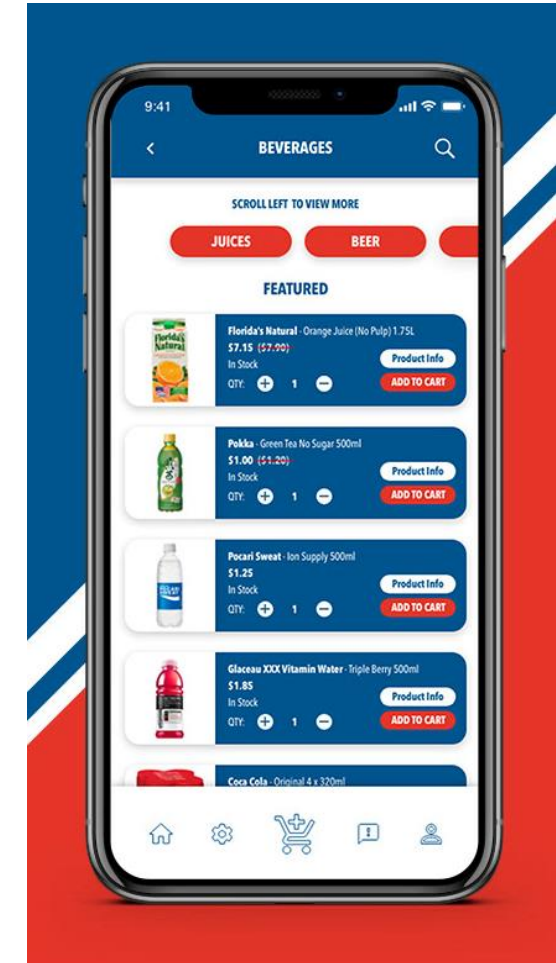


# SENTIMENT ANALYSIS FOR NTUC FAIRPRICE MOBILE APP

ESTHER LEUNG (GA DSI 16)



# **“HOW MIGHT WE IMPROVE NTUC FAIRPRICE MOBILE APP USER EXPERIENCE TO BOOST ONLINE GROCERY SALES?”**



# BUSINESS PROBLEMS



Poor customer experience

*short term*

Immediate stop gap measures

**Classification model** to identify negative reviews for prompt follow up and service recovery

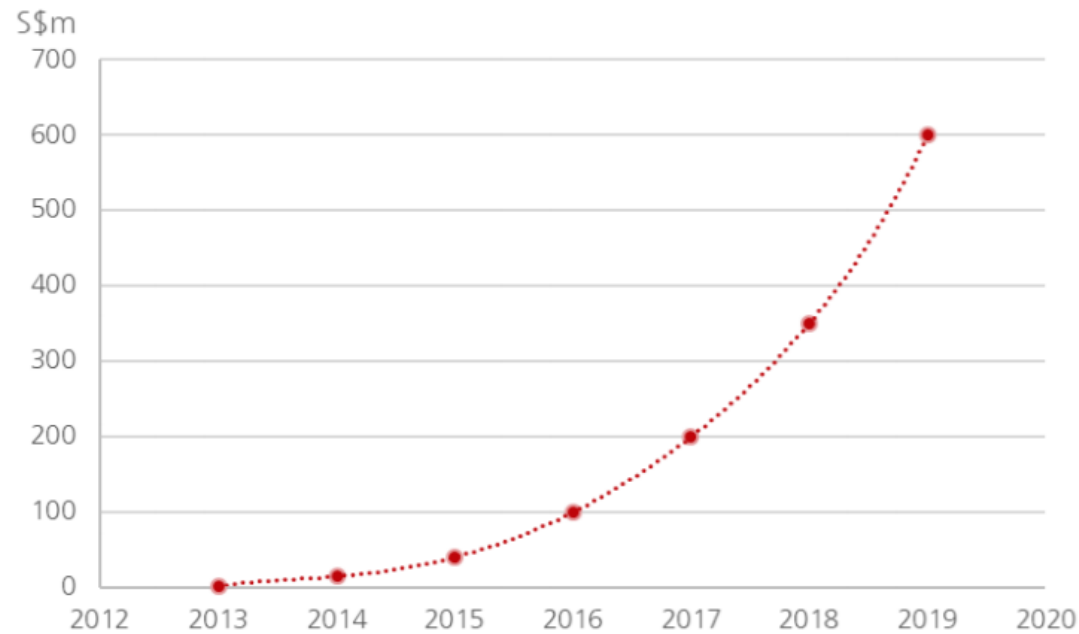
*long term*

Continuous improvement in customer experience

**Topic modelling** of negative reviews to understand customers' pain points

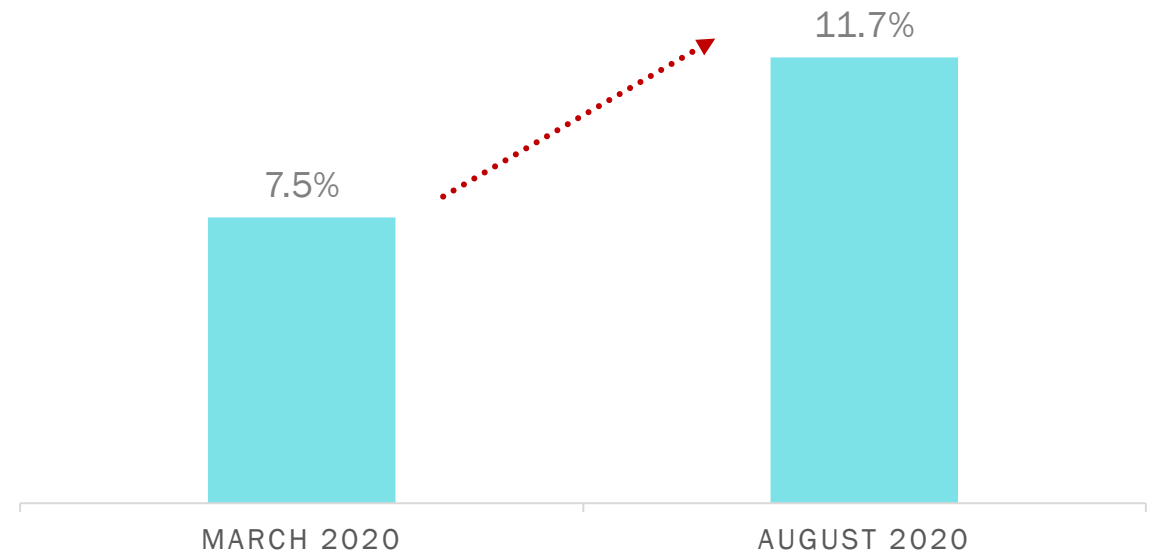
# WHY MOBILE APP CUSTOMER EXPERIENCE MATTERS?

**We estimated online grocery market to be c.S\$600m**



Source: Euromonitor, Singstat, DBS Bank estimates

PERCENTAGE OF ONLINE SALES - SUPERMARKET



Source: Department of Statistics Singapore



# DATA COLLECTION

## 3,657 REVIEWS COLLECTED FROM GOOGLE PLAY & APPLE APPSTORE



Google Play Store



yt ng

★ ★ ★ ★ ★ 31 July 2020



17

One of the lousiest app! Tried using it several times since May 20 but never once did I complete the transaction. Reason: 1. In May 20 it always say "no slot". By the time there was slot, many items in my cart had become "no stock". No point for me to pay the delivery fee for a "half-filled cart". 2. In Jul 20 I tried to use the app again to utilise a promo code. But it kept saying "promo code error". When the code finally got accepted, some items became "no stock" again. It's so irritating!

Use text in review identify consumer pain points & values sought



Apple App Store



Jyh Chyang, 11/10/2019

### Need more improvement

The design of this newer version looks much better and easier to navigate. However, with this new app, the delivery comes from a near by Fairprice store. Many items which I have been ordered regularly are no longer available or frequently out of stock for a long time. When I change to another address, I can see that the items are still available and not out of stock. Let me know if there is a way to change the supplying store. It is useless with a better UI but we can't get items we want. I used to make purchase every week but now I have to switch to another provider.

Use text in review to predict whether the review is negative or positive


### Target variable

Negative reviews: Rating 1 to 3

Positive reviews: Rating 4 to 5



# PRE-PROCESSING & FEATURE ENGINEERING

 yt ng  
★★★★★ 31 July 2020

**Review**

One of the lousiest app! Tried using it several times since May 20 but never once did I complete the transaction. Reason: 1. In May 20 it always say "no slot". By the time there was slot, many items in my cart had become "no stock". No point for me to pay the delivery fee for a "half-filled cart". 2. In Jul 20 I tried to use the app again to utilise a promo code. But it kept saying "promo code error". When the code finally got accepted, some items became "no stock" again. It's so irritating!

## Text Preprocessing

- Remove **HTML tags** using BeautifulSoup
- Remove **non-letter characters**
- Convert words to **lower case**
- Remove **stop words & frequently occurring words**
- **Lemmatize** the words to its root word form using NLTK Lemmatizer

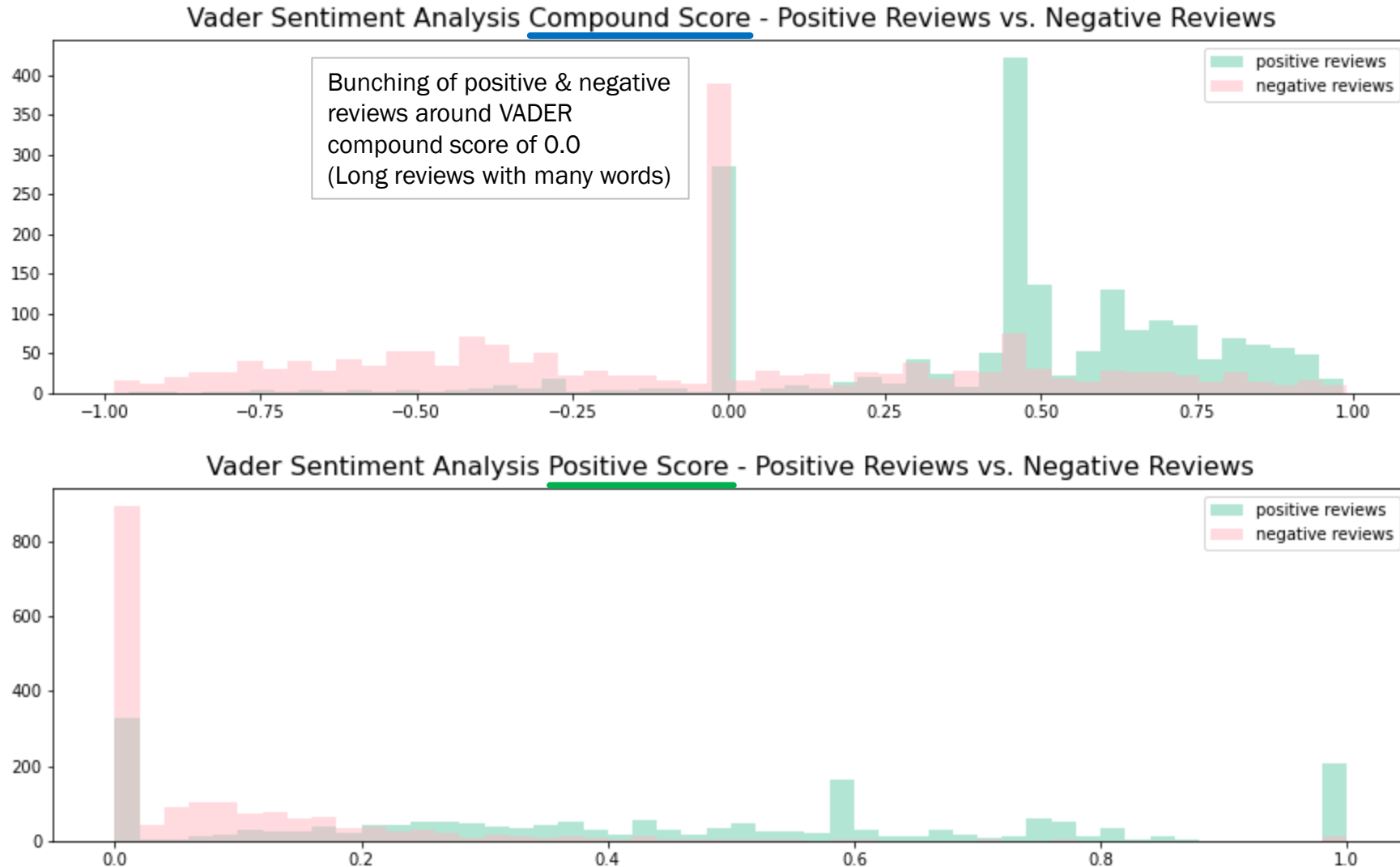


## VADER Sentiment Polarity Score

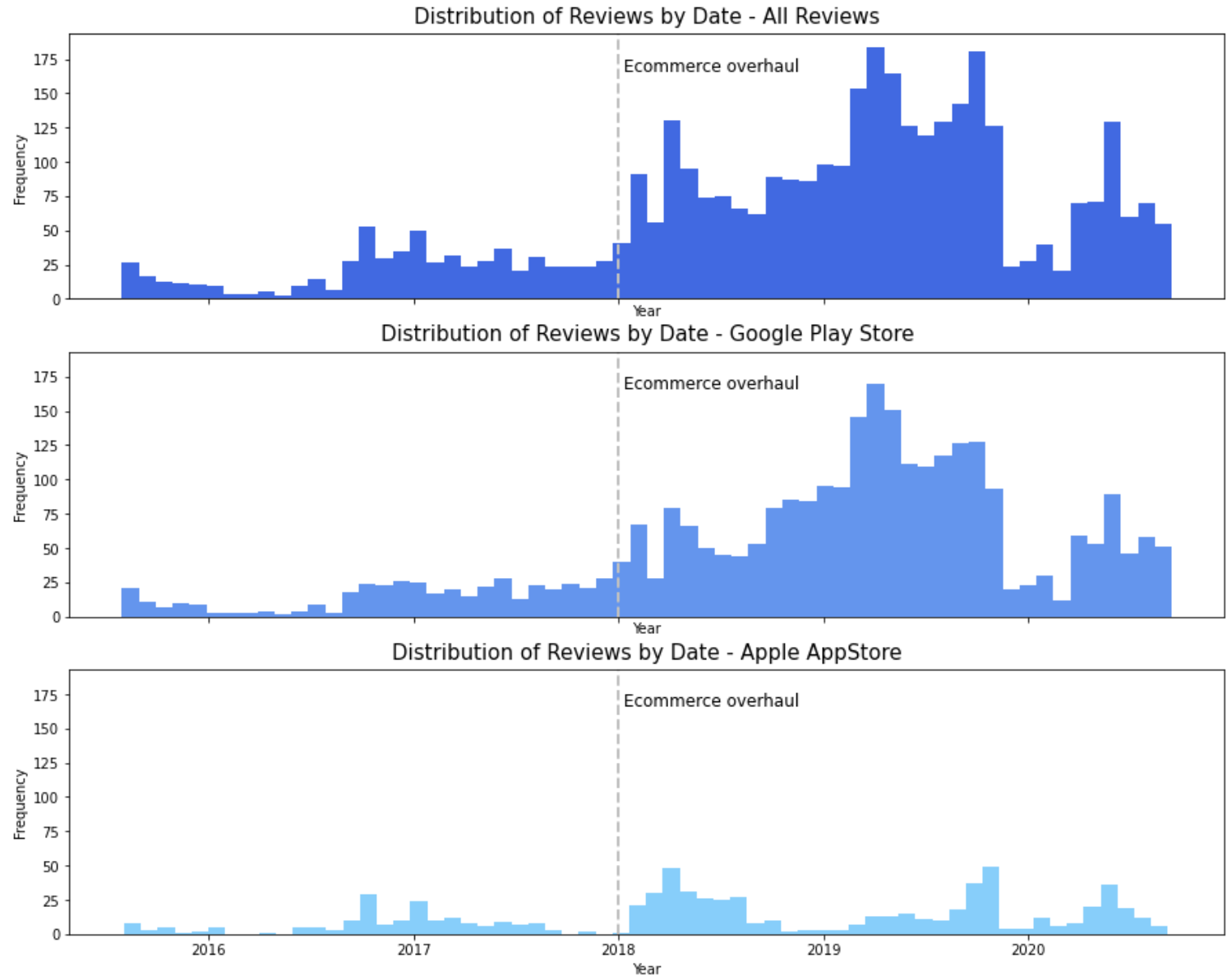
- Positive score
- Negative score
- Neutral score
- Compound score



# VADER positive score a better feature than compound score



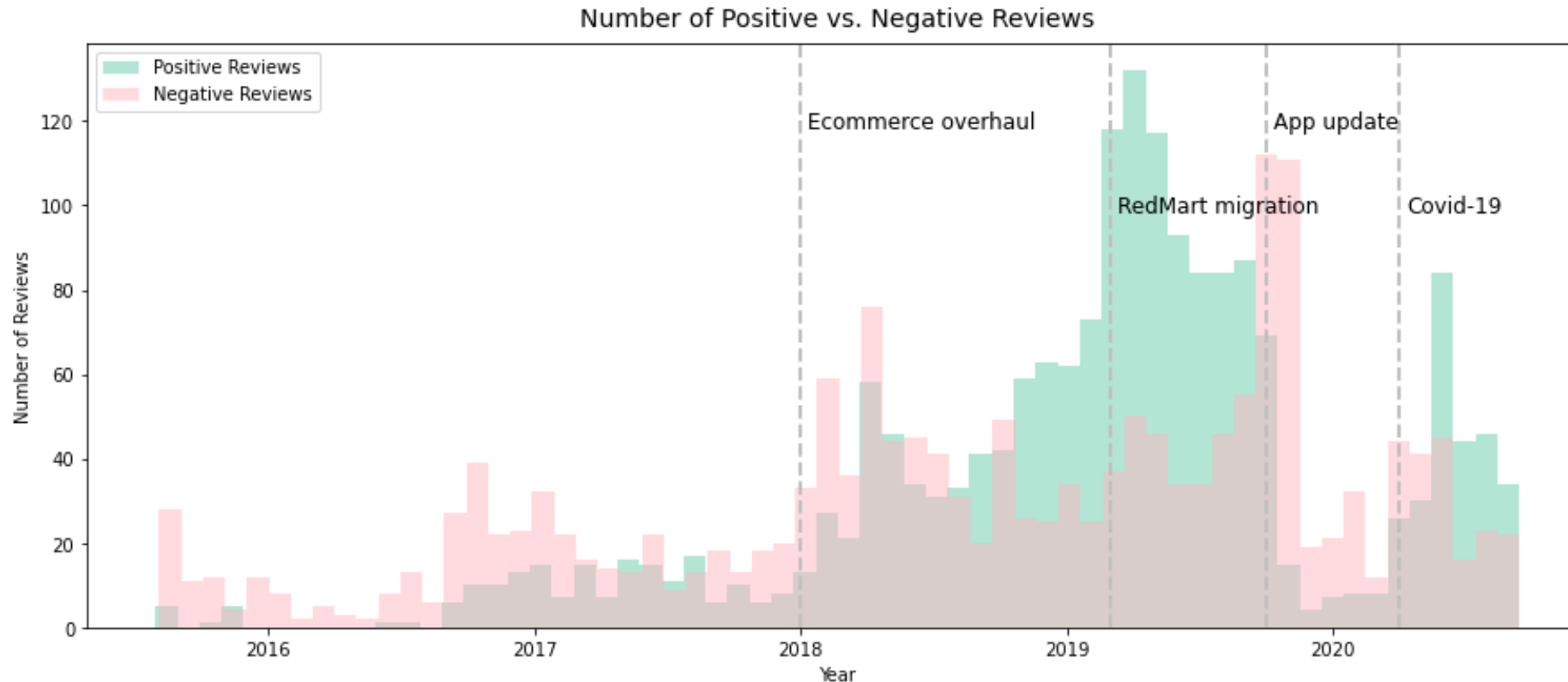
Uptake of reviews following NTUC Fairprice's e-commerce overhaul in early 2018.





# Number of positive vs. negative reviews mirror key market events

- Spikes in negative reviews following e-commerce overhaul in early 2018, and app update in late 2019
- Peak in positive reviews when RedMart migrated to Lazada platform in early 2019
- Surge in negative reviews in early phase of Covid-19 circuit breaker in Apr 2020, followed by improvement in May 2020,



## E-commerce overhaul/ App update

*"New upgrade version unable to log in to my account. Keep asking to change password."*

## RedMart Migration to Lazada

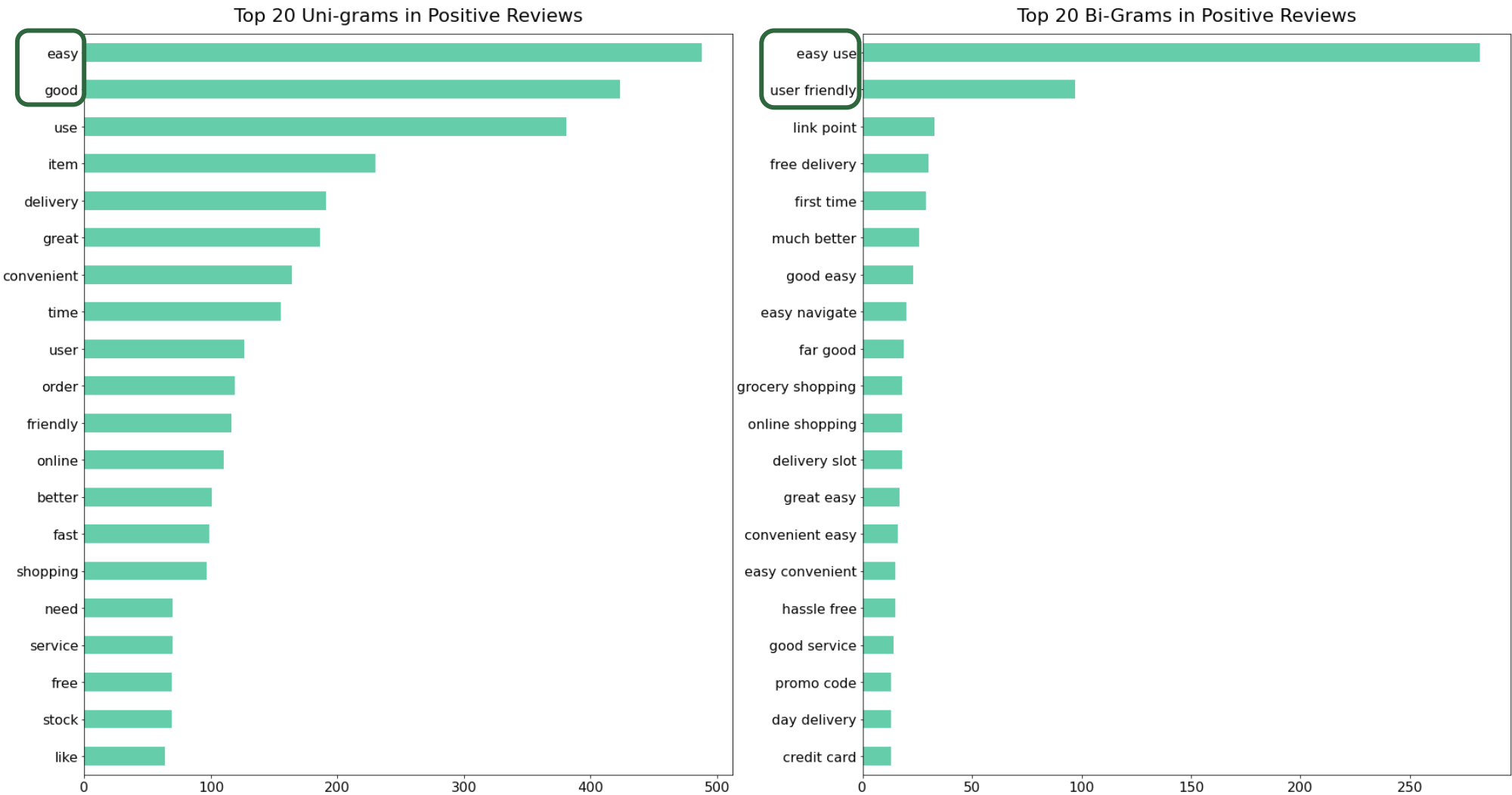
*"Switched from Redmart cos I hated how complicated it got to place order or get customer support. This is much better! Thanks!"*

## Covid-19

*"The app is very very slow and takes a very long time to load. A lot of the items are out of stock too. The delivery time is also unavailable."*

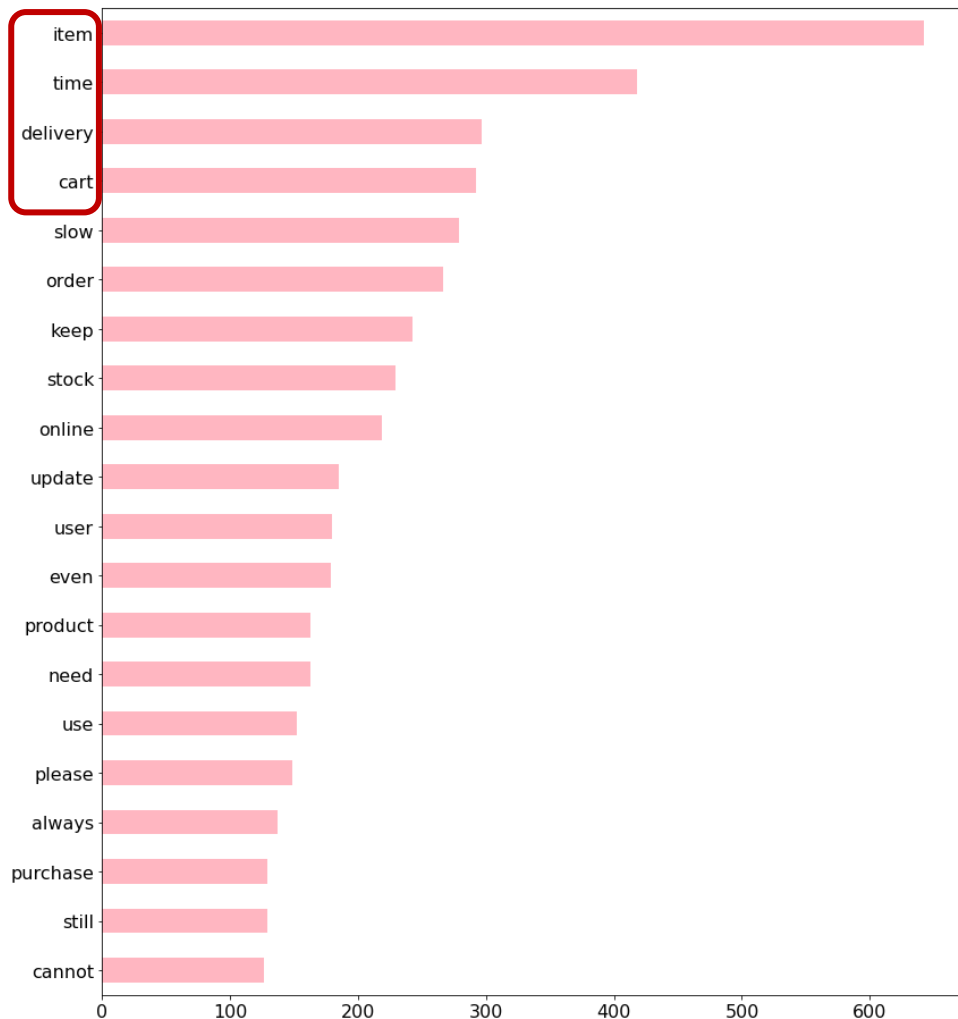


‘Easy’, ‘good’, ‘easy use’ and ‘user friendly’ among the most frequently occurring uni-grams and bi-grams for positive reviews

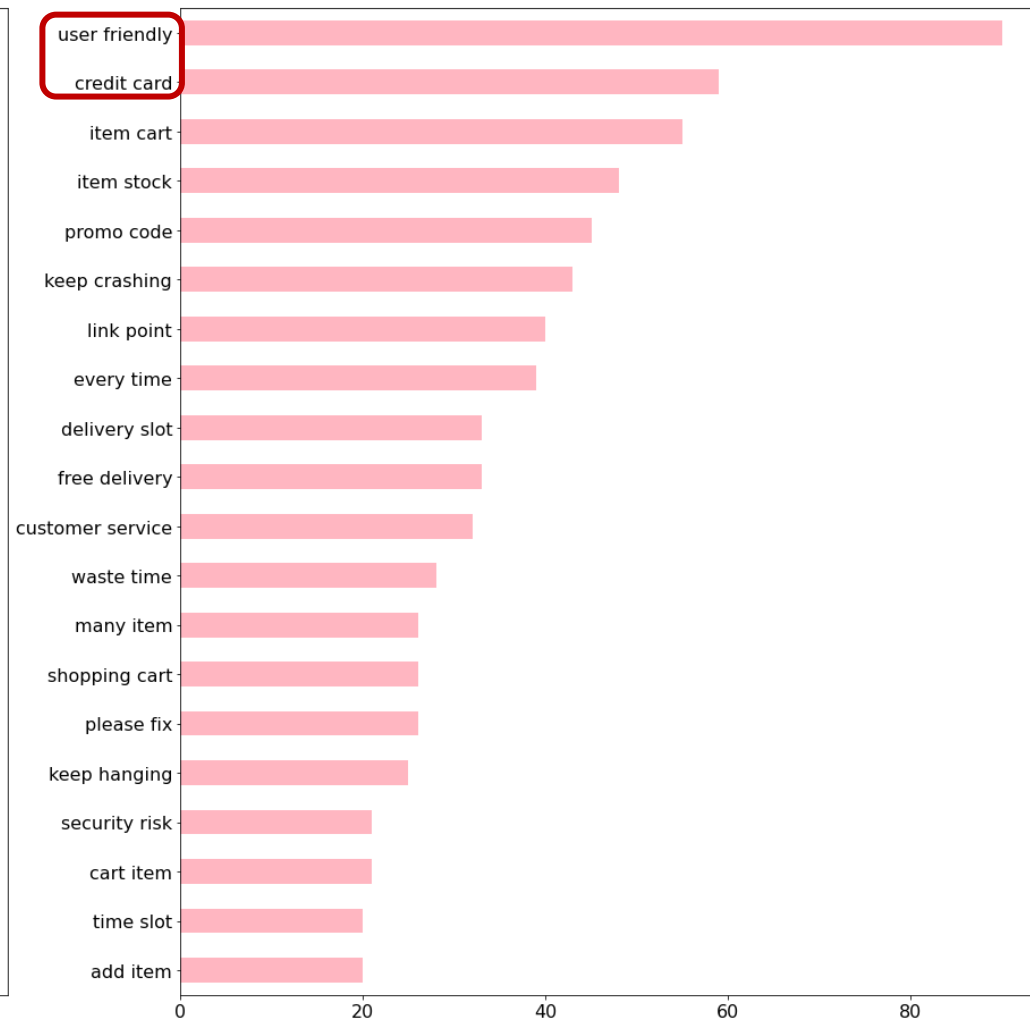


‘Item’, ‘time’, ‘delivery’, ‘cart’, ‘(not) user friendly’, ‘credit card’ the most frequently occurring uni-grams and bi-grams for negative reviews

Top 20 Uni-grams in Negative Reviews



Top 20 Bi-Grams in Negative Reviews



# CLASSIFICATION MODEL - EVALUATION

|                                             | Train accuracy | Test Accuracy | Recall | ROC AUC Score |
|---------------------------------------------|----------------|---------------|--------|---------------|
| MultinomialNB with TfidfVectorizer          | 0.85           | 0.87          | 0.89   | 0.94          |
| Logistic Regression with TfidfVectorizer    | 0.85           | 0.87          | 0.89   | 0.93          |
| MultinomialNB with CountVectorizer          | 0.84           | 0.87          | 0.86   | 0.93          |
| Support Vector Machine with TfidfVectorizer | 0.85           | 0.86          | 0.89   | 0.92          |
| Logistic Regression with CountVectorizer    | 0.84           | 0.85          | 0.83   | 0.92          |
| Support Vector Machine with CountVectorizer | 0.83           | 0.84          | 0.85   | 0.93          |
| Baseline Accuracy (based on majority class) | 0.51           |               |        |               |



# CLASSIFICATION MODEL - EVALUATION

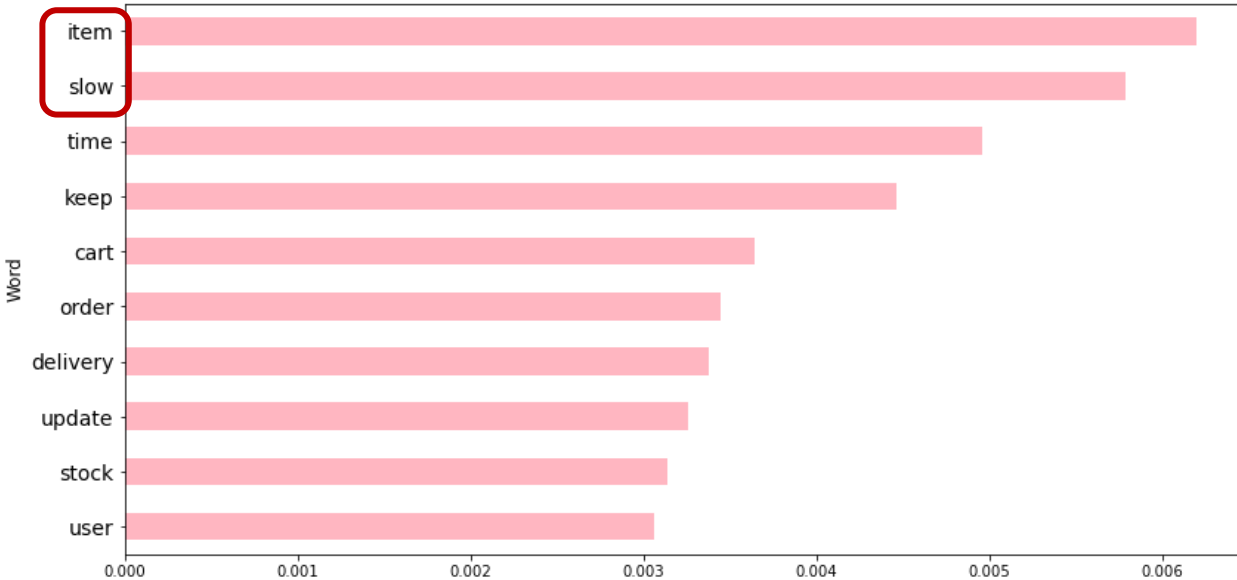
|                                                                                                | Train accuracy | Test Accuracy | Recall      | ROC AUC Score |
|------------------------------------------------------------------------------------------------|----------------|---------------|-------------|---------------|
| <b>Voting classifier</b><br>(MultinomialNB-Tfidf & Logistic Regression-Tfidf)                  | 0.92           | <b>0.88</b>   | <b>0.89</b> | 0.94          |
| <b>MultinomialNB with TfidfVectorizer</b><br>(with VADER positive score as additional feature) | 0.91           | 0.88          | 0.88        | 0.94          |
| <b>LSTM</b>                                                                                    | 0.90           | 0.88          | 0.85        | 0.94          |
| MultinomialNB with TfidfVectorizer                                                             | 0.85           | 0.87          | 0.89        | 0.94          |
| Logistic Regression with TfidfVectorizer                                                       | 0.85           | 0.87          | 0.89        | 0.93          |
| MultinomialNB with CountVectorizer                                                             | 0.84           | 0.87          | 0.86        | 0.93          |
| Support Vector Machine with TfidfVectorizer                                                    | 0.85           | 0.86          | 0.89        | 0.92          |
| Logistic Regression with CountVectorizer                                                       | 0.84           | 0.85          | 0.83        | 0.92          |
| Support Vector Machine with CountVectorizer                                                    | 0.83           | 0.84          | 0.85        | 0.93          |
| Baseline Accuracy (based on majority class)                                                    | 0.51           |               |             |               |



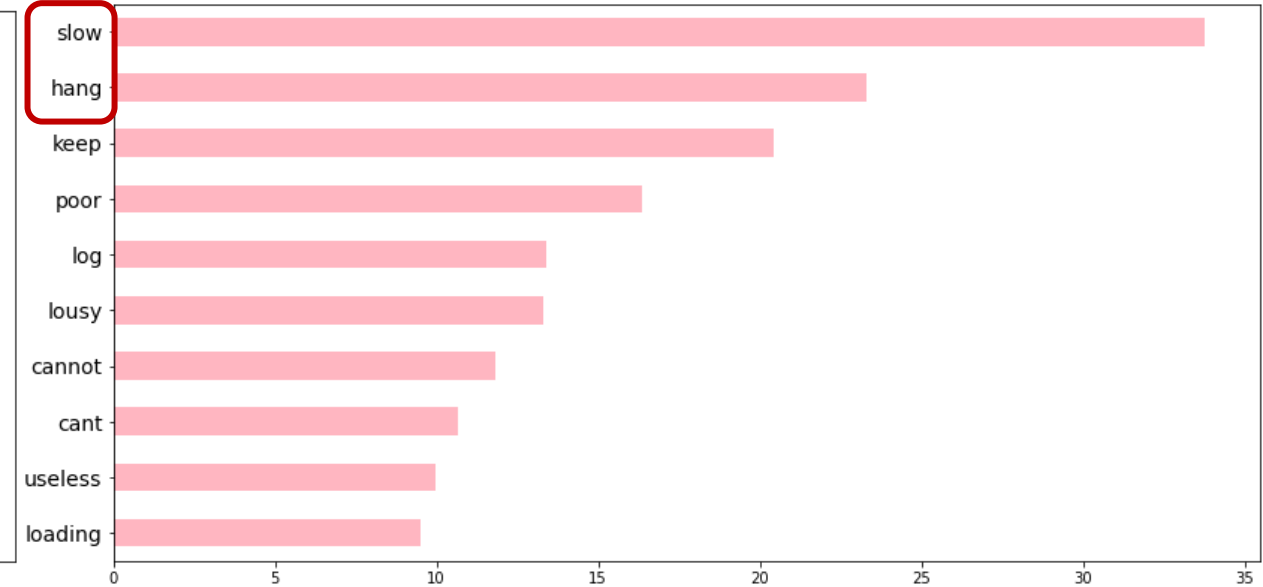
# MOST PREDICTIVE WORDS FOR NEGATIVE REVIEWS

## VOTING CLASSIFIER (MULTINOMIAL NB-TFIDF & LOGISTIC REGRESSION-TFIDF)

MultinomialNB with TfidfVectorizer's Top 10 Most Predictive Words for Negative Reviews



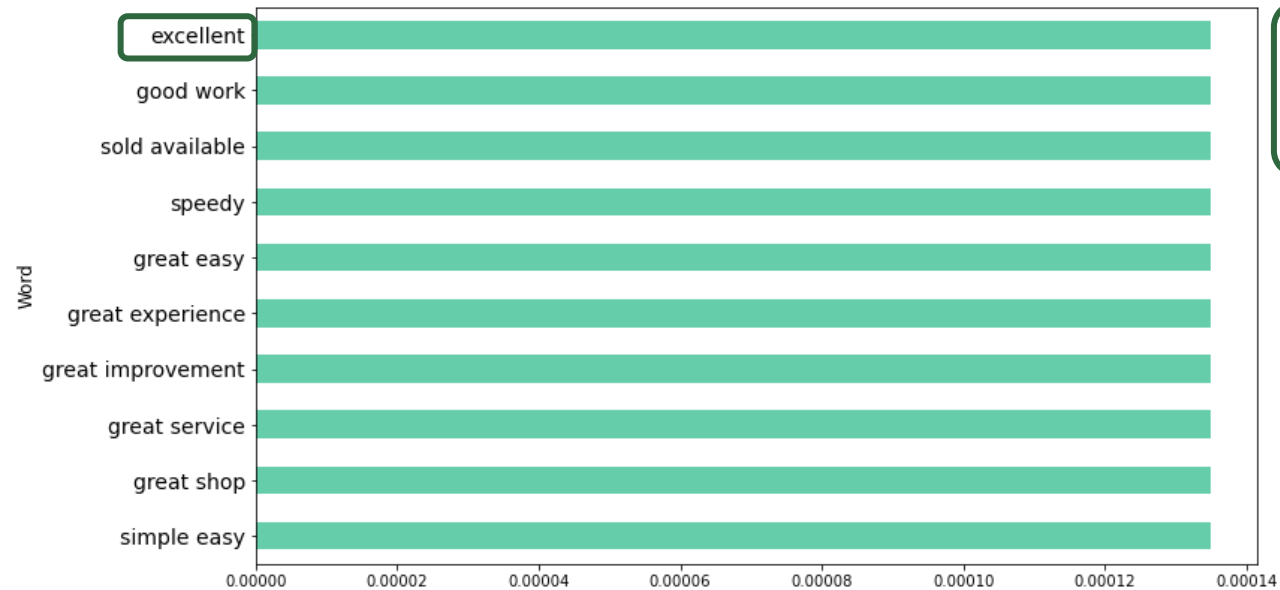
Logistic Regression with TfidfVectorizer's Top 10 Most Predictive Words for Negative Reviews



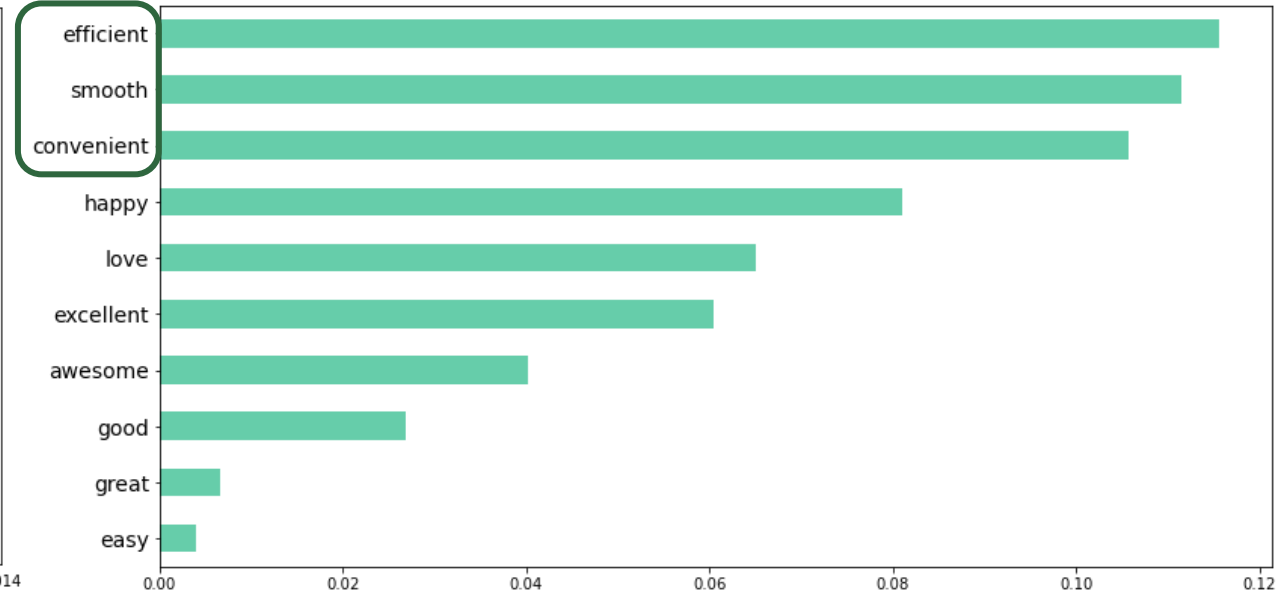
# MOST PREDICTIVE WORDS FOR POSITIVE REVIEWS

## VOTING CLASSIFIER (MULTINOMIAL NB-TFIDF & LOGISTIC REGRESSION-TFIDF)

MultinomialNB with TfidfVectorizer's Top 10 Most Predictive Words for Positive Reviews

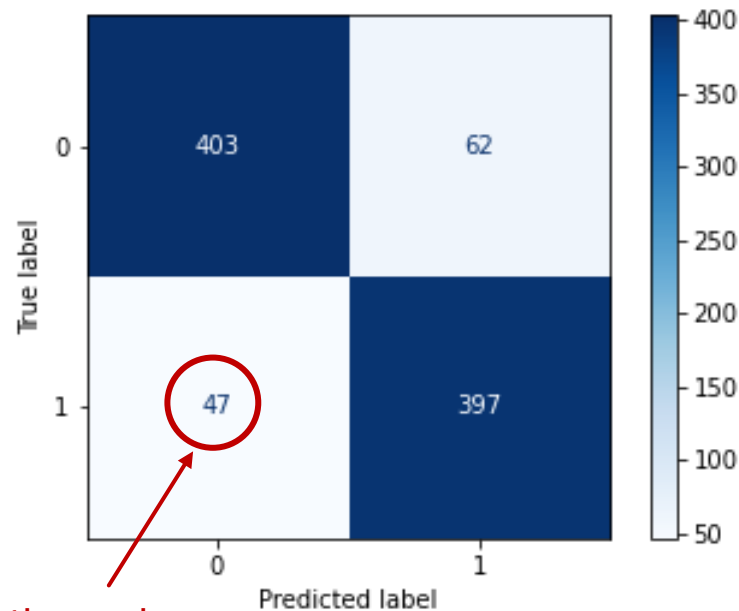


Logistic Regression with TfidfVectorizer's Top 10 Most Predictive Words for Positive Reviews

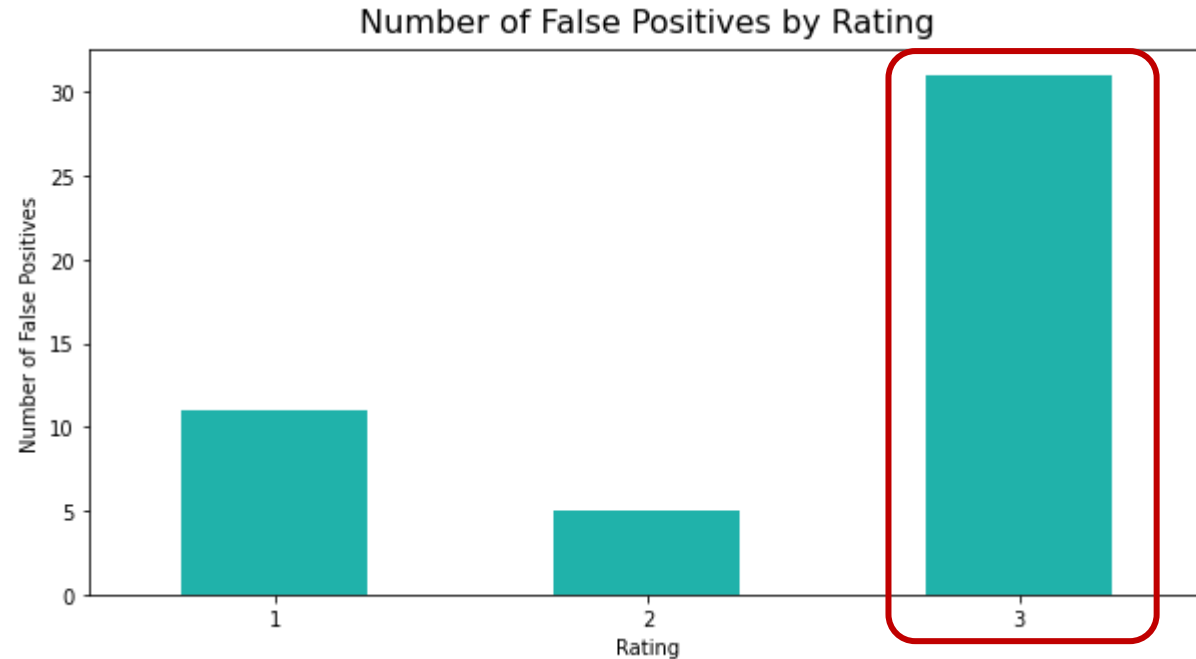


# LIMITATIONS

## NEUTRAL REVIEWS WITH SUGGESTIONS MISCLASSIFIED AS NEGATIVE REVIEWS



Negative reviews  
misclassified as  
positive reviews



*“user friendly as can order on the go but can be better if screen can load more products to view at a glance. best if intelligent s/w can help propose related products to make online shopping easier.”*

– Rating 3





# DEMO

## Sentiment Analyzer for NTUC Fairprice Mobile App

Esther Leung (DSI-16)

Enter The Review

Write Here...

Predict Sentiment

Press the above button...

<https://sentiment-classification-ntuc.herokuapp.com/>



# CUSTOMERS' PAIN POINTS

## TOPIC MODELLING ON NEGATIVE REVIEWS

### 1. Payment/ Credit Card Issues

update hang  
use even  
payment  
keep code time  
unable card

*"The payment and checkout keep registering unsuccessful transaction and ask to check for card expiry. It is your apps problem... nothing to do with the bank credit card."*

Intertopic Distance Map (via multidimensional scaling)

PC1

PC2

Marginal topic distribution



### 2. Out-of-stock/ No delivery slot

stock  
time delivery  
online  
available  
item  
purchase point  
order redmart

*"...it always says 'no slot'. By the time there was slot, many items in my cart had become 'no stock'.."*

### 3. Bugs/ Laggy Interface

take item  
time  
load user  
search update  
slow cart  
crash

*"I have been trying to load my cart for more than half an hour now and it's still not loading."*

# USER JOURNEY MAPING

Account Opening/  
Logging In

Browsing & Carting

Checkout

Order Confirmation  
& Select Time Slot

Payment

*No issue with account opening,  
browsing & carting.  
Customers excited to check out*

Positive



*Customers get worried  
when app is laggy/  
items disappear at  
checkout*

Negative



*Frustrated customers realising  
that items are out-of-stock/  
no delivery slot after all the time  
spent on browsing & carting*



*Customers get angry  
when payment is  
unsuccessful.  
Abandon cart.*



# RECOMMENDATIONS

## App Development

- Ensure that the app is not laggy in times of high loads
- Rectify issues such as items disappearing from carts and payment errors

## Operations & Supply Chain

- Improve inventory management
- Expand delivery capacity (in-house or third part logistics)



# CONCLUSION

## ■ Text Classification Model

- Production model (Voting Classifier) generalise well on unseen data with relatively high accuracy of 0.88 and recall of 0.89 on test data
- The model will help to identify negative reviews of NTUC Fairprice mobile app for prompt follow up and service recovery

## ■ Topic Modelling

- Identified 3 main customer pain points for continuous customer experience improvement
  1. Bugs/ Laggy interface
  2. Out-of-stock/ No delivery slot
  3. Payment/ credit card issues

## ■ Future Work

- Improve classification model accuracy by collecting more reviews
- Topic classification for negative reviews to channel to the right team for follow up





# THANK YOU

