Sentiment Analysis on Drug Product Reviews

Data Science Capstone Project

Present by Yan Zhang

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Problem Statement

Objective: Develop a sentiment analsyis model to gauge customer perception in drug reviews.

Challenge: distilling meaningful insights from the massive unstructured text data.

Reason:

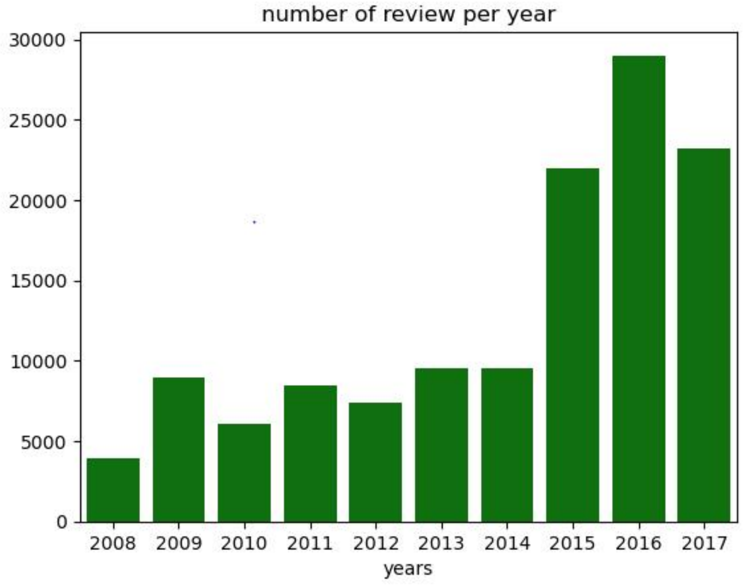
1. Improve and potential modifications in drug
2. Provide insights in product development and marketing strategies.

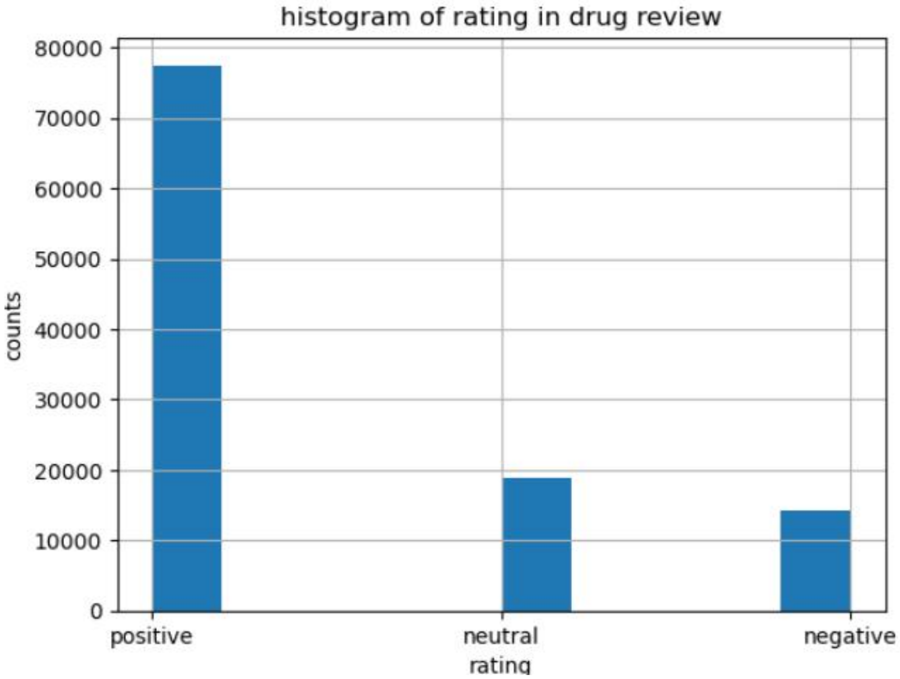
Data Wrangling

Quality of data:

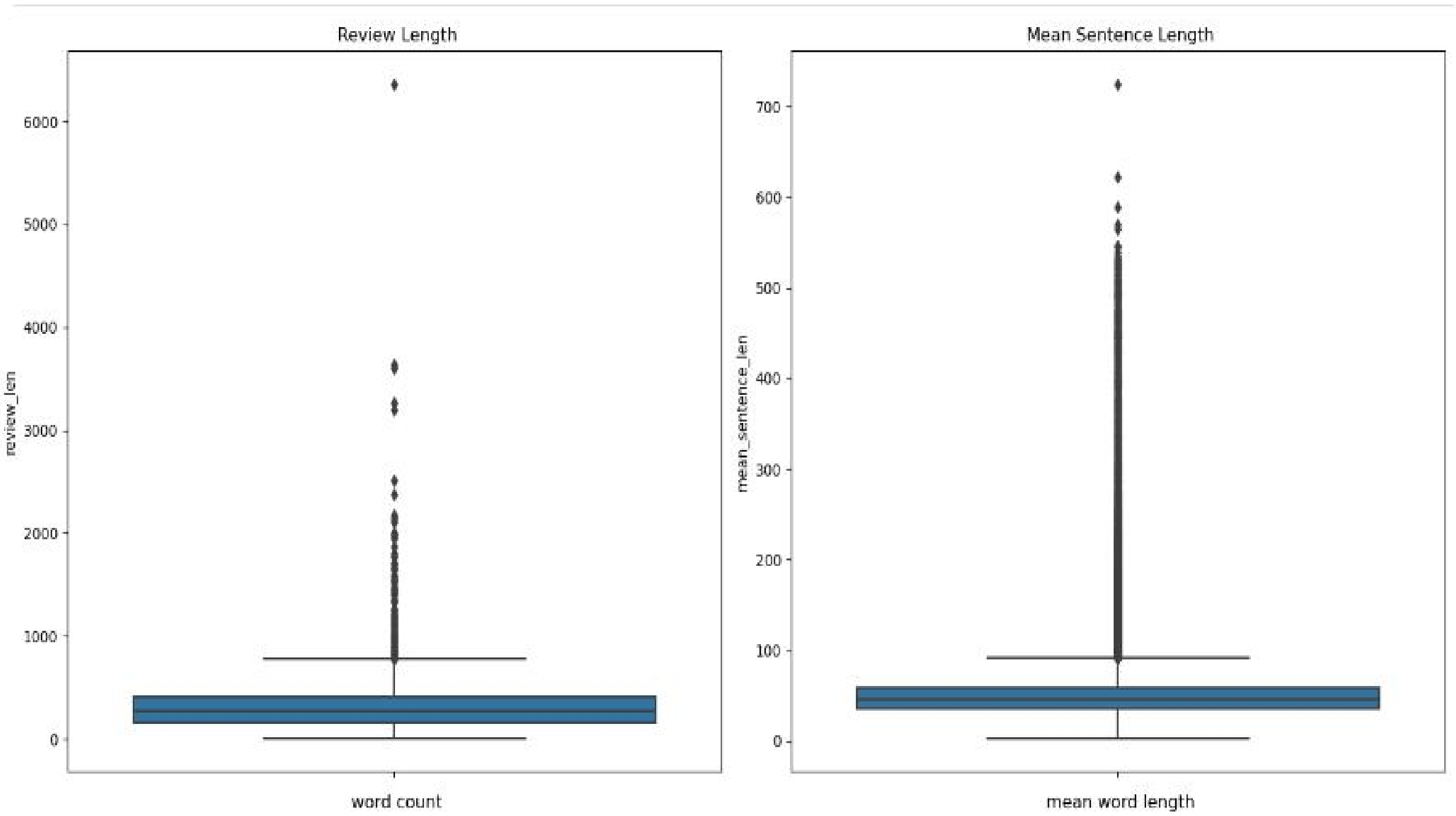
- Missing values, duplication (drop over 85000k)
- Corrected input error in “drugName” and “condition”
- “revew” column text data cleaning: special characters, contraction, whitespace, stopwords

Data distribution



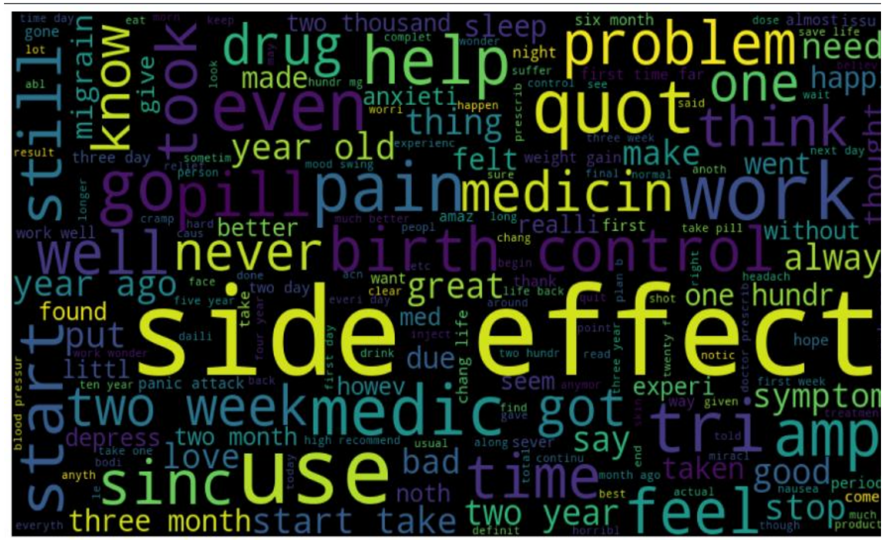


Data Wrangling

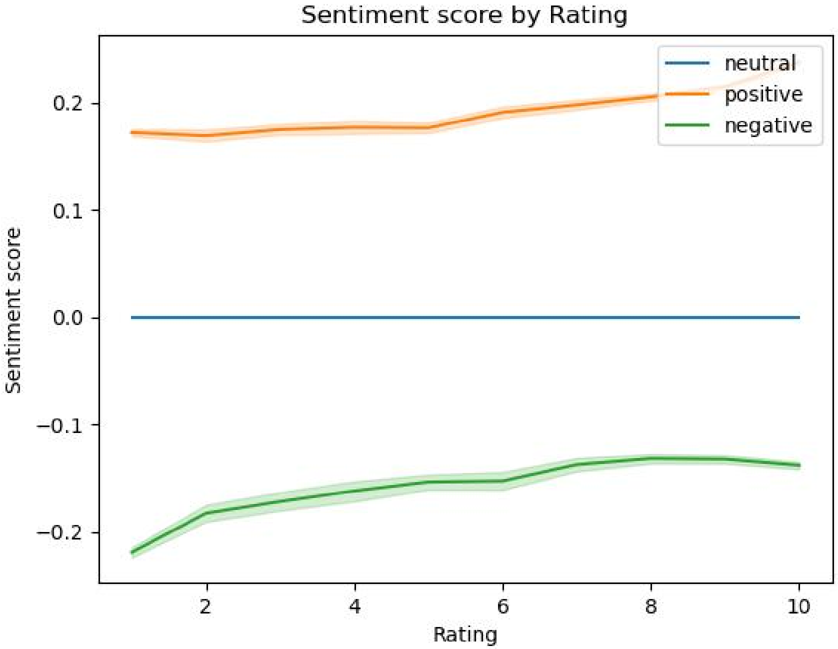


Add new features into dataset: 'word_count', 'mean_word_len', 'unique_word_count'

Data Wrangling



wordcloud with rating = 10



- wordcloud shows the top words in rating =10, reveal the high rating related to the mecial effective: such as side effect, help, better....
- Target feature sentiment_label was added.

Preprocess

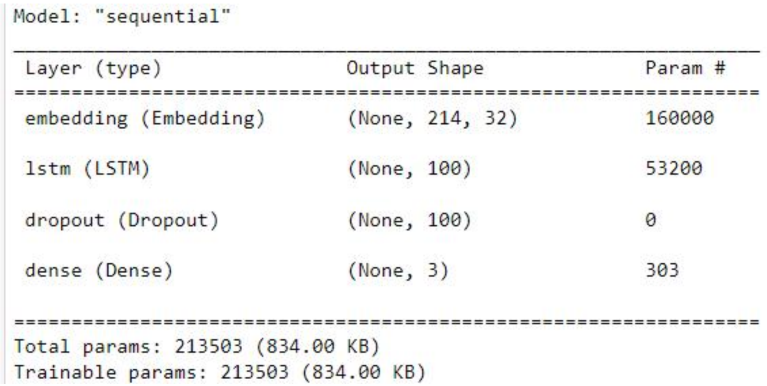
- Tokenize the'review_clean'
- Encode the categorical features and target 'sentiment_label'
- Extract the 'date' to several new features 'year','month','day'.
- Scale the numerical features using MinMaxScaler.
- Train test split

Model

- Multinomial Naive Bayes (MNB):baseline model
- Long Short-Term Memory (LSTM):
- Random Forest (RF):

Evaluation metrics: F1_score

LSTM



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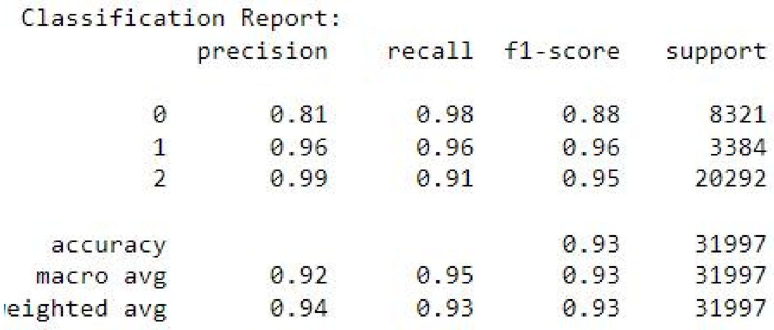
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding (Embedding)       (None, 214, 32)           160000

 lstm (LSTM)                 (None, 100)               53200

 dropout (Dropout)           (None, 100)               0

 dense (Dense)               (None, 3)                 303

=================================================================
Total params: 213503 (834.00 KB)
Trainable params: 213503 (834.00 KB)
```



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Classification Report:
              precision    recall  f1-score   support

           0       0.81      0.98      0.88      8321
           1       0.96      0.96      0.96      3384
           2       0.99      0.91      0.95     20292

    accuracy                           0.93     31997
   macro avg       0.92      0.95      0.93     31997
eighted avg       0.94      0.93      0.93     31997
```
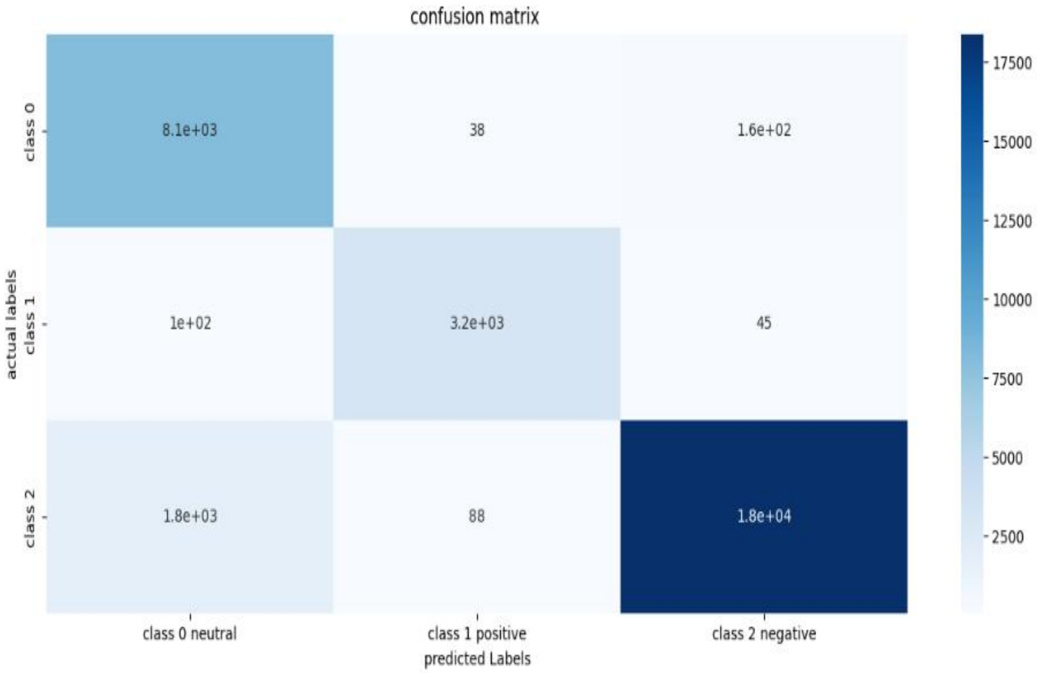
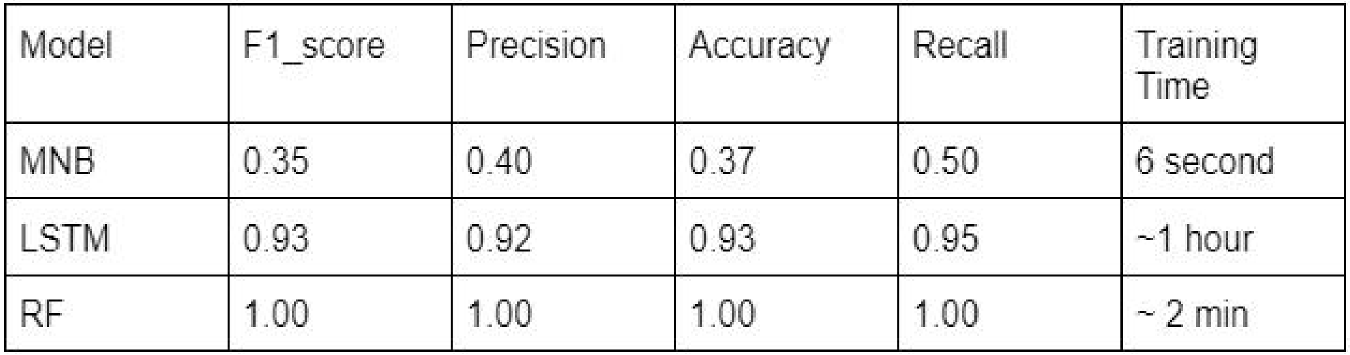



The F1 score and other scores are high, the dracback is the longer training time, >~1 hours

Model Metrics

Table 1: Three Model Performance



Model	F1_score	Precision	Accuracy	Recall	Training Time
MNB	0.35	0.40	0.37	0.50	6 second
LSTM	0.93	0.92	0.93	0.95	~1 hour
RF	1.00	1.00	1.00	1.00	~ 2 min

Random forest classifier shows the optimal performance and can be selected as the final model.

Future Work

- Selecting additional data for final modeling, utilizing the remaining dataset for training and modeling purposes will be explored .
- Reconfiguring the training and modeling process to focus on extracting feature importances.