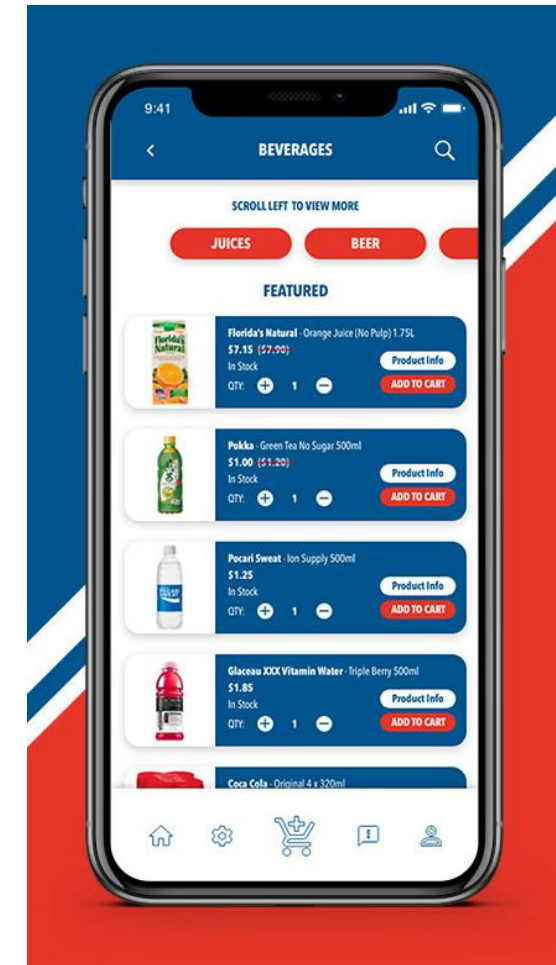# SENTIMENT ANALYSIS FOR NTUC FAIRPRICE MOBILE APP

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
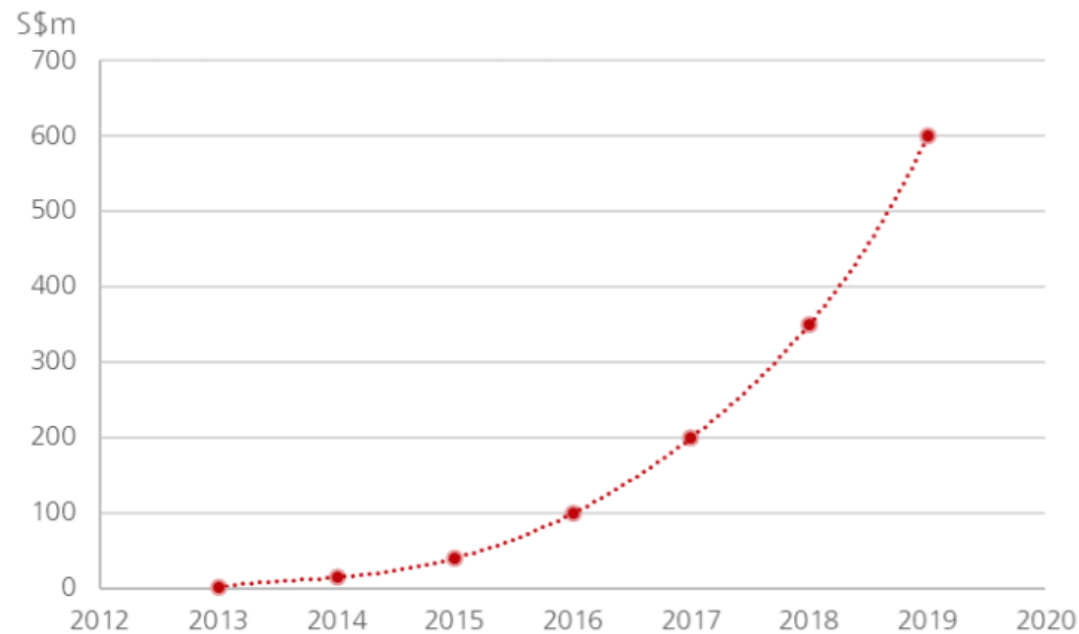
long term — Continuous improvement in customer experience — **Topic modelling** of negative reviews to understand customers' pain points
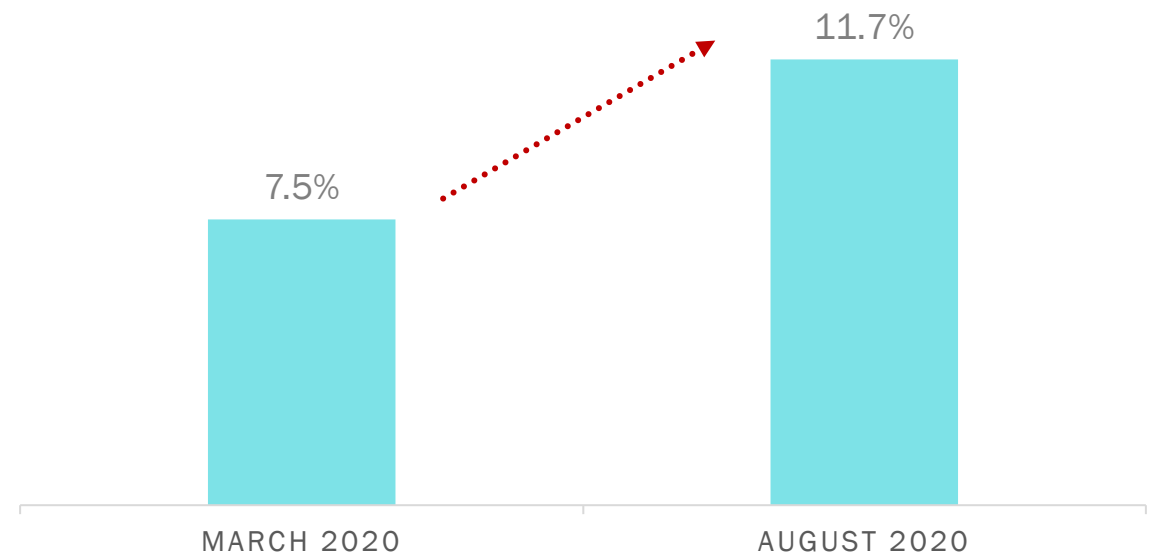
WHY MOBILE APP CUSTOMER EXPERIENCE MATTERS?

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

S$m

Source: Euromonitor, Singstat, DBS Bank estimates

PERCENTAGE OF ONLINE SALES - SUPERMARKET

7.5% MARCH 2020

11.7% AUGUST 2020

Source: Department of Statistics Singapore

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DATA COLLECTION
3,657 REVIEWS COLLECTED FROM GOOGLE PLAY & APPLE APPSTORE

Google Play Store

Apple App 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 through Topic Modelling

★★☆☆☆

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.

Rating *(Target variable)*
Negative reviews: Rating 1 to 3
Positive reviews: Rating 4 to 5

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

PRE-PROCESSING & FEATURE ENGINEERING

yt ng
★ ☆ ☆ ☆ ☆ 31 July 2020

👍
17

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

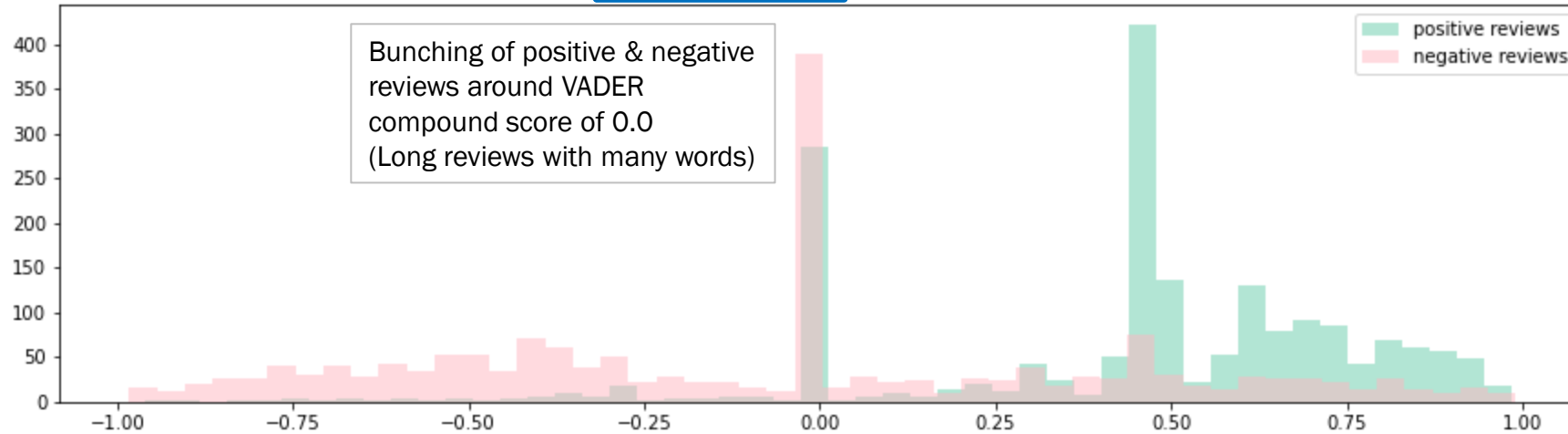## VADER Sentiment Polarity Score
- Positive score
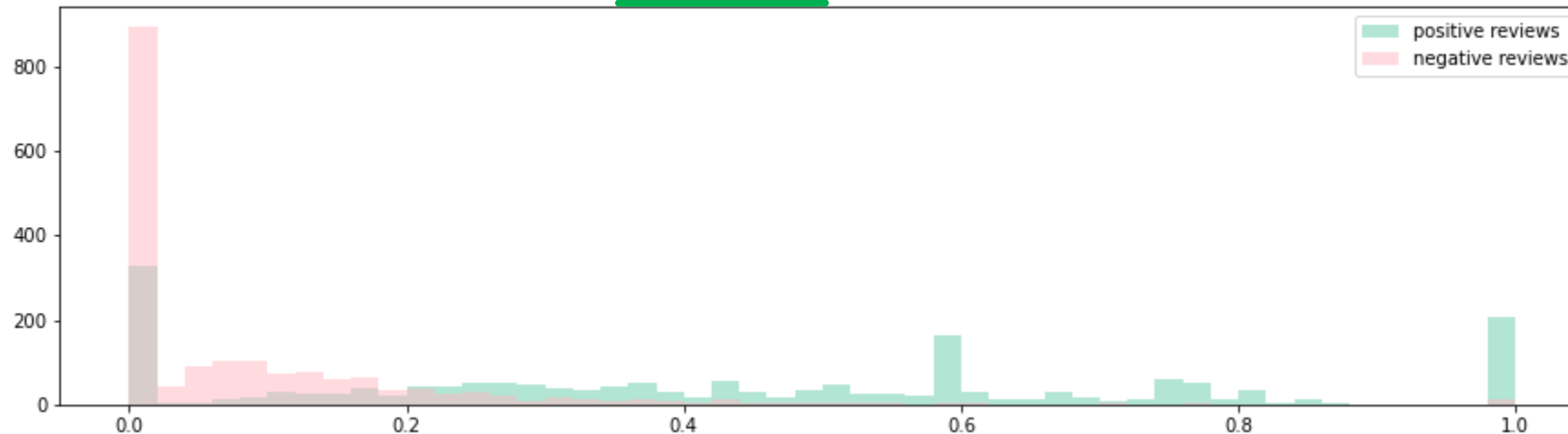- Negative score
- Neutral score
- Compound score

FEATURE ENGINEERING

VADER positive score better correlates to review sentiment

Vader Sentiment Analysis Compound Score - Positive Reviews vs. Negative Reviews

Bunching of positive & negative
reviews around VADER
compound score of 0.0
(Long reviews with many words)

Vader Sentiment Analysis Positive Score - Positive Reviews vs. Negative Reviews

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

Distribution of Reviews by Date - All Reviews

Distribution of Reviews by Date - Google Play Store

Distribution of Reviews by Date - Apple AppStore
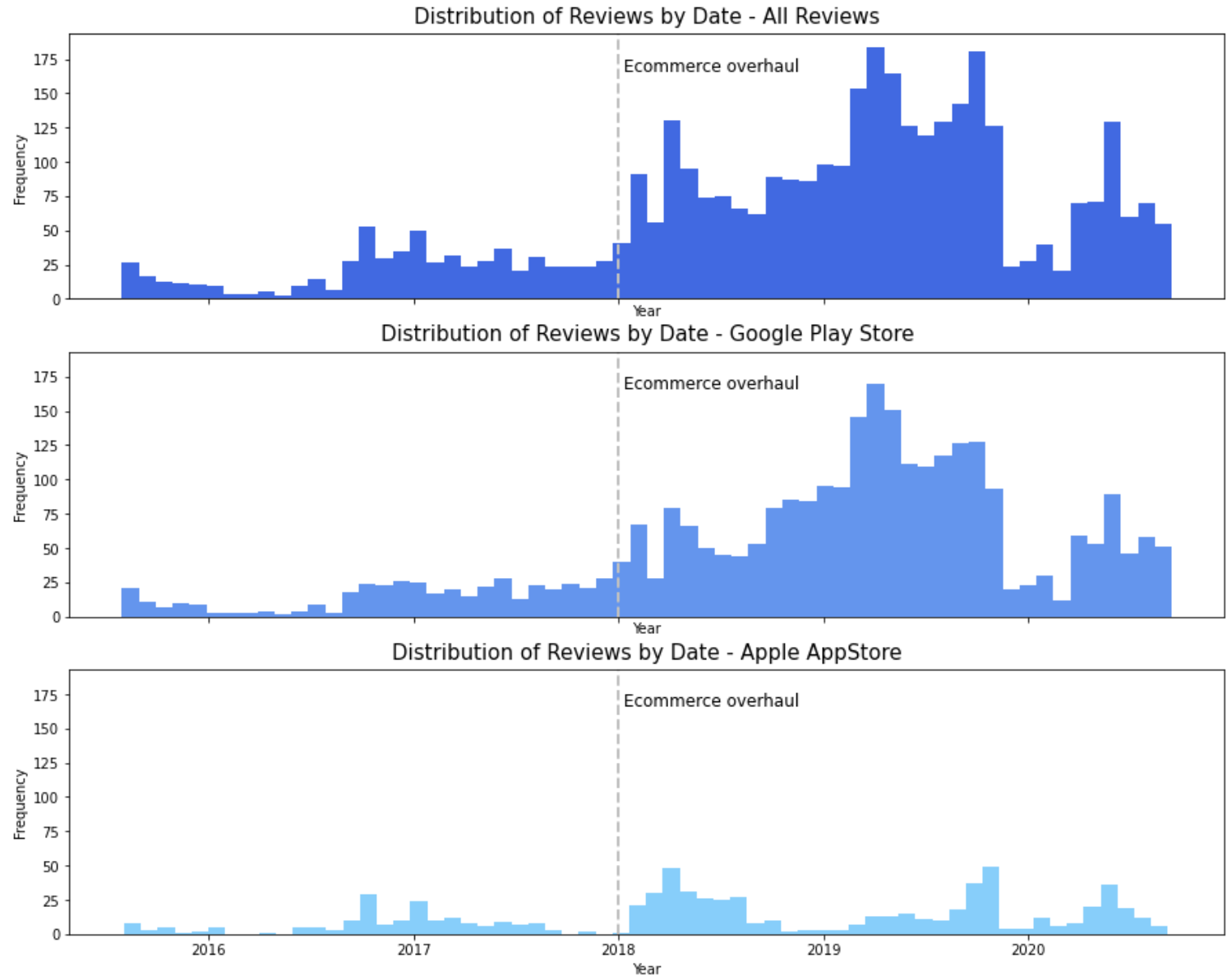
Number of positive vs. negative reviews mirror key market events

- 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,

Number of Positive vs. Negative Reviews
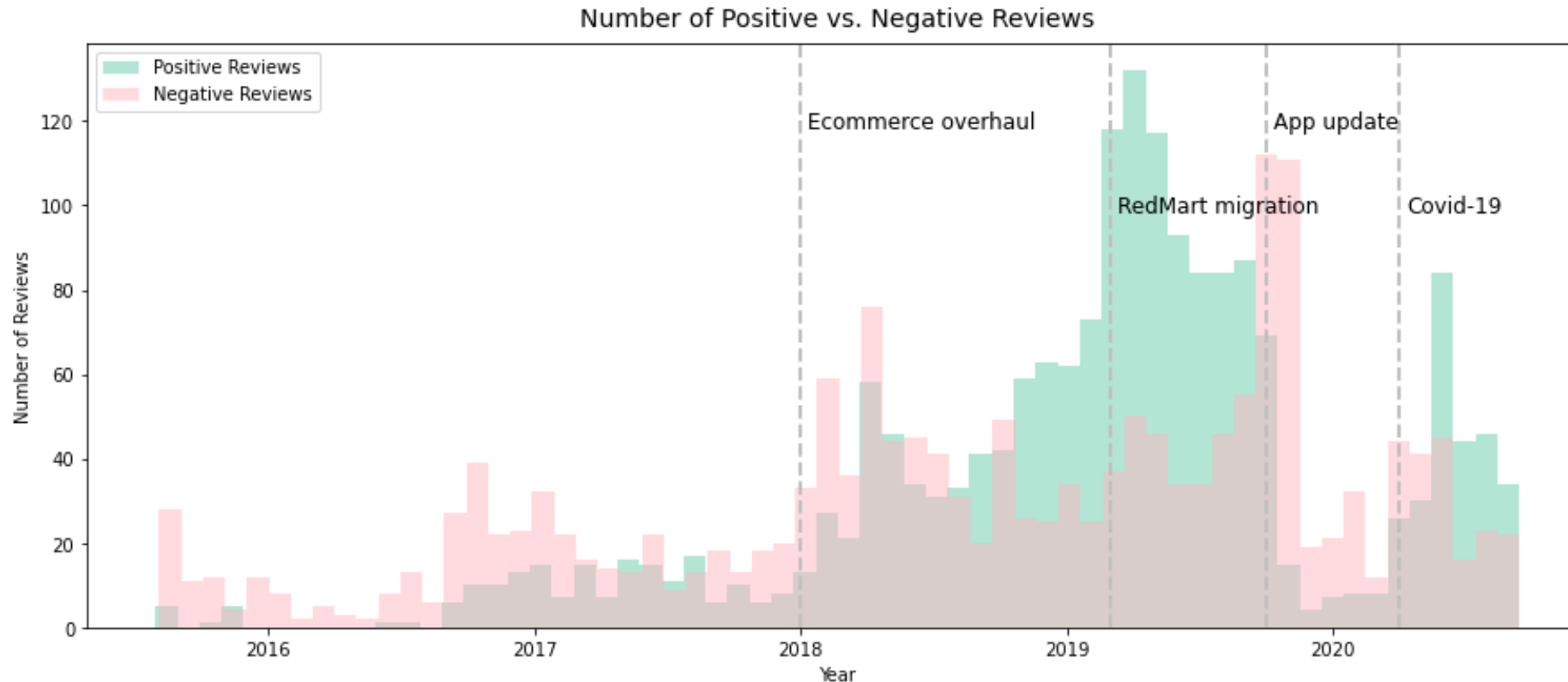
E-commerce overhaul/ App update
"New upgrade version unable to log in to my account. Keep asking to change password."
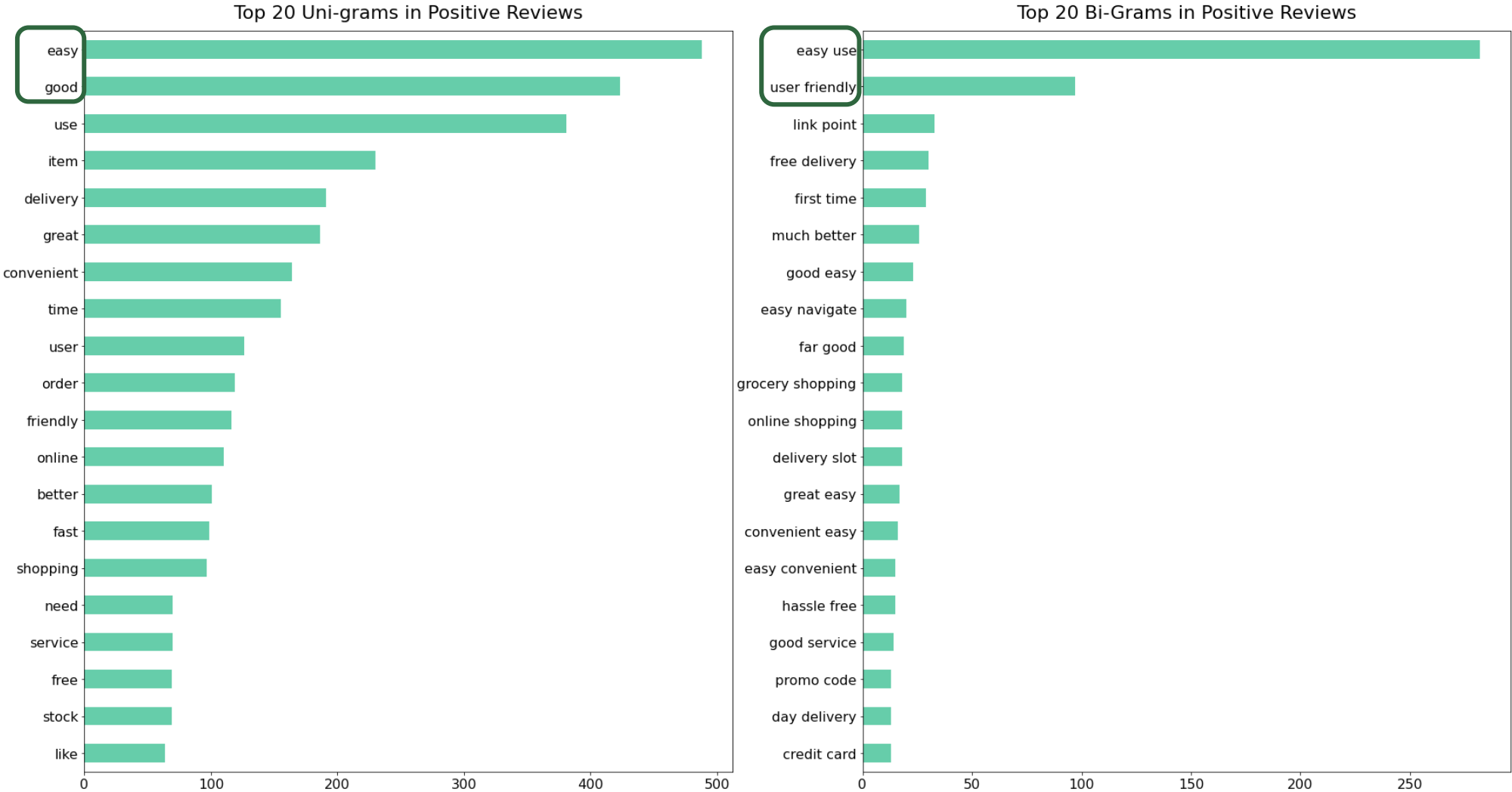
RedMart Migration to Lazada
"Switched from Redmart cos I hated how complicated it got to place order or get customer support. This is much better! Thanks!"

Covid-19
"The app is very very slow and takes a very long time to load. Alot 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

Top 20 Uni-grams in Positive Reviews

Uni-gram	Count
easy	~490
good	~420
use	~380
item	~230
delivery	~190
great	~185
convenient	~165
time	~155
user	~125
order	~120
friendly	~115
online	~110
better	~100
fast	~98
shopping	~95
need	~70
service	~70
free	~70
stock	~68
like	~62

Top 20 Bi-Grams in Positive Reviews

Bi-gram	Count
easy use	~275
user friendly	~95
link point	~35
free delivery	~30
first time	~30
much better	~25
good easy	~22
easy navigate	~20
far good	~18
grocery shopping	~18
online shopping	~18
delivery slot	~18
great easy	~16
convenient easy	~15
easy convenient	~15
hassle free	~15
good service	~14
promo code	~13
day delivery	~13
credit card	~13

'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
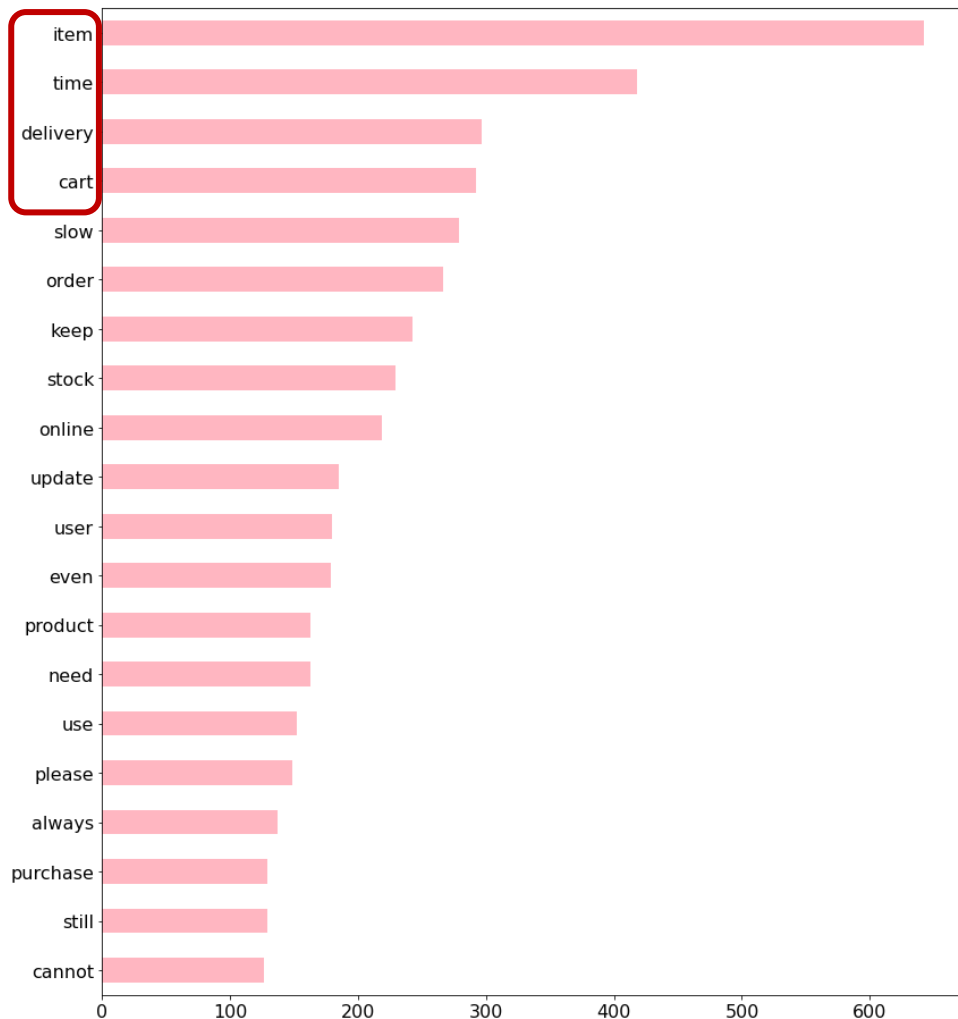
Top 20 Bi-Grams in Negative Reviews
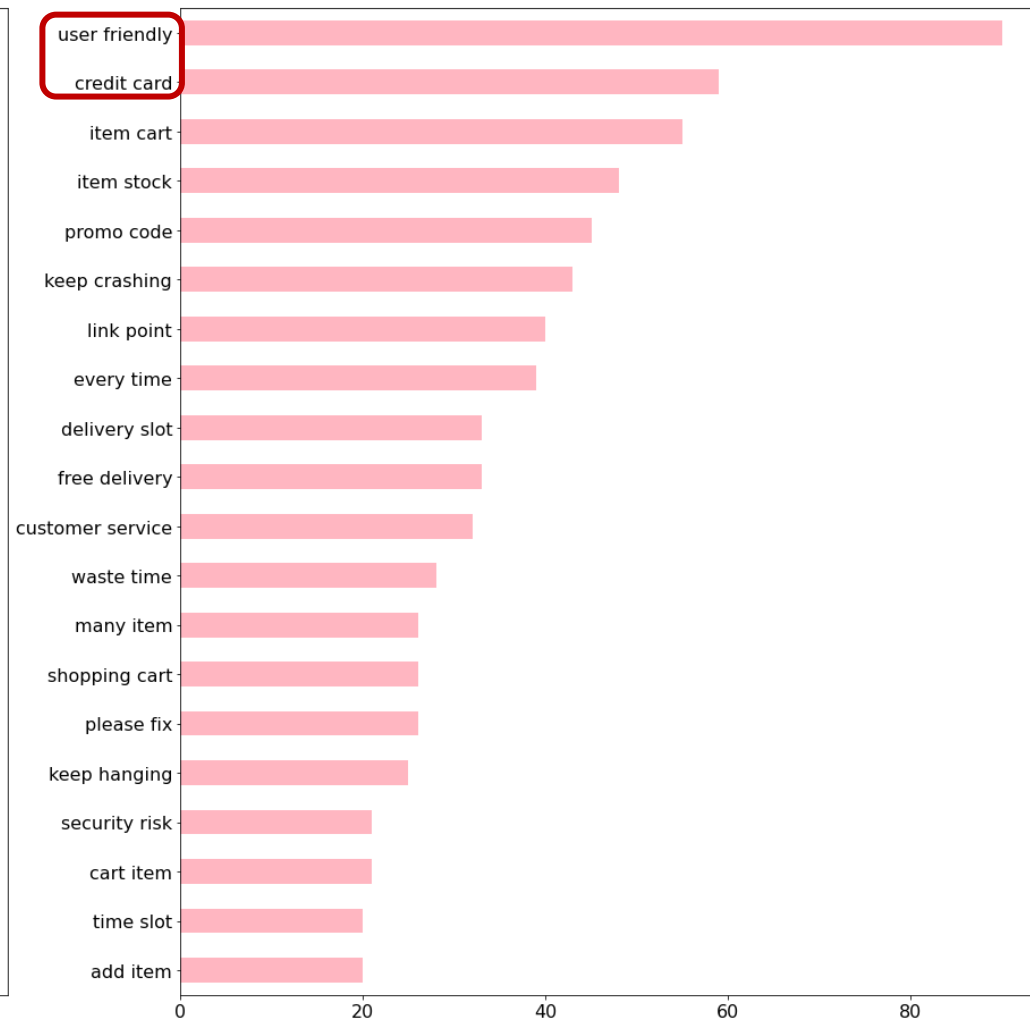
CLASSIFICATION MODEL - EVALUATION

Model evaluation metrics:

- Accuracy *(rate of correct classification)*
- Recall *(how well the model predicts positive class [negative reviews])*
- ROC AUC Score *(how well the model discriminates positive vs. negative class)*

	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

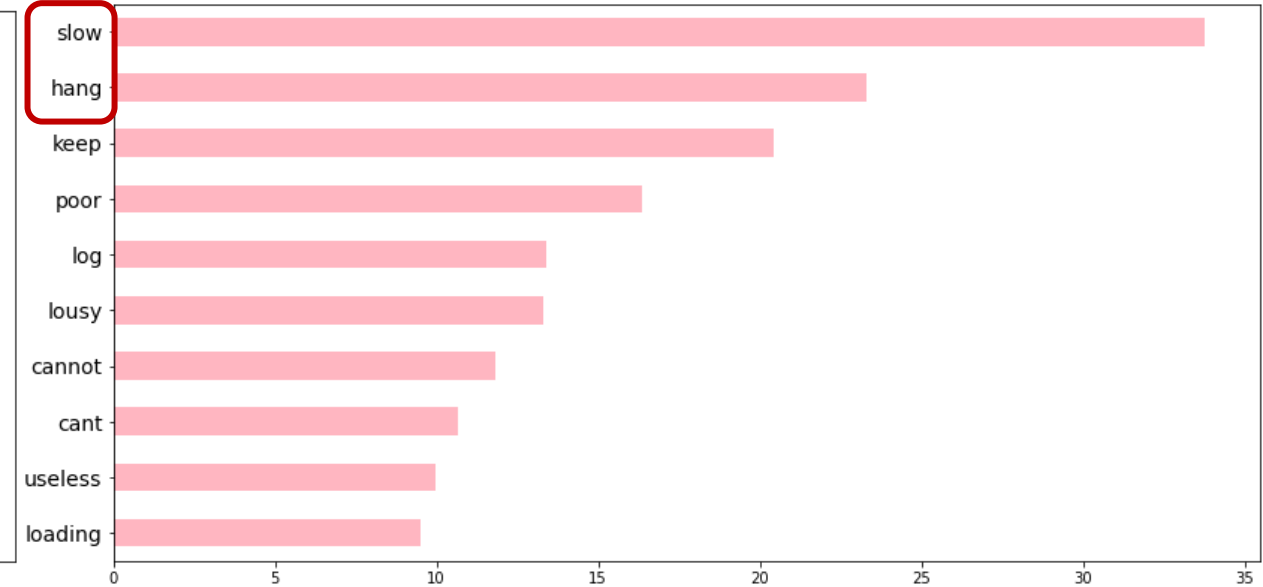|	Train accuracy	Test Accuracy	Recall	ROC AUC Score
Voting classifier *(MultinomialNB-Tfidf & Logistic Regression-Tfidf)*	0.92	**0.88**	**0.89**	0.94
MultinomialNB with TfidfVectorizer *(with VADER positive score as additional feature)*	0.91	0.88	0.88	0.94
LSTM	0.90	0.88	0.85	0.94
MultinomialNB with 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
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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
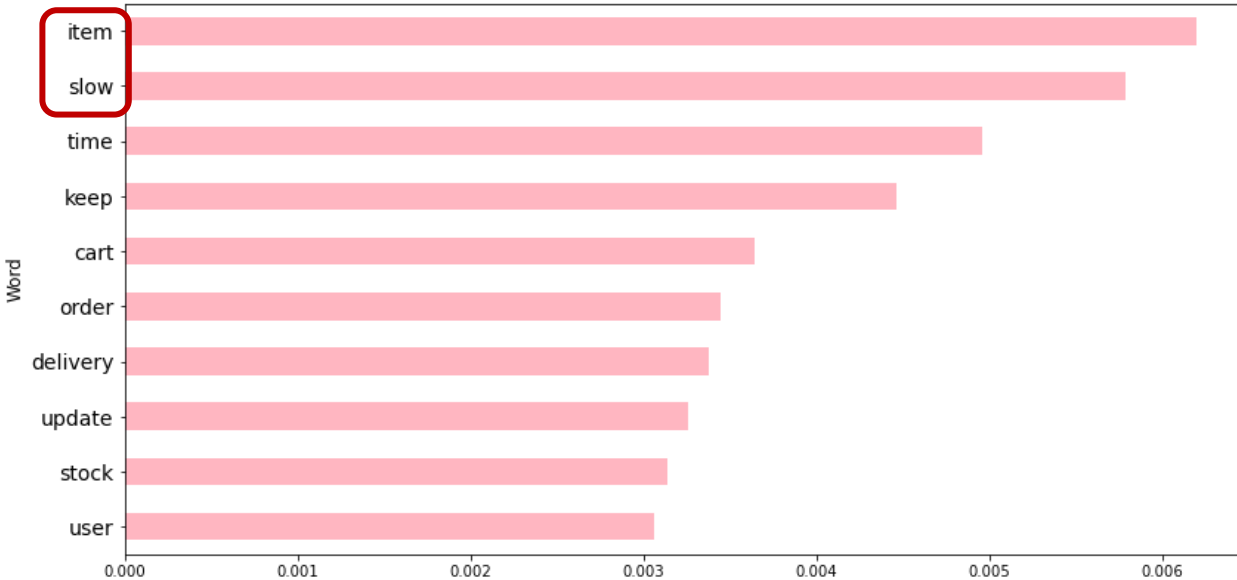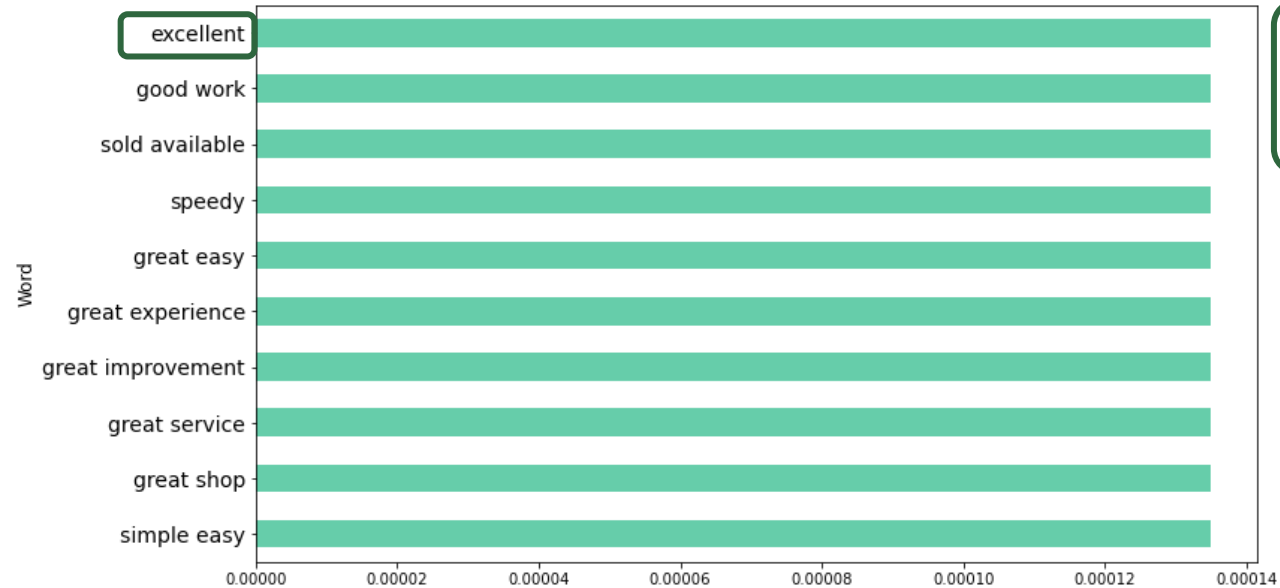
Logistic Regression with TfidfVectorizer's Top 10 Most Predictive Words for Negative Reviews
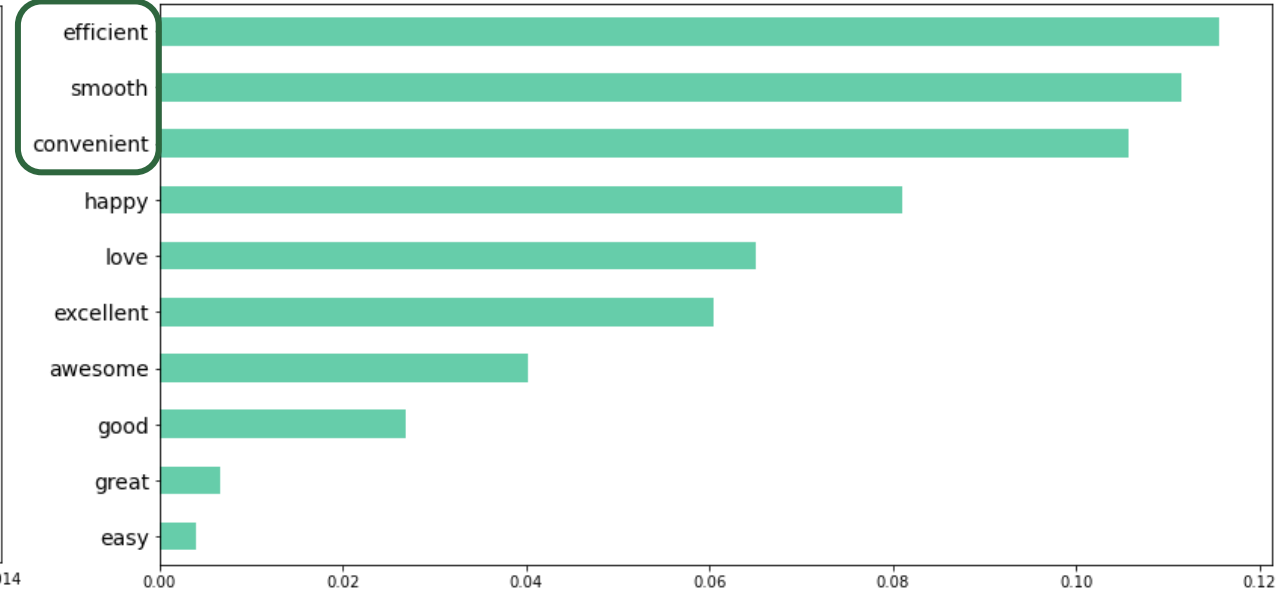
MOST PREDICTIVE WORDS FOR POSITIVE REVIEWS
VOTING CLASSIFIER (MULTINOMIAL NB-TFIDF & LOGISTIC REGRESSION-TFIDF)

MultinomialNB with TfidfVectorizer's Top 10 Most Predictive Words for Positive Reviews
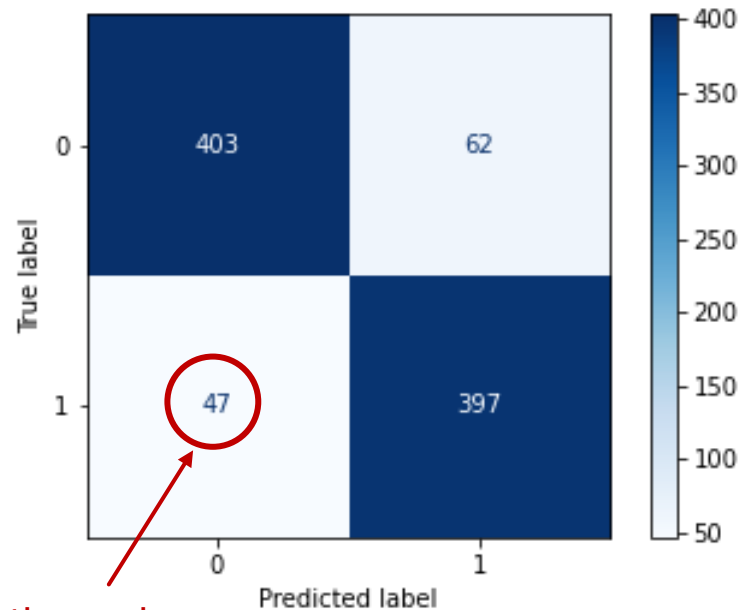
Logistic Regression with TfidfVectorizer's Top 10 Most Predictive Words for Positive Reviews
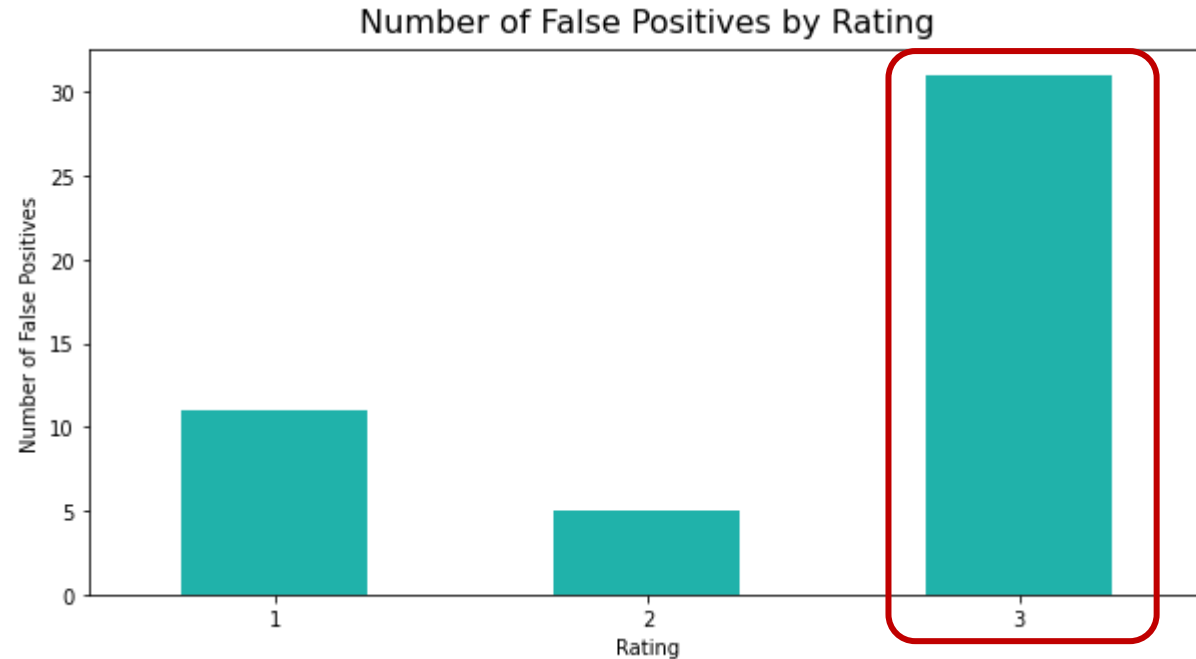
LIMITATIONS
NEUTRAL REVIEWS WITH SUGGESTIONS MISCLASSIFIED AS NEGATIVE REVIEWS

Negative reviews misclassified as positive reviews

Number of False Positives by Rating

"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

Intertopic Distance Map (via multidimensional scaling)

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."*

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."*

Marginal topic distribtion

2%
5%
10%

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USER JOURNEY MAPPING

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

Negative

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

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.

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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