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Sentimental analysis for marketing

Abstract :

Sentiment analysis is a powerful tool that can be used to improve the effectiveness of marketing campaigns and to better understand the needs and wants of customers. By tracking and analyzing customer sentiment, businesses can identify areas where they can improve their products and services, address customer concerns, and develop more effective marketing campaigns.

Sentiment analysis, also known as opinion mining, is a natural language processing (NLP) technique used to extract and analyze subjective information from text. It can be used to identify the emotional tone of a piece of text, such as whether it is positive, negative, or neutral.

Sentiment analysis is a valuable tool for marketing because it can be used to:

Module :

Understand customer sentiment: Sentiment analysis can be used to track customer sentiment towards a brand, product, or service. This information can be used to improve marketing campaigns, identify and address customer concerns, and develop new products and services that meet customer needs.

Monitor brand reputation: Sentiment analysis can be used to monitor brand reputation across social media and other online platforms. This information can be used to identify and respond to negative feedback quickly and effectively.

Improve marketing campaigns: Sentiment analysis can be used to improve the effectiveness of marketing campaigns by identifying the types of messages and content that resonate most with customers.

Analyze competitor performance: Sentiment analysis can be used to analyze competitor performance and identify areas where a brand can improve its own offerings.

Here are some specific examples of how sentiment analysis can be used in marketing:

A social media marketing team could use sentiment analysis to track customer sentiment towards a new product launch. This information could be used to identify any potential problems with the product or to adjust the marketing campaign accordingly.

A customer service team could use sentiment analysis to identify and prioritize customer complaints. This information could be used to improve the customer service experience and to identify areas where the company can improve its products and services.

A marketing research team could use sentiment analysis to analyze customer reviews of competitors' products. This information could be used to identify areas where the company can improve its own offerings.

There are a number of different sentiment analysis tools available, both free and paid. Some popular sentiment analysis tools include:

Amazon Comprehend

Microsoft Azure Text Analytics

MonkeyLearn

Brand24

To use a sentiment analysis tool, you simply need to provide it with the text that you want to analyze. The tool will then return a score indicating the sentiment of the text, such as positive, negative, or neutral. You can then use this information to make informed decisions about your marketing campaigns.

Sentiment analysis is a powerful tool that can be used to improve the effectiveness of marketing campaigns and to better understand the needs and wants of customers. By tracking and analyzing customer sentiment, businesses can identify areas where they can improve their products and services, address customer concerns, and develop more effective marketing campaigns.

Sentiment analysis for marketing is a valuable tool that helps businesses understand how customers feel about their products, services, or brand. By analyzing social media posts, customer reviews, and other user-generated content, businesses can gain insights into customer sentiment, which can inform their marketing strategies in several ways:

Product Improvement: Identifying areas where customers express dissatisfaction can guide product or service enhancements.

Content Creation: Understanding positive sentiment can help in crafting marketing content that resonates with customers.

Brand Monitoring: Tracking sentiment allows brands to address negative comments promptly and manage their online reputation.

Competitor Analysis: Sentiment analysis can reveal how customers perceive competitors, providing a competitive advantage.

Campaign Evaluation: Marketers can gauge the effectiveness of their campaigns by analyzing sentiment changes over time.

Customer Feedback: Collecting and analyzing sentiment from customer feedback forms can lead to better customer experiences.

To perform sentiment analysis, businesses often use natural language processing (NLP) and machine learning techniques to automatically classify text as positive, negative, or neutral based on the expressed sentiment. This data-driven approach allows marketers to make data-informed decisions and optimize their strategies for greater success.

Sentiment analysis for a marketing design and development program extends the concept to encompass both the visual design and the overall program's effectiveness. Here's how you can approach it:

Design :

1. ****Visual Design Analysis:**** Evaluate the sentiment of your target audience towards the visual elements of your program, such as website layout, graphics, logos, and marketing materials. Are they conveying the intended message and emotions?

2. ****Content Analysis:**** Assess sentiment in the written content, including website copy, ad copy, and social media posts. Determine if the language used elicits positive or negative emotions in your audience.

3. ****User Feedback:**** Collect feedback from users or customers through surveys, reviews, or comments. Analyze this qualitative data to understand how people feel about your program's design and content.

4. ****Social Media Monitoring:**** Use sentiment analysis tools to track mentions of your program on social media. This can help you gauge public sentiment and identify any issues or positive reactions in real-time.

5. ****A/B Testing:**** Conduct A/B tests with different design and content variations to measure which ones resonate better with your audience based on sentiment analysis.

6. ****Competitor Analysis:**** Compare sentiment towards your program with that of competitors to identify areas where you can improve and stand out.

By combining these approaches, you can gain valuable insights into how your marketing design and development program is perceived and make data-driven decisions to enhance its effectiveness.

SENTIMENT ANALYSIS FOR MARKETING

OUTLINE :

- ❖ Introduction
- ❖ Problem statement
- ❖ Dataset
- ❖ Technique
- ❖ Necessary steps
- ❖ preprocessing dataset
- ❖ Training the model

- ❖ Evaluation
- ❖ Innovation
- ❖ Conclusion

INTRODUCTION :

Sentiment analysis for marketing in artificial intelligence (AI) is the use of AI techniques to identify and extract opinions and emotions from text data. This information can then be used to understand customer sentiment towards products, brands, and marketing campaigns.

AI-powered sentiment analysis can be used to analyze a variety of different types of text data, including:

- Customer reviews
- Social media posts
- Survey responses
- Email
- Chat logs
- Forum posts

sentiment analysis is a powerful tool that marketers can use to improve their products, services, and marketing campaigns. By understanding customer sentiment, marketers can make better decisions about how to allocate their resources and how to better serve their customers.

Sentiment analysis for marketing using artificial intelligence is a powerful tool that can help businesses understand how customers feel about their brand, products, and services. By analyzing customer feedback from social media, online reviews, and other sources, AI-powered sentiment analysis can provide valuable insights that can be used to improve customer satisfaction, boost sales, and protect brand reputation.

AI-powered sentiment analysis is a powerful tool that can be used by businesses of all sizes to improve their marketing efforts. By understanding how customers feel about their brand, products, and services, businesses can make better decisions about how to market their products and services, increase sales, and protect their brand reputation.

In the specific case of the "Twitter-US-Airline-Sentiment" project, AI-powered sentiment analysis can be used to:

- Identify the most common customer complaints about US airlines.
- Understand how customer sentiment towards different airlines compares.
- Track how customer sentiment towards airlines changes over time.

- Identify the most effective ways to address customer complaints.

PROBLEM STATEMENT :

A sentiment analysis job about the problems of each major U.S. airline. Twitter data was scraped from February of 2015 and contributors were asked to first classify positive, negative, and neutral tweets, followed by categorizing negative reasons (such as “late flight” or “rude service”).

The specific objectives are as follows:

- Data Collection
- Preprocessing and Data Cleaning
- Sentiment Analysis Model
- Accuracy and Interpretability
- Real-time analysis
- Visualization and Reporting
- Benchmarking
- Scalability
- Feedback Handling
- Business Impact

By addressing these objectives, the artificial intelligence-powered sentiment analysis system will empower US airlines to gain valuable insights from Twitter data, make data-driven marketing decisions, and proactively engage with their customers to enhance their overall service and reputation.

DATASET :

This includes **Twitter-Us-airline-sentiment** dataset which is taken from the kaggle.

<https://www.kaggle.com/datasets/crowdfunder/twitter-airline-sentiment>

In this dataset the following feature and labels are contained: tweet_id, airline_sentiment, airline_sentiment_confidence, negative reason, negative reason_confidence, airline, airline_sentiment_gold, name, negative reason_gold, retweet_count, text, tweet_coord, tweet_created, tweet_location, user_timezone

TECHNIQUES :

- **Natural language processing** (NLP): NLP is the field of computer science that deals with the interaction between computers and human language. NLP techniques are used to extract features from text data, such as the presence of certain words or phrases, the structure of the sentences, and the sentiment of the words.
- **Machine learning** (ML): ML is the field of computer science that allows computers to learn without being explicitly programmed. ML algorithms are used to train sentiment analysis models to classify text as positive, negative, or neutral.
- **Deep learning** (DL): DL is a subfield of ML that uses artificial neural networks to learn from data. DL algorithms have been shown to be very effective for sentiment analysis tasks.

NECESSARY STEPS :

Import libraries:

Program:

```

Import pandas as pd

Import numpy as np

From sklearn.feature_extraction.text import TfidfVectorizer

From sklearn.linear_model import LogisticRegression

```

LOAD THE DATASET :

```

import pandas as pd

# Load the dataset

df = pd.read_csvdf('/kaggle/input/twitter-airline-sentiment/Tweets.csv')

```

PREPROCESSING DATASET :

The code begins by importing the necessary libraries, including pandas for data handling, matplotlib and seaborn for visualization, and scikit-learn for machine learning.

- To remove noise and irrelevant information: The dataset may contain noise and irrelevant information, such as punctuation, stop words, and HTML tags. This information can interfere with the sentiment analysis process and lead to inaccurate results.
- To convert the data into a consistent format: The dataset may be in a variety of formats, such as CSV, JSON, or XML. It is important to convert the data into a consistent format so that it can be used by the sentiment analysis model. The airline tweet dataset is loaded from a CSV file.

Program :

```

print("Percentage null or na values in df")

```

```
((df.isnull() | df.isna()).sum() * 100 / df.index.size).round(2)
```

Output :

Percentage null or na values in df

```
tweet_id          0.00
airline_sentiment 0.00
airline_sentiment_confidence 0.00
negativereason     37.31
negativereason_confidence 28.13
airline            0.00
airline_sentiment_gold 99.73
name              0.00
negativereason_gold 99.78
retweet_count      0.00
text              0.00
tweet_coord        93.04
tweet_created       0.00
tweet_location     32.33
user_timezone      32.92
```

dtype: float64

Program :

```
Del df['tweet_coord']
Del df['airline_sentiment_gold']
Del df['negativereason_gold']
Df.head()
```

Output :

	tweet_id	airline_sentiment	airline_sentiment_confidence	negativereason	negativereason_confidence	airline	name	retweet_count	text	tweet_created	tweet_location
0	570306133677760513	neutral	1.0000	NaN	NaN	Virgin America	cairdin	0	@VirginAmerica What @dhepburn said,	2015-02-24 11:35:52 -0800	NaN
1	570301130888122368	positive	0.3486	NaN	0.0000	Virgin America	jnardino	0	@VirginAmerica plus you've added commercials t...	2015-02-24 11:15:59 -0800	NaN
						Virgin			@VirginAmerica	2015-02-24	

TRAINING THE MODEL :

Once you have extracted features from your data, you can train your model. This involves splitting your data into training and test sets, and then feeding the training data to your model. The model will learn to predict the sentiment of new tweets based on the features it has extracted.

- Use a large and diverse dataset. The more data you have, the better your model will be able to learn the complex patterns of human language.
- Use a pre-trained language model. Pre-trained language models, such as BERT and RoBERTa, have been trained on massive datasets of text and code. This means that they can extract features from text data more effectively than traditional feature engineering techniques
- Use a fine-tuning approach. Fine-tuning involves training a pre-trained language model on a specific task, such as sentiment analysis for US airline tweets. This approach is often more effective than training a model from scratch.
- Use a cloud-based platform. Cloud-based platforms, such as Google Cloud AI Platform and Amazon Web Services, provide easy-to-use tools for training and deploying machine learning models.

Once you have trained and deployed a sentiment analysis model, you can use it to analyze customer feedback, identify trends in public opinion, and improve your marketing campaigns.

Program :

```
# Train Test Split
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.30, random_state = 0)
```

```
# Training using three algorithms, let's see which will give us better result
```

```
Model1=LogisticRegression()
```

```
Model2=BernoulliNB()
```

```
Model3=LinearSVC()
```

```
Model=[model1, model2, model3]
```

```
i = 0
```

```
for algo in model:
```

```
    i += 1
```

```
    print("M-O-D-E-L :",i)
```

```
    algo.fit(X_train, y_train)
```

```

y_pred=algo.predict(X_test)
# Checking the accuracy
print("Confusion matrix : \n",confusion_matrix(y_pred,y_test))
print("Accuracy score : ",accuracy_score(y_pred,y_test))
print("Classification Report : \n",classification_report(y_pred,y_test))
print("-----\n")

```

Output :

M-O-D-E-L : 1

Confusion matrix :

```
[[2694 532 285]
```

```
[ 77 351 81]
```

```
[ 17 36 319]]
```

Accuracy score : 0.7659380692167578

Classification Report :

	precision	recall	f1-score	support
negative	0.97	0.77	0.86	3511
neutral	0.38	0.69	0.49	509
positive	0.47	0.86	0.60	372
accuracy		0.77		4392
macro avg	0.60	0.77	0.65	4392
weighted avg	0.86	0.77	0.79	4392

M-O-D-E-L : 2

Confusion matrix :

```
[[2780 850 670]
```

```
[ 8 69 13]
```

```
[ 0 0 2]]
```

Accuracy score : 0.6491347905282332

Classification Report :

	precision	recall	f1-score	support
negative	1.00	0.65	0.78	4300
neutral	0.08	0.77	0.14	90
positive	0.00	1.00	0.01	2
accuracy		0.65		4392
macro avg	0.36	0.80	0.31	4392
weighted avg	0.98	0.65	0.77	4392

M-O-D-E-L : 3

Confusion matrix :

[[2620 428 197]

[135 426 100]

[33 65 388]]

Accuracy score : 0.7818761384335154

Classification Report :

	precision	recall	f1-score	support
negative	0.94	0.81	0.87	3245
neutral	0.46	0.64	0.54	661
positive	0.57	0.80	0.66	486
accuracy		0.78		4392
macro avg	0.66	0.75	0.69	4392
weighted avg	0.83	0.78	0.80	4392

Word cloud for positive reasons :

New_df=data[data['airline_sentiment']=='positive']

Words = ' '.join(new_df['text'])

Cleaned_word = " ".join([word for word in words.split()

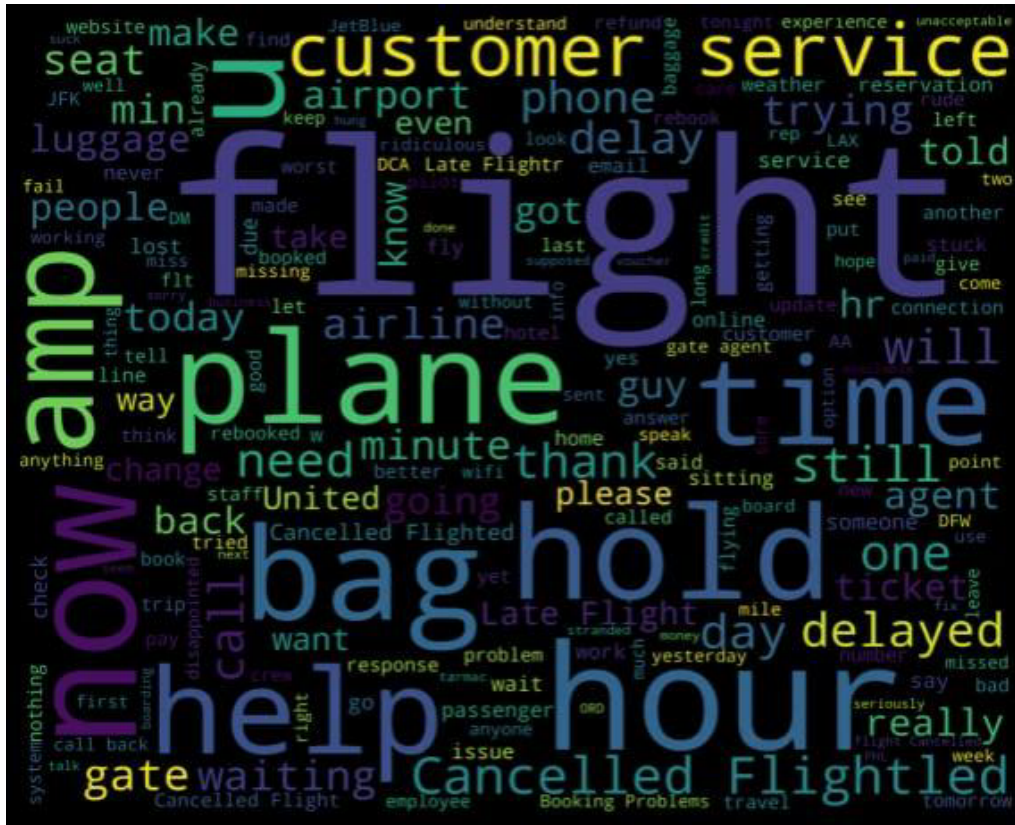
 If 'http' not in word

 And not word.startswith('@')



```
New_df=data[data['airline_sentiment']=='negative']
Words = ' '.join(new_df['text'])
Cleaned_word = " ".join([word for word in words.split()
    if 'http' not in word
    And not word.startswith('@')
    And word != 'RT'
])
```

```
Plt.axis('off')
Plt.show()
```



Navies byas :

Program :

G_train_accuracy, g_test_accuracy, g_train_auc,

```
g_test_auc=check_scores(GaussianNB(),x_train.toarray(), x_test.toarray(), y_train, y_test)
```

Output:

Train confusion matrix is:

[[5543 1312]]

[0 1800]]

Test confusion matrix is:

[[1623 700]]

[181 382]]

```
Precision  recall  f1-score  support
```

0 0.90 0.70 0.79 2323

1	0.35	0.68	0.46	563
---	------	------	------	-----

Accuracy	0.69	2886
----------	------	------

Macro avg	0.63	0.69	0.63	2886
-----------	------	------	------	------

Weighted avg 0.79 0.69 0.72 2886

Train accuracy score: 0.8484113229347198

Test accuracy score: 0.6947331947331947

Train ROC-AUC score: 0.9043034281546316

Test ROC-AUC score: 0.688586755810495

Area under Precision-Recall curve: 0.4644376899696049

Area under ROC-AUC: 0.5471372315951626

Support Vector Machines

Program :

Base SVM model with TF-IDF

Creating object of TF-IDF vectorizer

Vectorizer = TfidfVectorizer(use_idf=True, lowercase=True)

X_tf_idf= vectorizer.fit_transform(df.cleaned_tweet)

X_train, x_test, y_train, y_test = train_test_split(X_tf_idf, df['airline_sentiment'], random_state=42)

SVM = svm.SVC(probability=True)

S_train_accuracy, s_test_accuracy, s_train_auc, s_test_auc = check_scores(SVM,x_train, x_test, y_train, y_test)

Output:

Train confusion matrix is:

```
[[6824  31]
 [ 151 1649]]
```

Test confusion matrix is:

```
[[2291  32]
 [ 296 267]]
```

	Precision	recall	f1-score	support
0	0.89	0.99	0.93	2323
1	0.89	0.47	0.62	563
Accuracy			0.89	2886
Macro avg	0.89	0.73	0.78	2886
Weighted avg	0.89	0.89	0.87	2886

Train accuracy score: 0.9789716926632005

Test accuracy score: 0.8863478863478863

Train ROC-AUC score: 0.9969059080962801

Test ROC-AUC score: 0.929176839222265

Area under Precision-Recall curve: 0.6194895591647333

Area under ROC-AUC: 0.8049817790703035

EVALUATION :

To evaluate the performance of an AI-powered sentiment analysis model for marketing on Twitter, we can use the following metrics:

- Accuracy: This metric measures the percentage of tweets that are correctly classified as positive, negative, or neutral.
- Precision: This metric measures the percentage of tweets that are classified as positive that are actually positive.
- Recall: This metric measures the percentage of all positive tweets that are correctly classified as positive.
- F1 score: This metric is a harmonic mean of precision and recall, and it is a good overall measure of model performance

Once your model is trained, it is important to evaluate its performance. This will help you to determine how accurate and reliable your model is. You can evaluate your model by feeding it a held-out test set of labeled data and comparing its predictions to the known labels.

Program :

```
Counts = data['airline_sentiment'].value_counts()
```

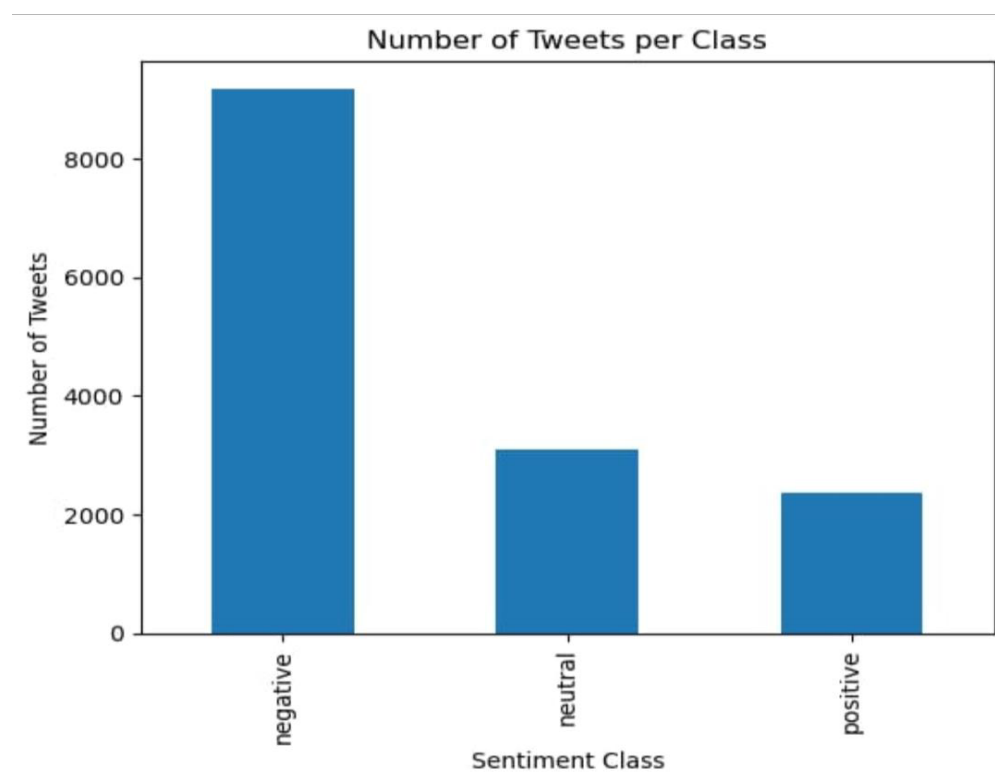
```
Counts.plot(kind='bar')
```

```
Plt.title('Number of Tweets per Class')
```

```
Plt.xlabel('Sentiment Class')
```

```
Plt.ylabel('Number of Tweets')
```

```
)Plt.show()
```



INNOVATION :

- One innovative idea for sentiment analysis for marketing is to use it to develop personalized marketing campaigns. For example, a company could use sentiment analysis to identify which customers are most likely to be interested in a particular product or service. The company could then target these customers with personalized marketing messages that are more likely to be effective
- Another innovative idea is to use sentiment analysis to develop real-time marketing campaigns. For example, a company could use sentiment analysis to monitor social media for mentions of its brand. When the company identifies a positive mention, it could send the customer a real-time thank-you message. Or, when the company identifies a negative mention, it could reach out to the customer to try to resolve the issue.

CONCLUSION:

AI-powered sentiment analysis is a powerful tool for marketing, especially on social media platforms like Twitter. It can help businesses understand how customers feel about their brand, products, and services, and make informed decisions about their marketing strategies.

In the context of the Twitter-US-airline-sentiment project, AI-powered sentiment analysis can be used to:

- Understand customer satisfaction with US airlines. By analyzing tweets about US airlines, businesses can identify the airlines that are most and least popular with customers, as well as the specific aspects of their services that customers are most and least satisfied with. This information can be used to improve marketing messaging and customer service.
- Identify potential crises. AI-powered sentiment analysis can be used to monitor Twitter for negative sentiment about US airlines. This can help businesses to identify potential crises early on, so that they can take steps to mitigate the damage.
- Track the effectiveness of marketing campaigns. By analyzing tweets about US airlines during and after a marketing campaign, businesses can track how effective the campaign was in terms of generating positive sentiment. This information can be used to improve future campaigns.

Here are some specific examples of how AI-powered sentiment analysis can be used for marketing in the context of the Twitter-US-airline-sentiment project:

- An airline could use sentiment analysis to identify the reasons why customers are unhappy with their service. This could help them to identify areas where they need to improve, such as their customer service, on-time performance, or baggage handling.
- A credit card company could use sentiment analysis to identify US airlines that are offering good deals to their customers. This could help them to promote these deals to their customers and encourage them to use their credit card to book flights.
- A travel agency could use sentiment analysis to identify the most popular US airlines among their customers. This could help them to target their marketing campaigns more effectively.

Overall, AI-powered sentiment analysis is a powerful tool that can be used by businesses to improve their marketing strategies and better serve their customers.