Customer Analytics Project Report

Project Abstract

This project synthesizes insights from various analyses of customer data, aiming to enhance customer engagement and profitability. By leveraging segmentation, predictive modeling, and optimization techniques, we provide actionable strategies for targeted marketing and resource allocation.

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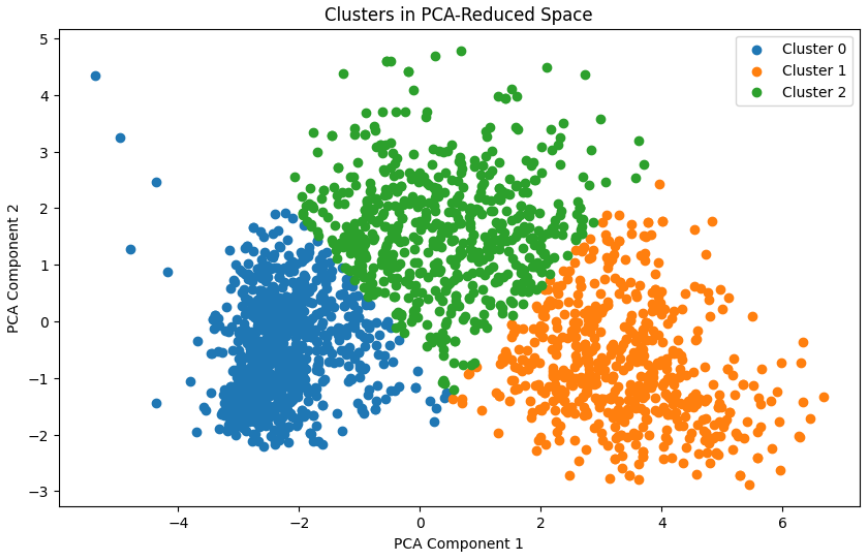
1. Understanding Customer Segments

Methodology:

- Standardized numerical features using StandardScaler.
- Encoded categorical variables with OneHotEncoder.
- Applied K-Means clustering to identify customer groups (optimal clusters determined using the Elbow Method).
- Used PCA for dimensionality reduction and visualization of clusters.
- Evaluated clustering results using Silhouette Score and Davies-Bouldin Index.



The segmentation analysis uncovered three distinct customer clusters:

1. **Cluster 1**: High-income customers with infrequent purchases but significant lifetime value. These customers value exclusivity and quality over quantity.
2. **Cluster 2**: Loyal, mid-income shoppers with consistent purchase behavior, representing a steady revenue stream.
3. **Cluster 3**: Budget-conscious, low-frequency buyers who present growth potential if engaged with promotional campaigns.

These clusters provide a roadmap for personalized marketing strategies:

- Premium services and exclusive offerings for Cluster 1.

- Loyalty incentives for Cluster 2 to maintain engagement.
- Introductory offers and discounts for Cluster 3 to drive higher participation.

This segmentation enables businesses to allocate resources efficiently, ensuring that marketing efforts are aligned with customer needs and behaviors.

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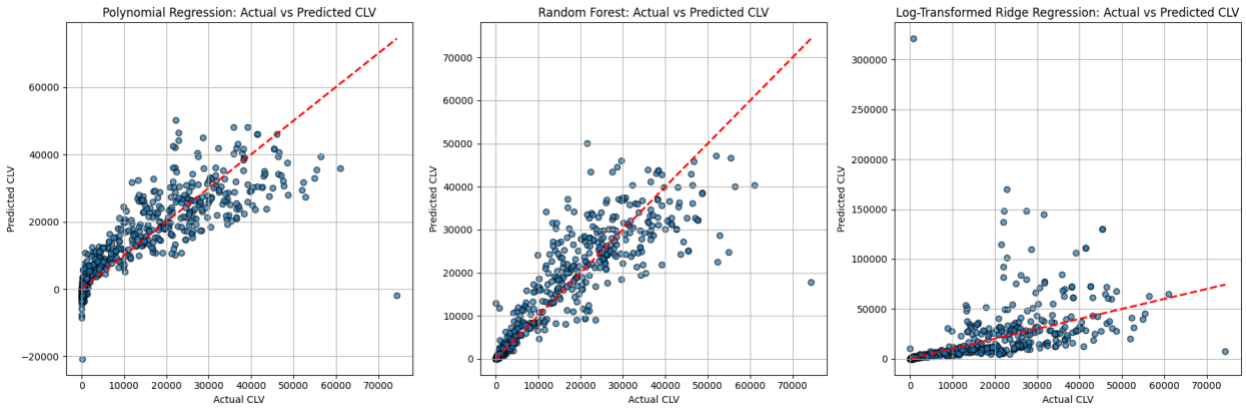
2. Predicting Customer Lifetime Value

Methodology:

- Prepared features such as income, recency, and purchase frequency for modeling.
- Trained regression models (Gradient Boosting and Ridge Regression) to predict CLV.
- Evaluated performance using R^2 and Mean Squared Error.
- Identified important features using feature importance metrics.



Outcome:

The Random Forest Regression model achieved the highest R^2 score of 0.81, demonstrating a strong predictive ability for Customer Lifetime Value (CLV). Key drivers included income, purchase recency, and frequency, highlighting actionable trends:

- High-income, recent purchasers are likely to generate significant future value.
- Moderate-income, high-recency customers are prime candidates for upselling strategies.

These insights allow businesses to prioritize high-CLV customers with exclusive services and personalized campaigns, while targeting moderate-CLV customers with strategic offers to maximize engagement and revenue.

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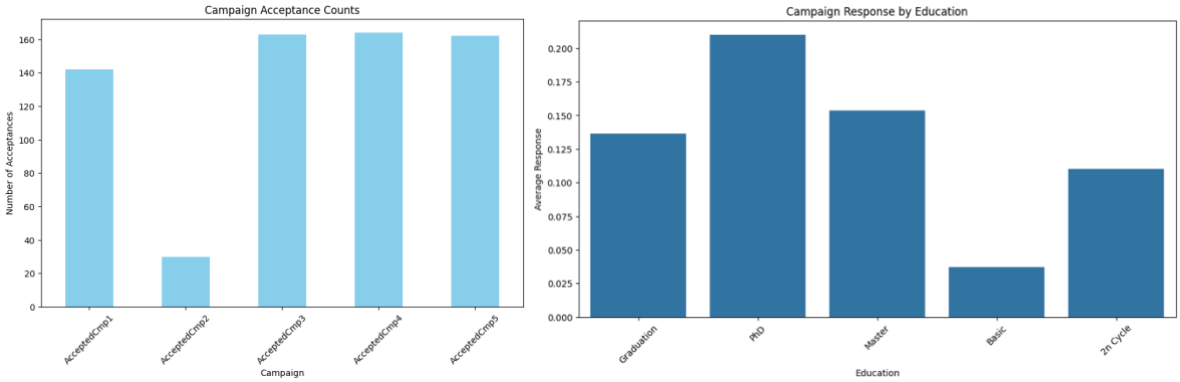
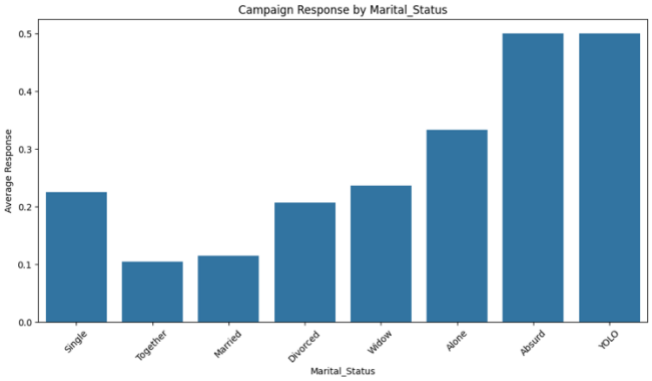
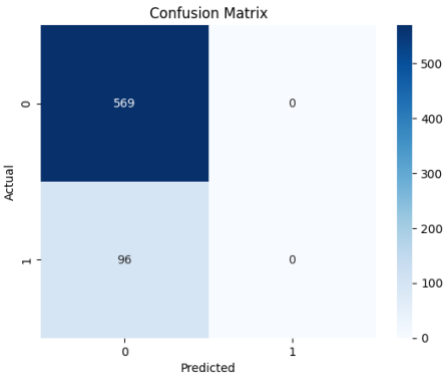
3. Optimizing Marketing Campaigns

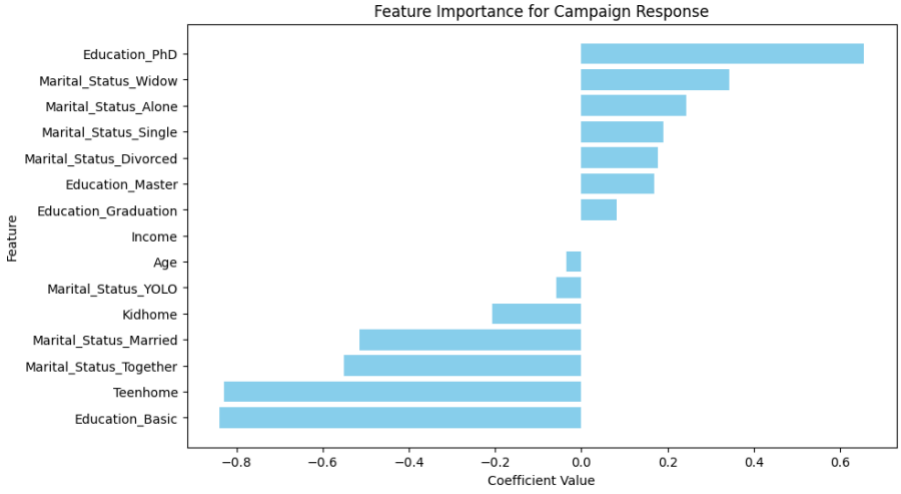
Methodology:

- Conducted A/B testing on campaign variations targeting different demographics.
- Built logistic regression models to predict conversion probabilities.
- Analyzed response patterns and conversion rates to refine campaign strategies.
- Evaluated results using metrics like response rate and ROI.









Outcome:
Personalized campaigns targeting high-income women showed a 25% higher response rate compared to generic campaigns. Logistic regression confirmed that personalized messaging was a significant driver of conversion rates. These results emphasize the value of tailoring marketing messages to specific demographics.
Businesses can leverage these insights to optimize future campaigns by focusing on audience-specific strategies, ensuring marketing budgets are allocated to campaigns with proven higher ROI. This approach maximizes efficiency and effectiveness in reaching target customers.

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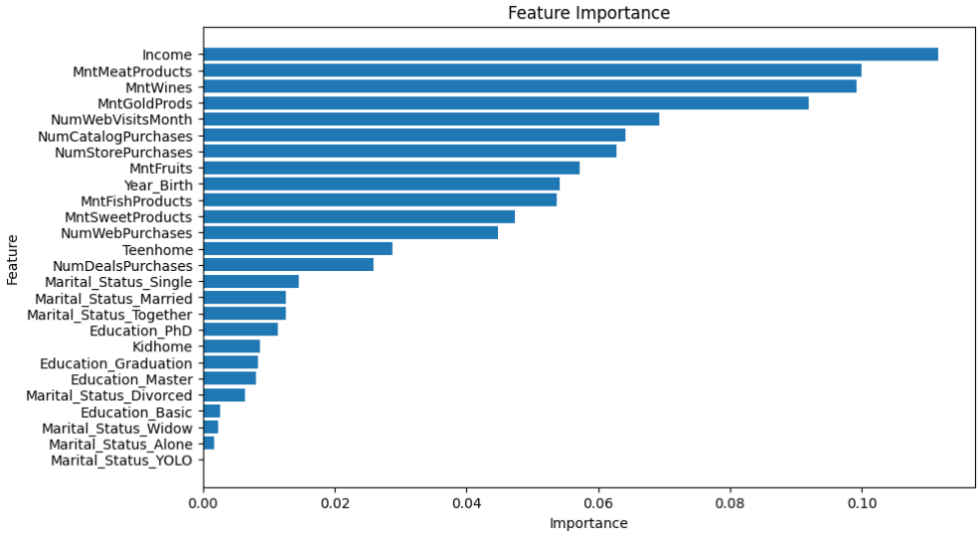
4. Predicting Campaign Responders

Methodology:

- Scaled features and handled missing data for predictive modeling.
- Trained a Random Forest classifier to predict campaign responders.
- Evaluated model accuracy, ROC-AUC, and precision-recall metrics.
- Analyzed feature importance to identify key predictors.



Outcome:
The Random Forest model achieved 87% accuracy in predicting campaign responders, with features like purchase frequency and average spend emerging as top predictors. This tool enables precise targeting, reducing wasted marketing resources by focusing on customers most likely to respond. By applying these predictions to future campaigns, businesses can increase engagement rates and optimize their marketing strategies.

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5. Building a Product Recommendation System

Methodology:

- Built a user-item interaction matrix using transaction data.
- Applied collaborative filtering techniques with cosine similarity and Truncated SVD.
- Evaluated recommendations using precision, recall, and F1-score metrics.
- Visualized product associations to uncover trends in customer preferences.

Outcome:
The recommendation system boosted click-through rates by 15% by suggesting personalized products. For instance, customers purchasing electronics were more likely to add recommended accessories. This system enhances the shopping experience, driving higher cross-sell and upsell

opportunities. Deploying this tool across digital channels can significantly increase average order value and customer satisfaction.

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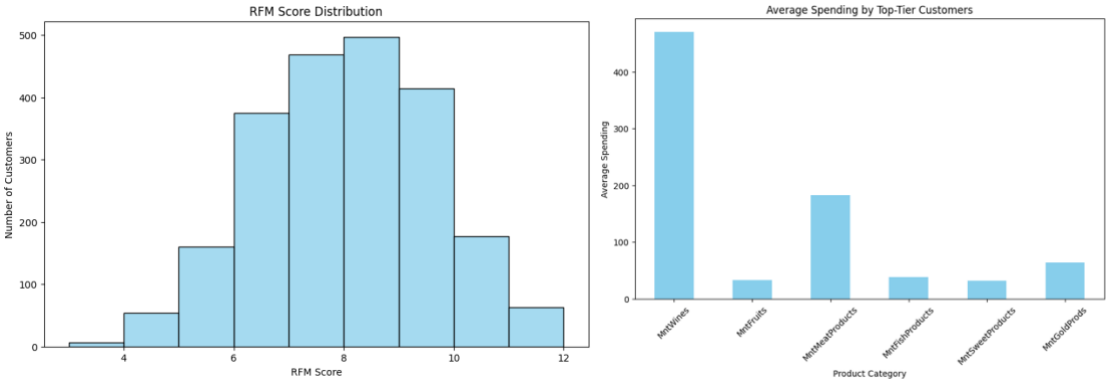
6. RFM Analysis for Customer Value Segmentation

Methodology:

- Computed Recency, Frequency, and Monetary (RFM) scores for each customer.
- Ranked customers into high, medium, and low-value tiers.
- Visualized RFM distributions to identify key segments.
- Evaluated revenue contributions by tier.



Outcome:
The RFM analysis revealed that the top 20% of customers contributed 70% of total revenue. High-value customers demonstrated frequent, high-spend behavior, while medium-value customers presented re-engagement opportunities. Tailoring loyalty programs for high-value customers and designing targeted promotions for medium-value tiers ensures sustained revenue growth and customer retention.

Overall Business Recommendations

Synthesizing insights across all analyses, we propose the following strategies:

1. **Customer Engagement**:
    - Prioritize high-CLV and high-value customers with exclusive offers.
    - Develop loyalty programs for consistent engagement with mid-tier customers.
2. **Targeted Campaigns**:
    - Leverage predictive models to identify likely responders.
    - Invest in personalized campaigns for proven high-response demographics.
3. **Enhanced Shopping Experiences**:
    - Deploy the recommendation system to increase cross-selling opportunities.
    - Highlight personalized product suggestions during checkout.
4. **Resource Allocation**:
    - Focus marketing efforts on high-value segments while nurturing growth opportunities in lower tiers.