Credit Card Benefits Recommendation System

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***Abstract*—Due to the overwhelming variety of credit card options available, choosing the best option for one's needs can be overwhelming for the consumers. With cards offering different perks such as cashback, travel rewards, and points systems, it becomes challenging to identify which credit card aligns best with an individual's financial needs and preferences. This project seeks to simplify this decision-making process by leveraging user-generated content from online platforms such as Reddit and Quora. The project involves scraping customer reviews and discussions regarding various credit card features to gather a broad spectrum of insights. These reviews are then subjected to sentiment analysis to better understand the general opinion on each credit card service. The primary objective is to distill the sentiment surrounding key credit card features such as cashback rewards, points accumulation, APR, and user experience with customer service. By analyzing the aggregated sentiments, this project aims to present a comprehensive view of the strengths and weaknesses of different credit card offerings. The results will be used to generate data-driven comparisons and recommendations for consumers, helping them make more informed decisions on which credit card best suits their needs. Ultimately, this project not only provides consumers with a tool to compare credit cards based on real customer experiences but also highlights the value of sentiment analysis in making complex financial decisions. The insights derived from this analysis aim to provide the consumers with the information they need to navigate the credit card market confidently.**

I. Introduction

In today's cashless society, credit cards play a pivotal role in personal financial management. Beyond their basic functionality, credit cards offer benefits that range from cashback and travel rewards to exclusive perks, making them an attractive tool for various consumer needs. However, with numerous options in the market, each offering a unique mix of rewards, APR rates, and service features, consumers often face difficulties in selecting the card that best aligns with their financial objectives and lifestyle. Traditional comparison methods, which rely on static information or marketing materials, may fall short of capturing the full consumer experience. Instead, user-generated content from online forums like Reddit and Quora provides a wealth of personal insights and real-world experiences, offering a more nuanced understanding of credit card satisfaction.

This project leverages user-generated reviews and discussions to address the complex process of credit card selection. By scraping customer opinions from popular financial forums and applying sentiment analysis, this study distills consumer sentiment toward key credit card features. Ultimately, this project aims to create a recommendation dashboard based on aggregated reviews to help consumers make informed credit card decisions. This approach not only simplifies the selection process for consumers but also highlights the power of sentiment analysis in making financial choices based on collective insights.

II. Related Work

The widespread use of credit cards in the United States underscores the importance of understanding consumer sentiment in this domain. According to the Federal Reserve, 82 percent of U.S. adults held at least one credit card in 2022, indicating a broad reliance on these financial tools. Research from Experian further reveals that Americans, on average, maintain three credit card accounts, with 13 percent of users holding five or more. These numbers reflect a competitive landscape in which credit card providers are continuously innovating to attract consumers through rewards, perks, and exclusive offers. Rewards programs, in particular, play a substantial role in influencing credit card usage and consumer loyalty. For instance, a study by the Reserve Bank of Australia found that loyalty programs increase the likelihood of credit card use by 23 percent. Features such as cashback, travel points, and service quality significantly impact consumer decision-making, as individuals seek cards that align with their personal spending habits and financial goals. However, understanding consumer preferences requires more than a surface-level analysis of advertised features; real consumer sentiment provides deeper insights.

The rise of social media, online forums, and review sites has opened up new avenues for exploring these consumer experiences and preferences. User-generated content on platforms like Reddit, Quora, and WalletHub offers detailed perspectives on specific features, service experiences, and overall satisfaction with various credit cards. Recent studies, including Du et al. (2024), demonstrate the utility of sentiment analysis in the financial sector, where consumer feedback can reveal preferences and identify potential areas for service improvement. This project builds on such research by applying sentiment analysis to user-generated reviews, capturing a comprehensive view of consumer attitudes toward credit card features. By analyzing these sentiments, the project aims to offer a data-driven resource that helps consumers make informed credit card choices based on the real-world experiences of other users.

III. Our Solution

A. Description of Dataset

The data for this project was collected from two primary sources: a structured dataset from Kaggle and a separate dataset scraped from WalletHub. Together, these datasets provide both quantitative and qualitative insights into consumer opinions on credit cards.

1) Kaggle Dataset: The first dataset, sourced from Kaggle, contains 7,513 user reviews of various credit cards. This dataset includes structured fields such as ratings and card categories, offering a broad foundation for analyzing consumer sentiment. Each review is associated with a specific rating, allowing for a numerical assessment of customer satisfaction. This dataset's structured nature makes it suitable for preliminary analysis and sentiment scoring, helping identify general trends in consumer opinions.

2) Scraped Reviews Dataset: The second dataset was scraped directly from WalletHub, focusing on user reviews and detailed card information. This dataset includes unstructured user-generated content, capturing a qualitative perspective on features like cashback, customer service, and rewards. The scraping process involved two phases: the first targeted individual reviews of specific credit cards, while the second focused on structured card features (e.g., APR, annual fees, rewards) from WalletHub's overview page. By consolidating both datasets, this project compiles a comprehensive array of consumer experiences and card attributes for analysis. Throughout the data collection process, ethical guidelines were strictly followed. Only publicly accessible information was gathered, and requests were rate-limited to prevent server strain. Headers were customized to mimic typical browsing behavior, minimizing the likelihood of blocking. These considerations ensured compliance with web scraping protocols and allowed for reliable data acquisition.

B. Machine Learning Algorithms

We use a Count Vectorizer to convert the features into two classes namely 'positive' and 'negative'. This is an essential step in pre-processing to ensure smooth functioning of the algorithms. The goal is to classify reviews into given classes. For our project, we compare the results of Logistic Regression and Random Forest algorithms. Logistic Regression enables us to measure how each feature contributes to the sentiment analysis. In this research, we want to find how various features or benefits of a particular credit card affect the decision of a consumer when selecting a card service. This algorithm provides insight into how each feature such as Annual Fee, Rewards rate, etc. affect sentiment analysis. The accuracy obtained when using class weights is 74 percent.

Random Forest handles non-linear relationships between various features to provide feature importance ranking. It performs well for merged datasets without excessive hyperparameter tuning. This algorithm is comparatively less sensitive to outliers and reduces overfitting of the model. The accuracy for Random Forest with class weights is 95 percent.

After evaluating the results from the algorithms, we prioritize review length, as reviews that are descriptive in nature offer more comprehensive insights. Short reviews generally fail to provide sufficient reasoning for sentiment. We also use BERT to ensure the model understands the contextual meaning of words in a given sentence. Its bidirectional nature allows the model to consider the entire sentence before determining meaning, thus improving results. This approach helps understand nuanced human speech, including sarcasm. For the recommendation module, Cosine similarity is used as a measure to find similar words to the input based on the existing dataset. Cosine similarity works by focusing on the direction of the vector, which makes it particularly useful for text analysis.

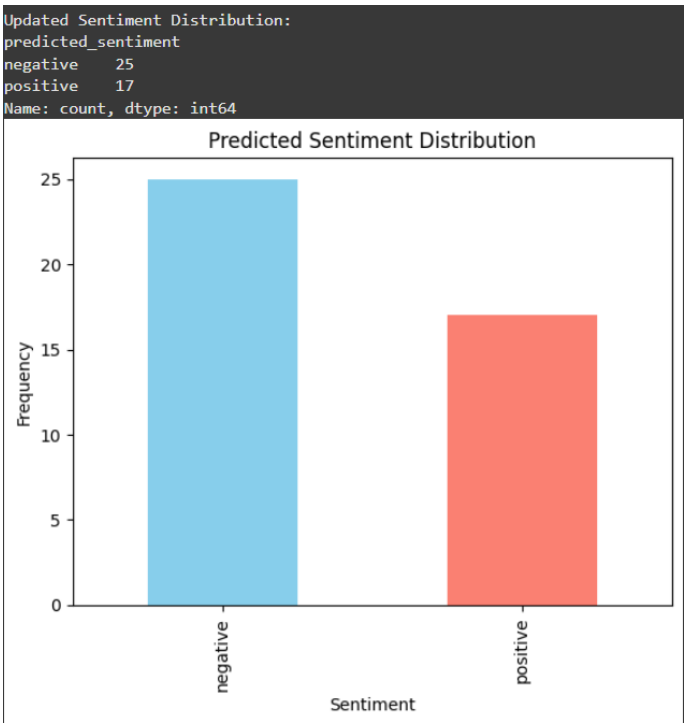

Fig. 1. Sentiment Distribution – The bar chart of sentiment scores showing the overall sentiment in the reviews from the mined dataset.

C. Implementation Details

Exploratory Data Analysis (EDA) was conducted on both datasets to identify patterns, trends, and insights into consumer sentiments toward credit card features. This analysis focused on rating distributions, sentiment scores, frequently discussed features, and key themes in customer reviews.

1) EDA on Kaggle Dataset: The Kaggle dataset, with its 7,513 reviews, provided an initial understanding of consumer satisfaction trends. Analysis of the ratings distribution revealed a significant proportion of low ratings, suggesting that many consumers may have experienced dissatisfaction with specific aspects of credit card services. Categories such as "Lifestyle" and "Rewards" received the highest number of reviews, indicating that consumers are particularly focused on these benefits when selecting a card. Sentiment analysis using TextBlob revealed considerable variation in satisfaction across different cards, with higher sentiment scores associated with positive experiences and lower scores signaling areas of potential improvement.

2) EDA on Scraped Dataset: The scraped dataset offered qualitative insights that complemented the Kaggle data. Sentiment analysis of the scraped reviews uncovered a broad range of user perspectives, often centered on recurring themes like customer service and rewards. Generating a word cloud from this dataset highlighted frequently mentioned terms such as "rewards", "cashback", and "customer service", underscoring the features that consumers prioritize in their evaluations. Examining reviews with the highest and lowest sentiment scores provided additional context, with positive reviews generally praising card benefits, while negative reviews often mentioned dissatisfaction with fees or service responsiveness.

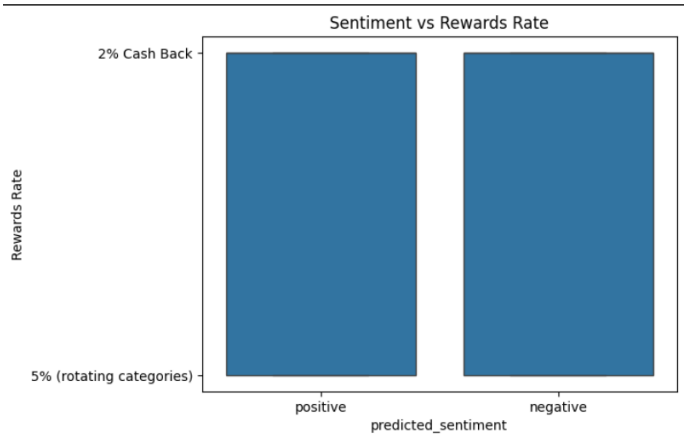

Fig. 2. Sentiment vs Rewards Rate – shows the distribution of customer sentiments (positive vs. negative) across different credit card rewards rates, highlighting sentiment trends for varying cashback offers.

IV. Comparison

Together, these datasets provide a comprehensive view of consumer sentiment. The structured Kaggle dataset allows for quantitative sentiment analysis, while the scraped dataset provides qualitative nuances that enrich the overall interpretation of user experiences. By integrating these perspectives, this project develops a well-rounded understanding of consumer satisfaction, highlighting both strengths and areas for improvement across different credit card options. This comprehensive analysis forms the foundation for the project's recommendation dashboard, which aims to guide consumers in their credit card selection based on collective user insights.

V. Limitations and Future Direction

A. Limitations

The current model has limited information about various credit cards available in the market. For the services mentioned in the study, the data included accounts only for a particular frame of time. The rewards offered and the APRs are constantly changing depending upon seasons, festivals and other market trends. It is crucial that this data is constantly updated to achieve optimal results.

The reviews obtained for sentiment analysis are biased in nature. Most of the scrapped reviews are for a particular credit card service. This affects the recommendation system as the insights from the sentiment analysis on these reviews is the base for recommendation model.

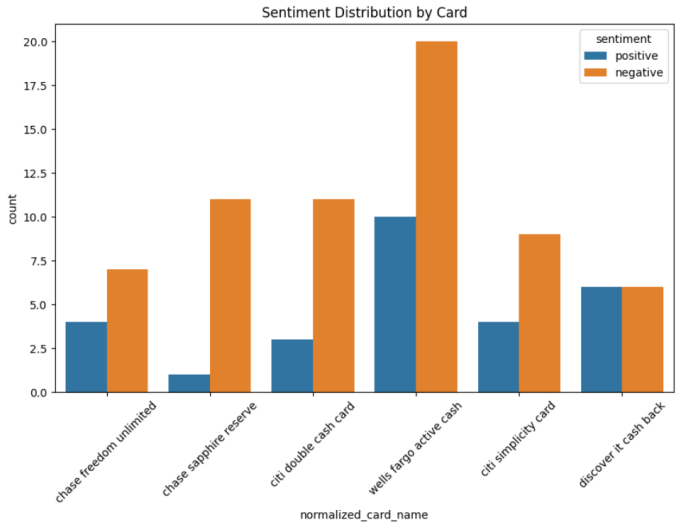

Fig. 3. Comparison Bar Chart – a comparison of sentiments between different credit card categories, displaying which cards have the highest and lowest positive r negative consumer satisfaction scores.

B. Future Scope

We can increase the number of credit card services that are used for comparison to provide a more comprehensive recommendation to the consumers. An auto updating module will ensure that the information for comparison is accurate and up-to-date at any given moment. Currently, the scraped reviews are unbalanced in nature resulting in a biased result even after using BERT. To tackle this, we need to include more reviews for a diverse range of credit card services. This will also enhance the sentiment analysis modelling and give better insights into the current market perception of the product

VI. Conclusion

After analyzing the collected data, we can observe that consumer satisfaction for credit cards is more dependent on short-term or immediate benefits, as compared to long-term benefits. Attributes such as travel benefits or point systems are insignificant when the consumer determines which credit card to choose. In contrast, attributes such as cash back that provide immediate returns play a more deterministic role. The different credit cards compared in our project have little to no difference in interest rates. Thus, this attribute is also deemed irrelevant for this process. Based on these insights, we built a recommender system that can aid the consumers when selecting a credit card. This system recommends the consumer a suitable credit card service based on his requirements. These requirements can be type of use(travel, lifestyle, etc.) or company specific options.

This research forms a basis for the primary idea that sentiment analysis of the consumer's perception of a product provides organizations with a means to attract, promote, and sell their products successfully. Similarly, the insights gained in this process can be leveraged to help the customer better understand the current standing of a product in the market in terms of popularity, availability, usability, etc. The restrictive nature of sentiment analysis lies in the limited ability of the machine to understand nuances of the human emotions.

However, if used correctly, we can build a model that can help both sides of the economy to make informed decisions.

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