visualization - Created graphs using Matplotlib and Power BI.

# 7. Technology Stack

* - Python
* - Pandas, TextBlob, Scikit-learn, Seaborn, Matplotlib
* - Jupyter Notebook

# 9. Conclusion

This project demonstrates how combining structured campaign data with unstructured sentiment feedback can significantly improve marketing insights. The predictive model supports smarter decision-making and campaign optimization.

# 10. Future Enhancements

* - Integrate live feedback from platforms like Amazon, Twitter
* - Use advanced NLP models like BERT or VADER
* - Deploy the solution as a web application (Flask or Streamlit)
* - Real-time dashboards using Power BI

# 11. References

- Kaggle Marketing Dataset

- TextBlob Documentation

- Scikit-learn Documentation

- Matplotlib & Seaborn Tutorials