University of Windsor

Sentiment Analysis of Customer Reviews on Amazon Products

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Our Agenda

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- Approach
- Tools and Technologies
- Implementation
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- Demo
- Conclusion
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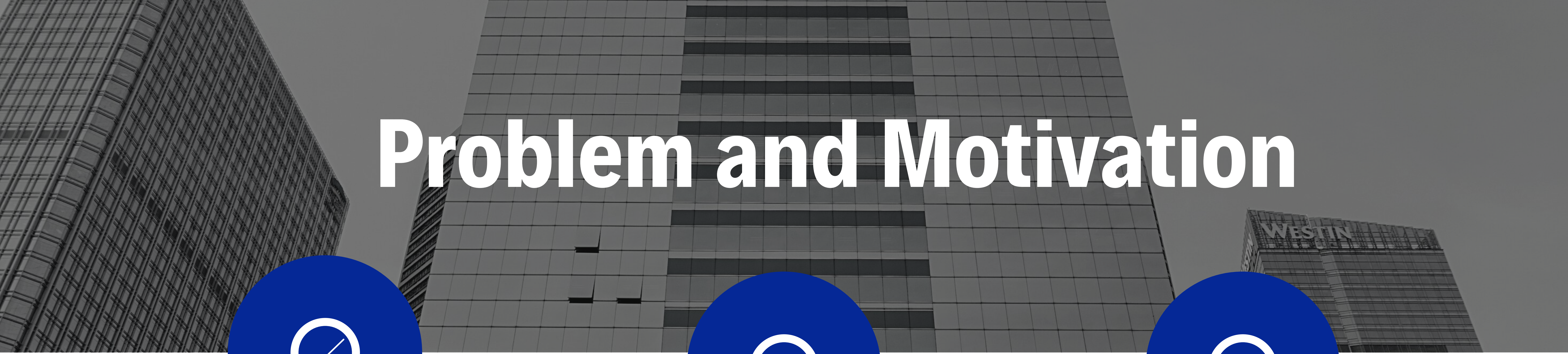
Problem and Motivation



Businesses and researchers in e-commerce platforms might benefit from analysing and utilising user product reviews in emotions.

With the shift from traditional brick-and-mortar retail outlets to online shopping, product reviews are becoming increasingly significant.

In real-time, customers are leaving reviews on product pages. Because of the large number of customer evaluations, it is possible to see how the market reacts to a particular product.

Introduction

We will differentiate Amazon product reviews into two categories: positive and negative which will help to improve the quality of the product and define the market needs for producers.

Sentiment analysis

The producer can filter the negative review and study them to improve the product quality while on the other hand, positive comments will help them in estimating the production in a certain amount of time.

Our Approach

01

Load Data into HDFS

Gather customer reviews and load data into HDFS

02

Data Preprocessing

Cleaning the data and preparing it for a machine learning model. It improves the model's accuracy and efficiency

03

Sentiment Analysis

Using Logistic Regression, to build a sentiment predictive model

04

Data Visualization

Visualize the gather data in a form of a graph, table, and matrix

Tools and Technologies

Programming Language: Python

Development Tools: Anaconda, Jupyter Notebook

Machine Learning Libraries: NumPy, Pandas, Sklearn

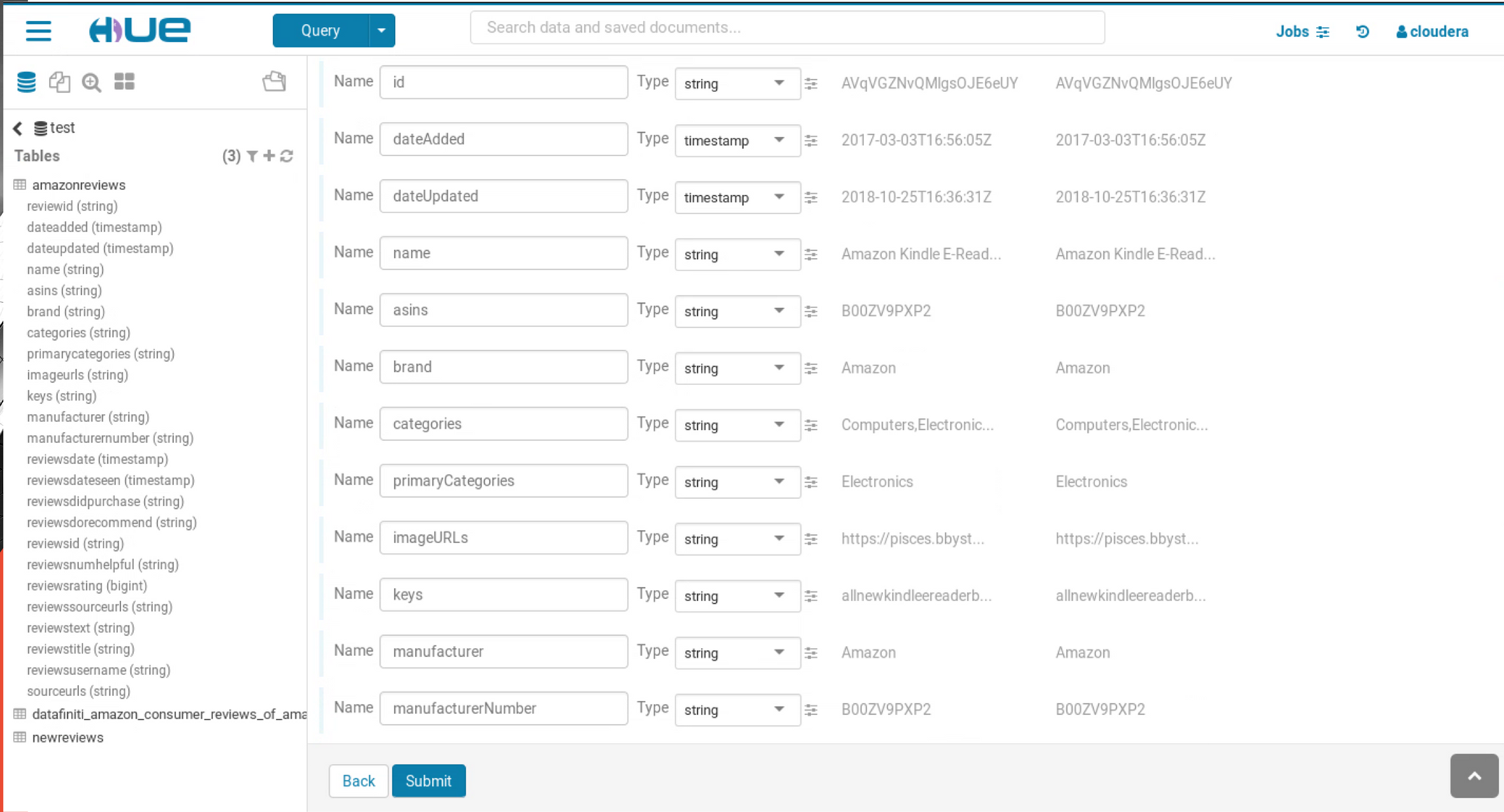
Model: Logistic Regression

Database Management System: Hadoop, Hue

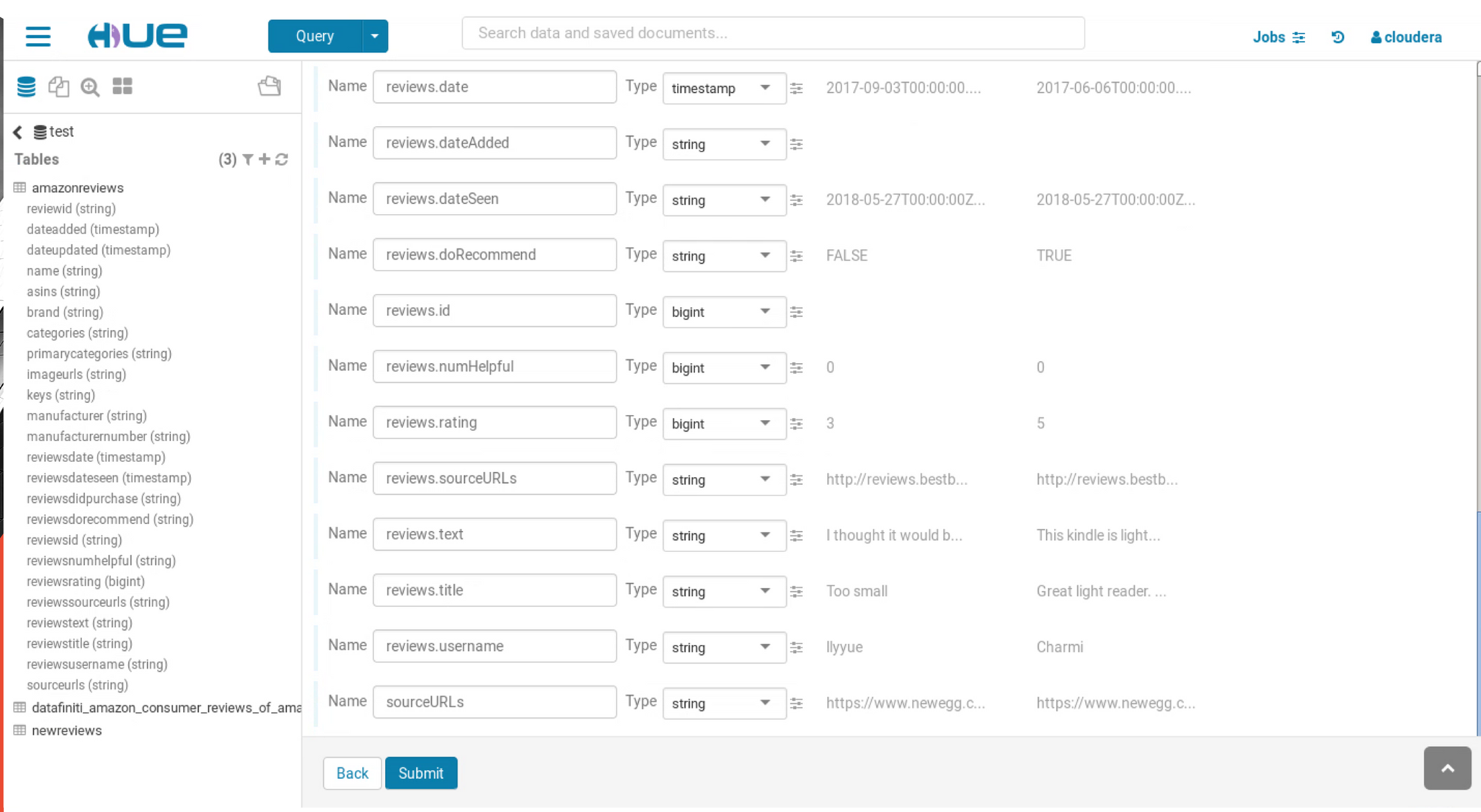
Datasets: Amazon Product Reviews

Implementation

Step–1: Loading Data



Loading Data



Step–2: Text Preprocessing

In [9]:
```python
#import libraries from Sklearn

from sklearn.linear_model import LogisticRegression
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import plot_confusion_matrix, plot_precision_recall_curve
```

In [10]:
```python
# label Encoder

vect_data = TfidfVectorizer(ngram_range=(1,2),
                            min_df=3,
                            max_df=0.9,
                            strip_accents='unicode',
                            use_idf=1,
                            smooth_idf=1,
                            sublinear_tf=1)

encoder = LabelEncoder()
```

In [11]:
```python
# transforming data using fit_transform

X_train = vect_data.fit_transform(train['reviews'])
X_test = vect_data.transform(test['reviews'])
Y_train = encoder.fit_transform(train['label'])
Y_test = encoder.transform(test['label'])
```

Data Processing

```
In [12]: # Logistical Regression

         data_model = LogisticRegression(C=4, dual=True, solver='liblinear', random_state=42)
         data_model.fit(X_train, Y_train)

Out[12]: LogisticRegression(C=4, dual=True, random_state=42, solver='liblinear')

In [13]: # predicting probabilities

         predicts = data_model.predict_proba(X_test)
```

Results

```
In [5]: # Printing data with top 50 reviews

train.head(50)
```

Out[5]:

	label	reviews
2079998	Negative	Expensive Junk: This product consists of a pie...
1443106	Negative	Toast too dark: Even on the lowest setting, th...
3463669	Positive	Excellent imagery...dumbed down story: I enjoy...
2914699	Negative	Are we pretending everyone is married?: The au...
1603231	Negative	Not worth your time: Might as well just use a ...
2944012	Negative	Book reads like written for grade schoolers: I...
3403602	Negative	Jeanne de Florette & Manon of the Springs: I s...
1039142	Negative	Theater Projector Ceiling Mount: Would not fit...
431645	Positive	This import is soooooooooo good: This is a gr...
694263	Negative	Garbage: The handle broke clean off after TWO ...
36844	Positive	Amazing, Fascinating: This was a stunning book...
1915310	Negative	Not great: This book just gives you the basics...
621191	Negative	superficial fluff: This book does not convey m...
939874	Positive	Great Album - some serious stuff: First off, I...

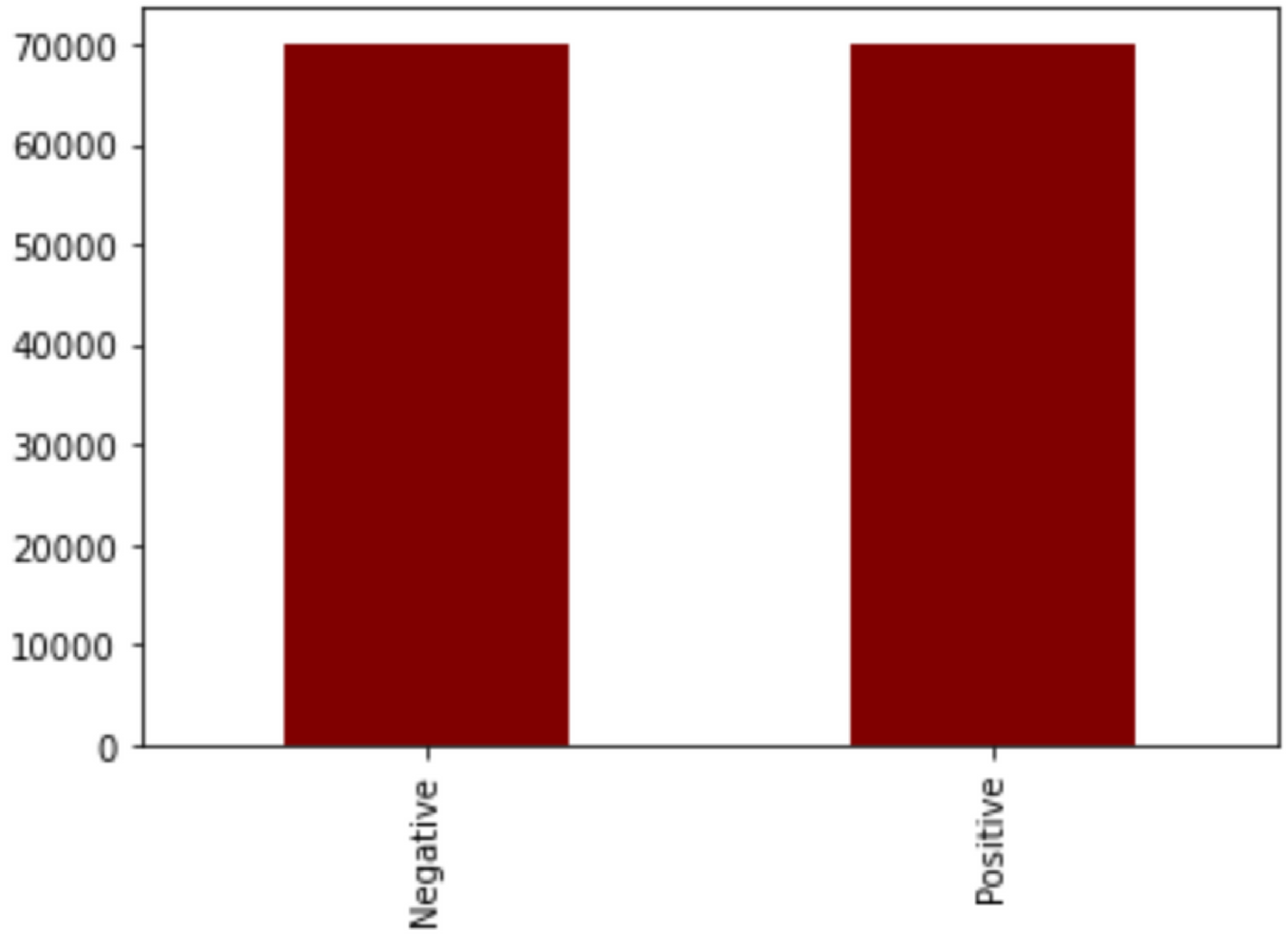
Table Representation for Positive and Negative Reviews

Results

```
In [6]: # plot bar graph for data visualization

        train['label'].value_counts().plot(kind='bar', color='maroon')

Out[6]: <AxesSubplot:>
```

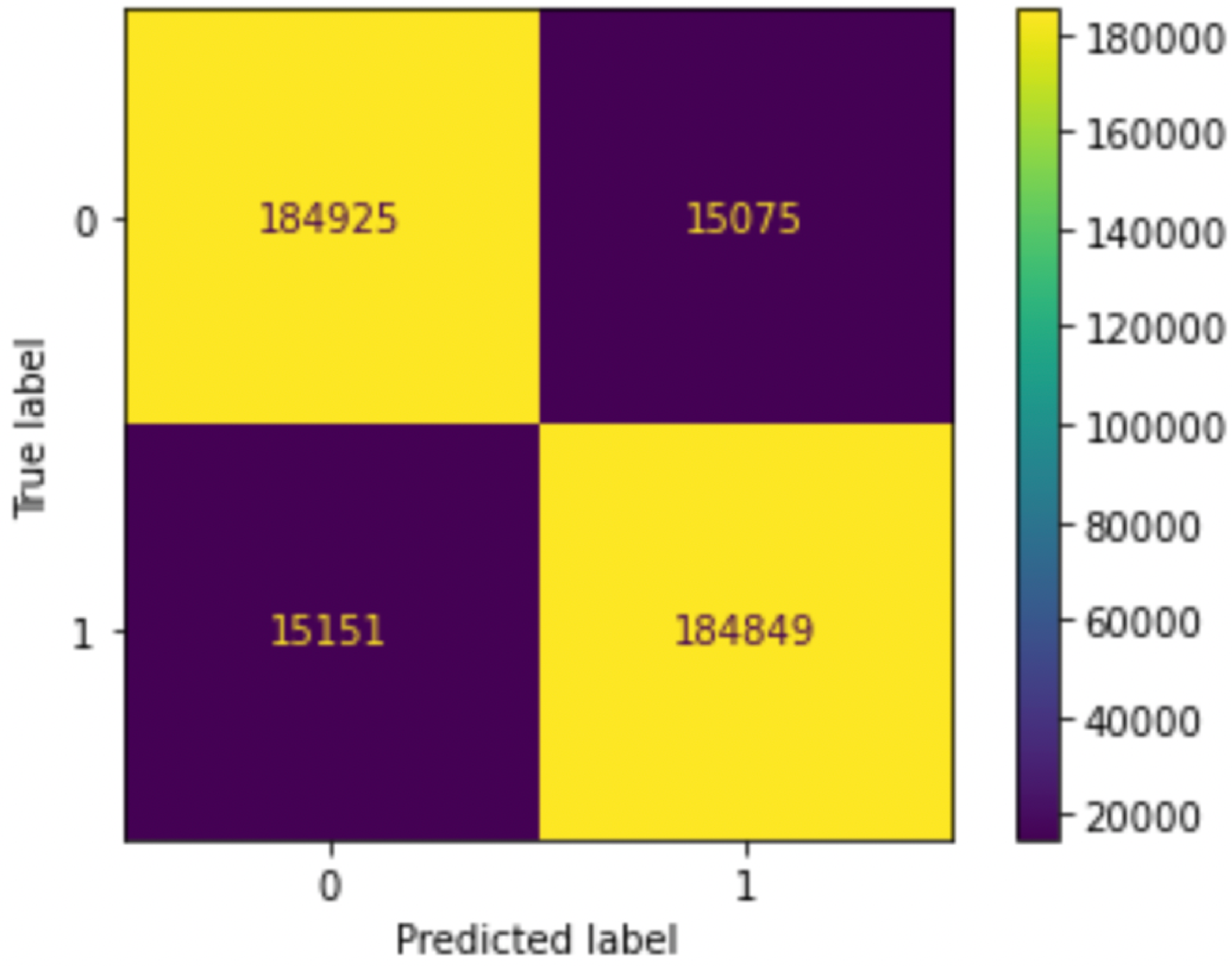


Bar Graph for Data Visualize

Results

```
In [14]: # Matrix

plot_confusion_matrix(data_model, X_test, Y_test);
```

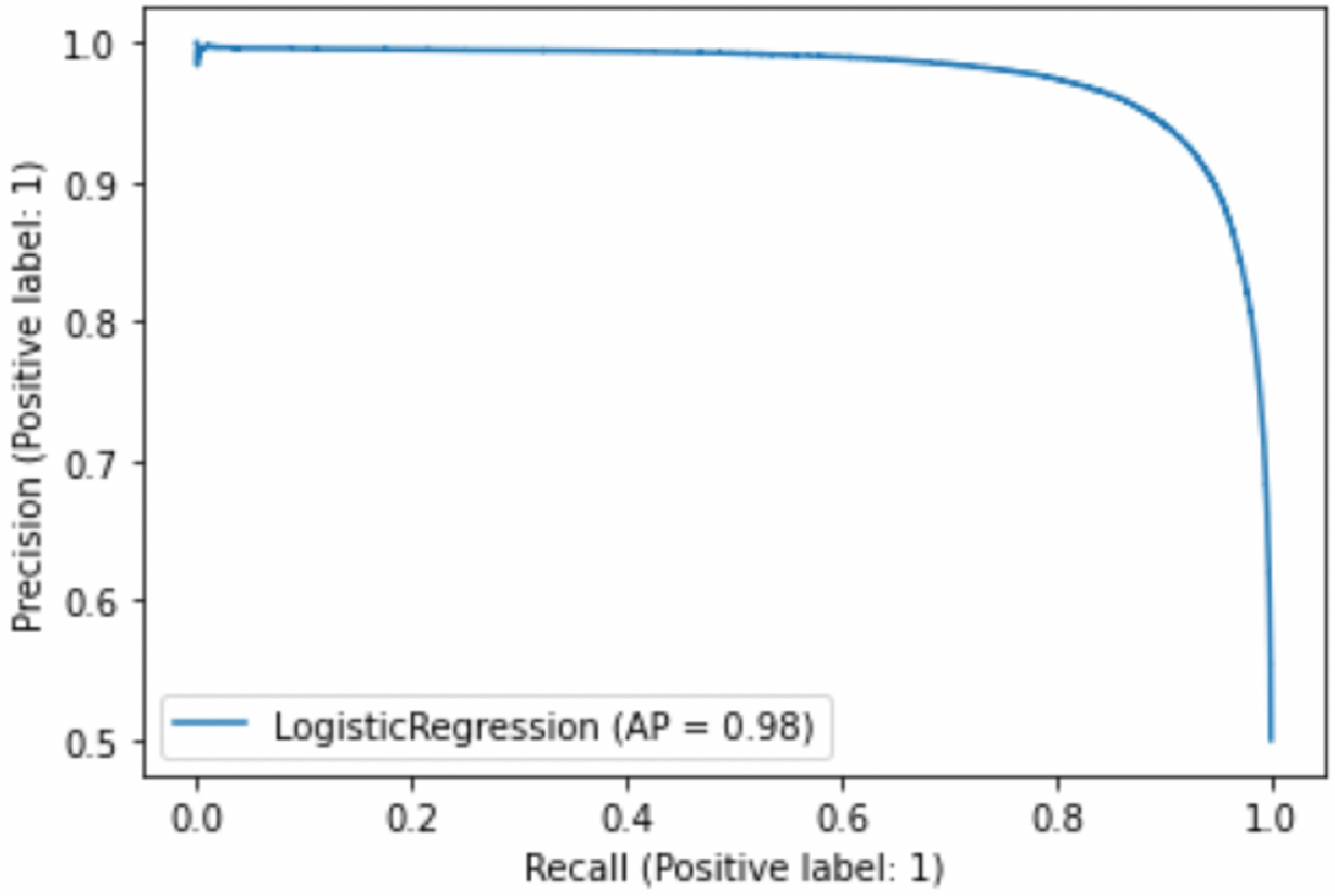


Matrix for Model Accuracy

Results

In [15]:
```
# plot curve

plot_precision_recall_curve(data_model, X_test, Y_test);
```



Precision Recall Curve for Model Precision

Results

```
In [18]:
# User Interactive model for providing outcome based on review enter by user

user_input = vect_data.transform([input()])
predict2 = data_model.predict_proba(user_input)
predict3 = data_model.predict(user_input)

if predict3[0]:
    print("\nSentimental Analysis""\nThis review is Positive"  " \U0001f600" "\nSentiment Score:", predict2[0][1])



else:
    print("\nSentimental Analysis\nThis review is Negative" " \U0001f621" "\nSentiment Score:", predict2[0][1])
```

```
Great book for travelling Europe: I currently live in Europe, and this is the book I recommend for my visitors. It covers ma
ny countries, colour pictures, and is a nice starter for before you go, and once you are there.

Sentimental Analysis
This review is Positive 😀
Sentiment Score: 0.9980583185819476
```

```
In [34]:
# User Interactive model for providing outcome based on review enter by user

user_input = vect_data.transform([input()])
predict2 = data_model.predict_proba(user_input)
predict3 = data_model.predict(user_input)

if predict3[0]:
    print("\nSentimental Analysis""\nThis review is Positive"  " \U0001f600" "\nSentiment Score:", predict2[0][1])



else:
    print("\nSentimental Analysis\nThis review is Negative" " \U0001f621" "\nSentiment Score:", predict2[0][1])
```

```
I am very excited to buy this painting for my friend but when I got this product. I am disappointing with this as it is not
very frustrating to stick on wall. I waste my money and time on this product.

Sentimental Analysis
This review is Negative 😡
Sentiment Score: 7.450884339937399e-05
```

Sentiment Analysis

Launching our Sentiment Analysis Demo

Conclusion

- Improve Customer Service
- Develop Quality Products
- Discovering New Marketing Strategies
- Improve Media Perceptions
- Increasing Sales Revenue
- Improve Crises Management

Future Scope

Machine Learning models can not work as human minds. Tone can be difficult to interpret verbally, and even more difficult to figure out in the written word. Our team did a study on this issue and came to know about the tone detector algorithm (Smart sentiment API).

References

- https://www.kaggle.com/bittlingmayer/amazonreviews
- https://scikit-learn.org/stable/modules/generated/sklearn.feature_extraction.text.TfidfVectorizer.html
- https://scikit-learn.org/stable/modules/generated/sklearn.linear_model.LogisticRegression.html
- https://scikit-learn.org/stable/modules/generated/sklearn.feature_extraction.text.TfidfVectorizer.html

Thank you!

Feel free to approach us
if you have any questions.