

# **CLASSIFICATION AND VISUALIZATION OF TWITTER SENTIMENT ANALYSIS TOWARDS ONLINE FOOD DELIVERY SERVICES IN MALAYSIA**

**NUR SHAHIRAH BINTI JAILANI**

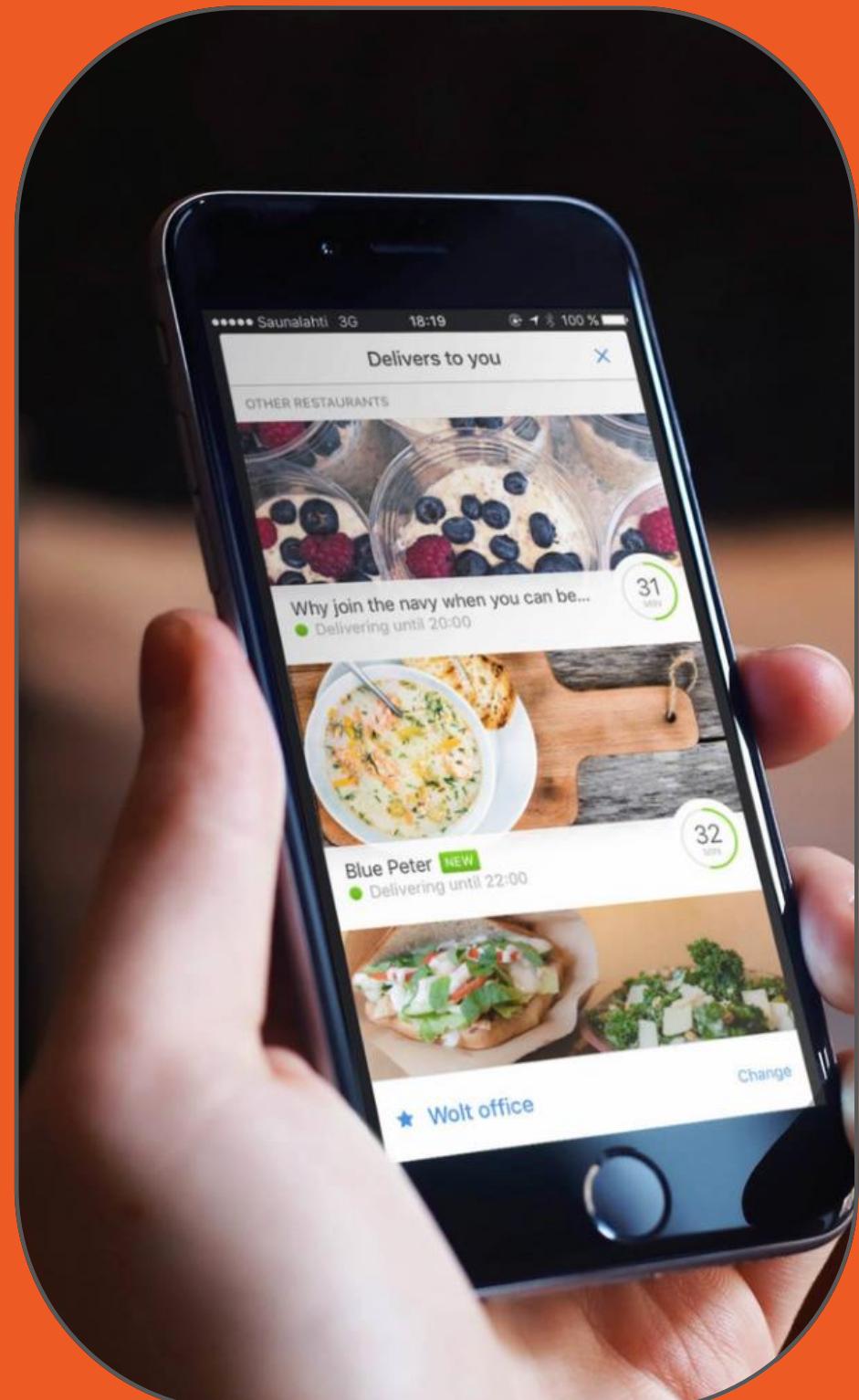
**2021115393**

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**LECTURER'S NAME:**

**DR SITI FEIRUSZ BINTI AHMAD FESOL**



# BACKGROUND OF STUDY

## SOCIAL MEDIA

One of important platform that allow users to quickly obtain information and share their opinions on products and services on a big scale in real-time



## TWITTER

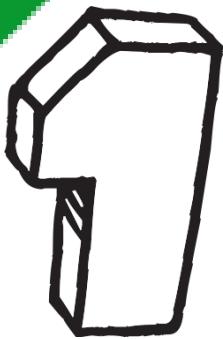
Twitter is a popular method for Malaysians to voice their thoughts and views about the use of online food delivery



## ONLINE FOOD DELIVERY

Online food delivery industry also want to know their customers' opinions about their service





- Time-consuming and difficult to compare Malaysia's online food delivery (OFD) services manually. Most customers are drawn to O2O platforms because of the inexpensive pricing and their ability to compare costs (Cheong & Law, 2022)
- A survey has been conducted towards 113 respondents
- 91.2% agreed that it is time-consuming to compare to find the best online food delivery services manually



- Online reviews usually available in English. Not all reviews in other languages are analyzed, which could lead to inaccurate results (Rasmussen & Montgomery, 2018)

# OBJECTIVES



1

To design a web application system that can classify Twitter sentiment analysis on Malaysia's best online food delivery based on customer satisfaction using Naïve Bayes and visualize the result

2

To develop the designed system

3

To test the functionality and usability of the system

4

## TARGET AUDIENCE

The users that are being targeted are current and future users of online food delivery in Malaysia.

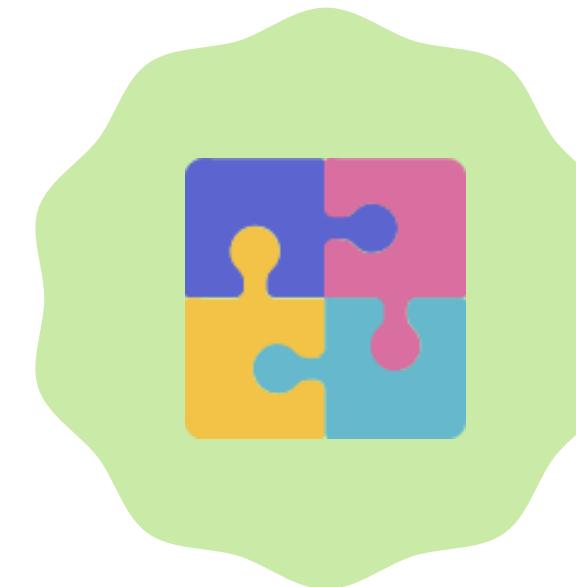
## FEATURES OF THE SYSTEM

- Web-based application written in Python
- Obtained from Twitter social platform in bilingual English and Bahasa Malaysia
- Dated from January 1st, 2022, to December 31st, 2022

## 5 FACTORS WILL BE FOCUSED ON

- Δ Affordable price
- Δ Promotion and discount
- Δ Review rating
- Δ Delivery time
- Δ Condition of food delivered

# PROPOSED SOLUTION



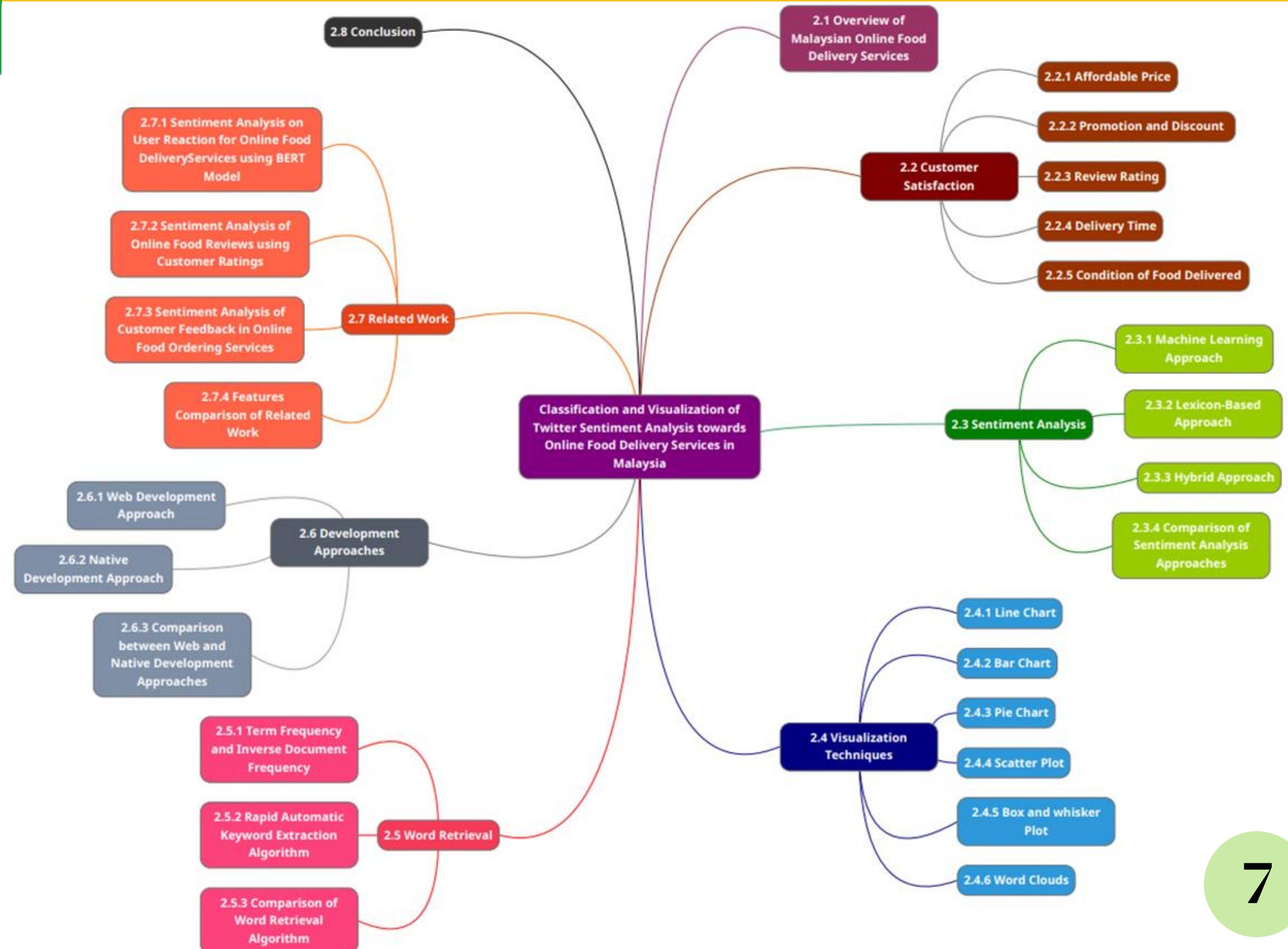
This system enables the user to compare online food delivery based on their preferences among other online food delivery services



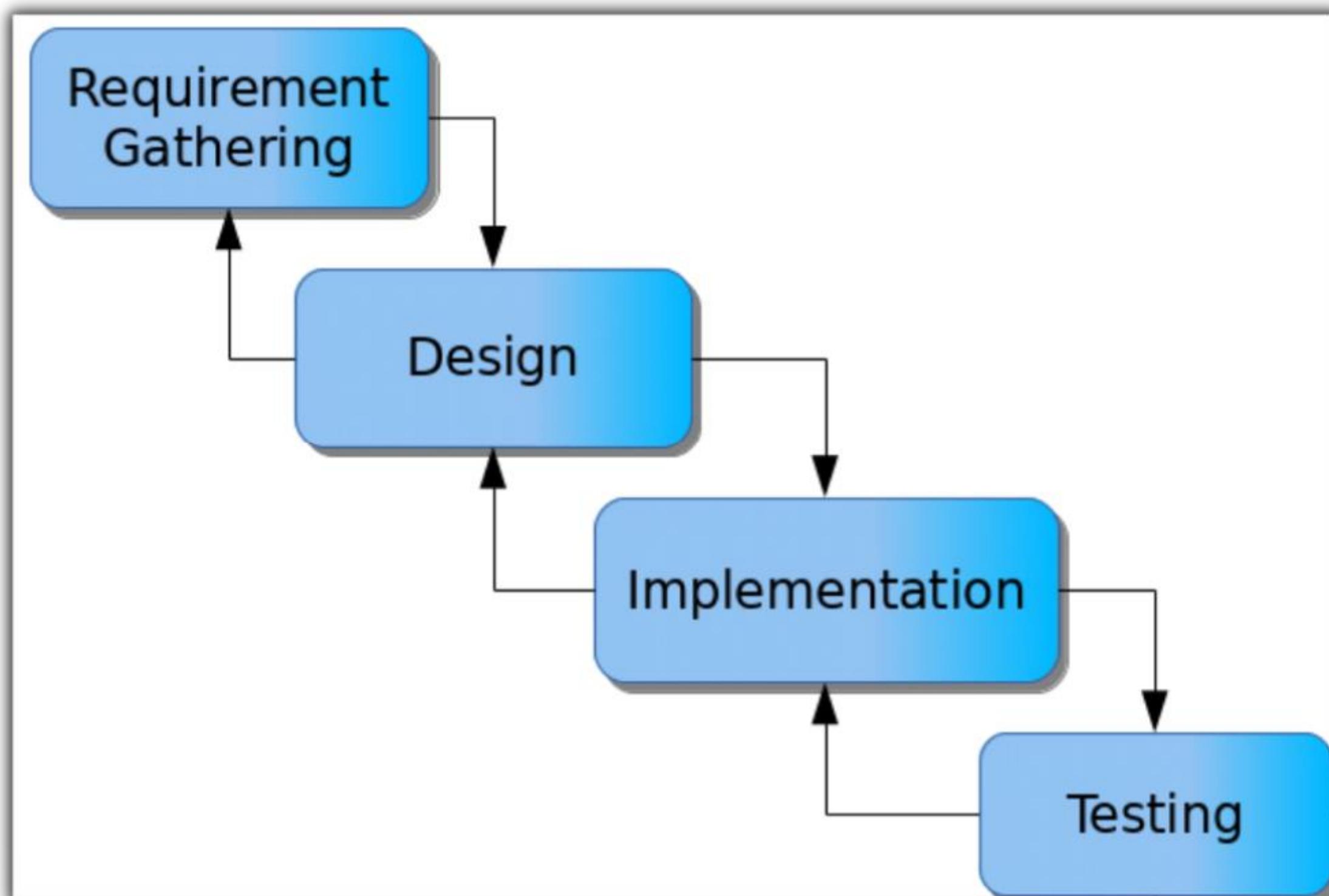
This system can assist Malaysian online food delivery in visualizing its reputation and competing among three online food delivery services: Foodpanda, GrabFood and ShopeeFood

## The Outline of Literature Review for Comparison of OFD services in Malaysia

# LITERATURE REVIEW



# METHODOLOGY



Modified Waterfall  
Methodology

## CHAPTER 3 METHODOLOGY

# PHASES IN MODIFIED WATERFALL METHODOLOGY

Phase	Activities	Deliverable		
Requirement	<ul style="list-style-type: none"> <li>▪ Identify the area and the purpose of the proposed system implementation</li> <li>▪ Set the project title</li> <li>▪ Define the problem statements</li> <li>▪ Identify the objectives, scope, and significance of this project</li> <li>▪ Develop the Gantt Chart</li> </ul>	<b>Chapter 1: Introduction</b> <ul style="list-style-type: none"> <li>▪ Background of Study</li> <li>▪ Problem Statements</li> <li>▪ Project Objectives</li> <li>▪ Project Scope</li> <li>▪ Project Significances</li> <li>▪ Survey Questionnaires</li> <li>▪ Gantt Chart</li> </ul>	Implementation	<ul style="list-style-type: none"> <li>▪ Data collection of English and Malay models for training and testing sets</li> <li>▪ Collection of data for real-world implementation</li> <li>▪ Data pre-processing</li> <li>▪ Develop the Naïve Bayes Model</li> <li>▪ Data visualization</li> <li>▪ Build a system prototype</li> <li>▪ Apply the Naïve Bayes Model on top of the system prototype</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Collect all relevant information for the project</li> <li>▪ Review existing journal, article, and book</li> <li>▪ Review the existing related projects</li> </ul>	<b>Chapter 2: Literature Review</b> <ul style="list-style-type: none"> <li>▪ Overview of Malaysian OFD Services</li> <li>▪ Customer Satisfaction</li> <li>▪ Sentiment Analysis</li> <li>▪ Visualization Technique</li> <li>▪ Word Retrieval Algorithm</li> <li>▪ Development Approaches</li> <li>▪ Related Work</li> </ul>		
Design	<ul style="list-style-type: none"> <li>▪ Identify project methodology</li> <li>▪ Define the technique and procedure for the development of the proposed system</li> <li>▪ Identify the approach of research design</li> </ul>	<b>Chapter 3: Methodology</b> <ul style="list-style-type: none"> <li>▪ Modified Waterfall Methodology</li> <li>▪ Flowchart</li> <li>▪ Use Case</li> <li>▪ User Interface Design</li> <li>▪ Research Design</li> </ul>	Testing	<ul style="list-style-type: none"> <li>▪ Test all available functions to ensure all requirements are met and work well together</li> <li>▪ Conduct system acceptance testing, including the functionality and usability test</li> </ul>

## Classification and Visualization of Twitter Sentiment Analysis towards Online Food Delivery Services in Malaysia

Assalamualaikum, I am Nur Shahirah binti Jailani and I am currently pursuing Degree in Bachelor of Computer Science (Hons.) at Universiti Teknologi MARA (UITM). My research study proposes about Online Food Delivery Services in Malaysia.

This survey is an initiative form to gather information for subject Project Formulation (CSP600). It is aimed specifically at people interested in ordering to online food delivery service or who have already ordered. I would appreciate it if you could spend a few minutes answering this survey.

Your privacy is considered to be paramount and the information you provide will be held securely and used ONLY for the purpose of this research. All data will be anonymous and will be destroyed at the completion of the research. I really appreciate your cooperation in contributing your time to answer these survey questions.

May the kindness you spread keep returning to you. Thankyou!

 nshahirah567@gmail.com (not shared) [Switch accounts](#)

\*Required

Q1. During the comparing process to choose THE BEST online food delivery services, do you agree that it was time-consuming to review the company's reputation? \*

- Yes
- No

Q2. Have you ever facing a problem regarding online food delivery services? \*

- Yes
- No

Q3. Which of the following is/are the problem(s) that you are facing when choosing online food delivery services (OFDS) ? (you may choose more than one answer) \*

- Finding the OFDS that provide the cheapest delivery cost
- Finding the OFDS that provide the best promotion and discount
- Finding the OFDS that provide the fastest delivery time
- Finding the OFDS that have highest rating
- Finding the OFDS that provide the good condition of the delivered food

Q4. Which of the following method that are you referring to before choosing the online food delivery services (OFDS) ? \*

- Check online information related to the OFDS
- Check online reviews related to the OFDS
- Check the online food delivery application
- Compare available shops in online food delivery application
- Get an opinion from a friend(s)
- Other: \_\_\_\_\_

Q5. If you need to choose one online food delivery services, why do you choose that particular services? (you may choose more than one answer) \*

- Affordable price
- Promotion and discount
- Quality of the food
- Delivery time
- Condition of food delivered
- Review rating
- Security and privacy
- Wide selection of shop

Q6. In your opinion, which of the following is THE BEST online food delivery services in Malaysia? \*

- GrabFood
- Foodpanda
- ShopeeFood
- Airasia Food
- EASI (Hungry)
- Bungkusit
- DeliveryEat
- LOLOL
- GemSpot
- Beep Delivery
- Tapau
- OdaMakan

Q7. In your opinion, is it good if there is a Web-based platform that can show you visually the reviews and compare Malaysia's existing online food delivery services? (Using graph, word cloud and pie chart) \*

- Yes
- No

Q8. Why do you think so? (referring Q7) \*

Your answer

Submit

Clear form

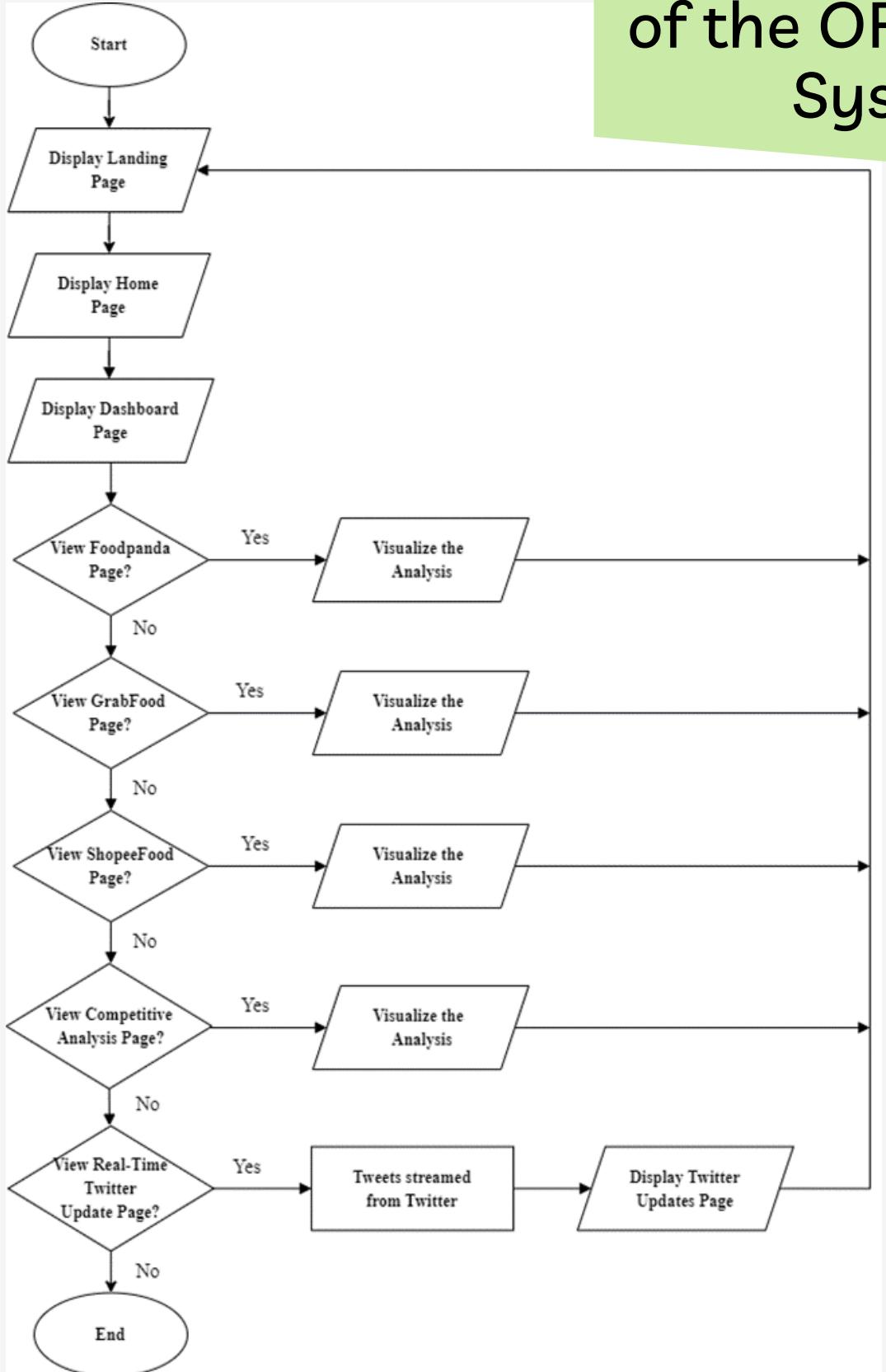
# REQUIREMENT PHASE

Gantt Chart

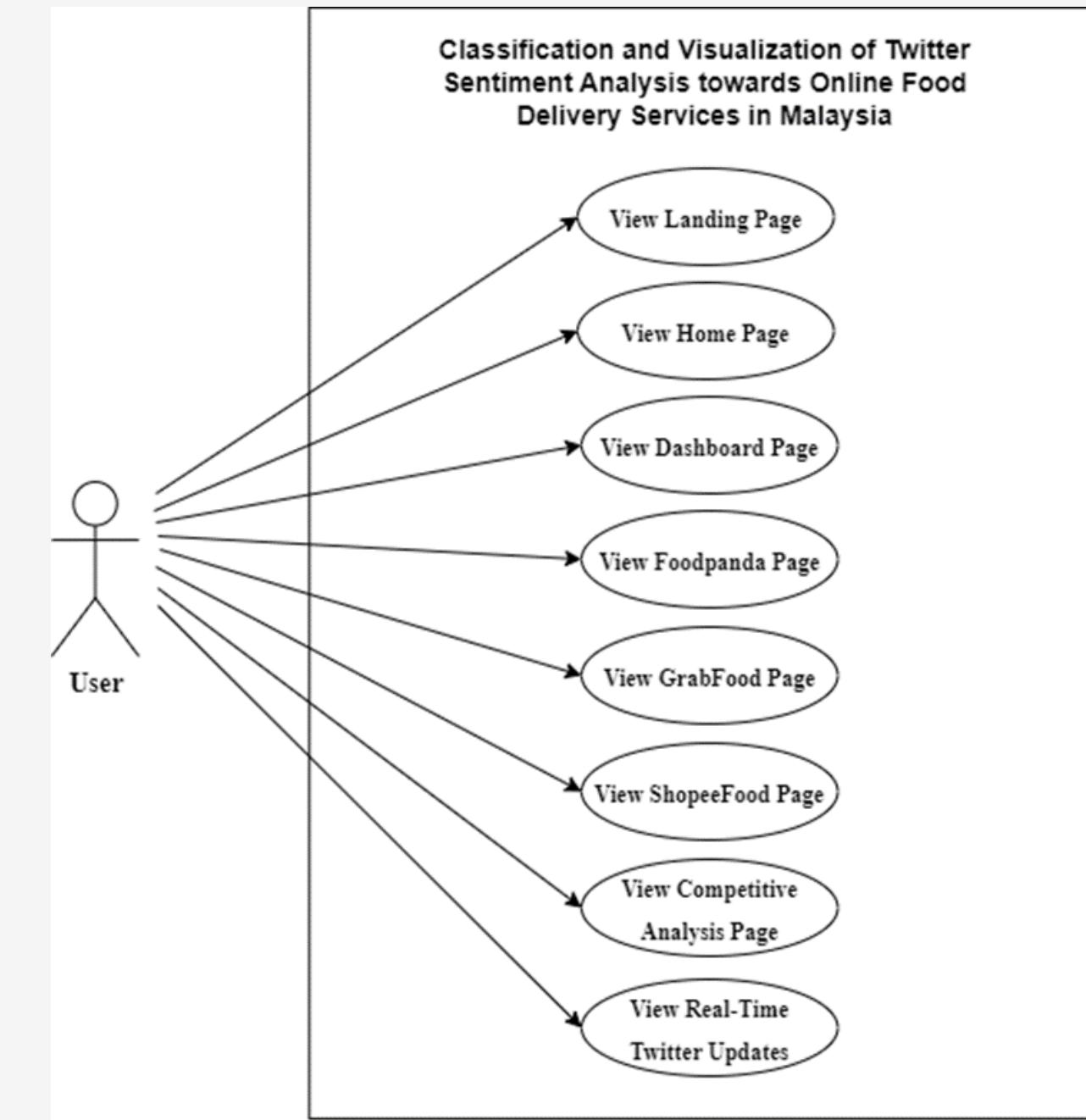
CSP600 Gantt Chart														
Description	Week													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mutual Acceptance Form (F1)														
Proposal Outline Form (F2)														
Writing Chapter 1														
Chapter 1 Submission														
Writing Chapter 2														
Chapter 2 Submission														
Literature Review Evaluation Form (F3)														
Writing Chapter 3														
Chapter 3 Submission														
Methodology Evaluation Form (F4)														
Plagiarism Checking														
Proposal Presentation and Submission														
Q & A Session with Supervisor and Examiner														

CSP650 Gantt Chart														
Description	Week													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Develop Prediction Model														
Data Collection														
Data Transformation														
Accuracy Testing of Prediction Model Data														
Develop Interfaces														
Develop Decision Support System														
System Testing														
Writing Chapter 4														
Writing Chapter 5														
Writing Chapter 6														
Plagiarism Checking														
Presentation and Submission of Full Report														
Q & A Session with Supervisor and Examiner														

Flowchart Diagram  
of the OFD Overall  
System



Use Case Diagram  
of the System



# DESIGN PHASE

User Interface  
Design



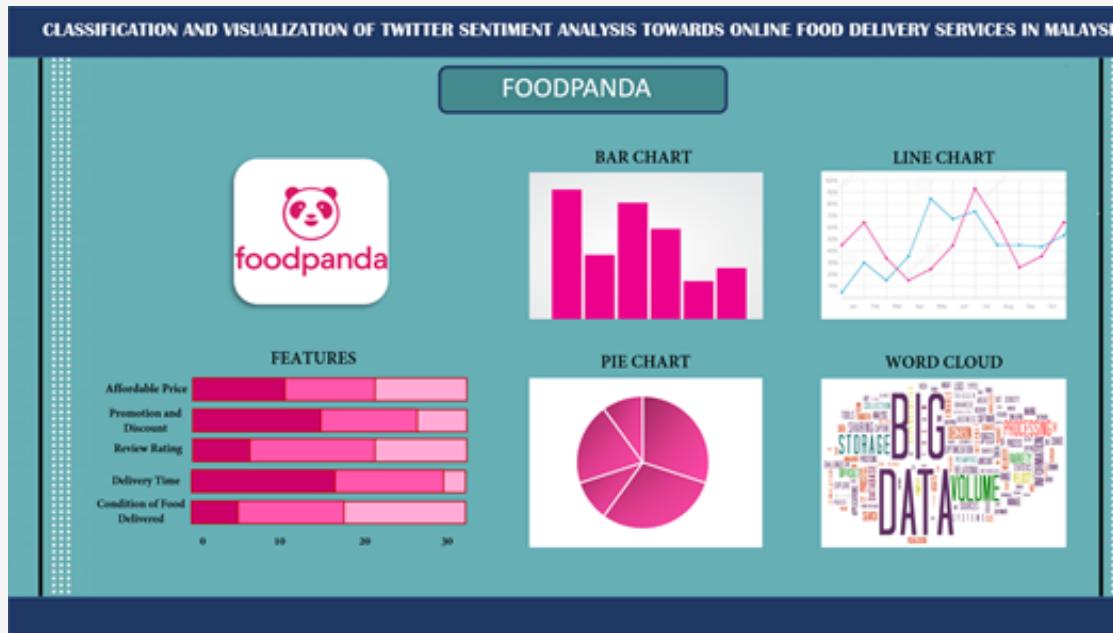
Landing Page



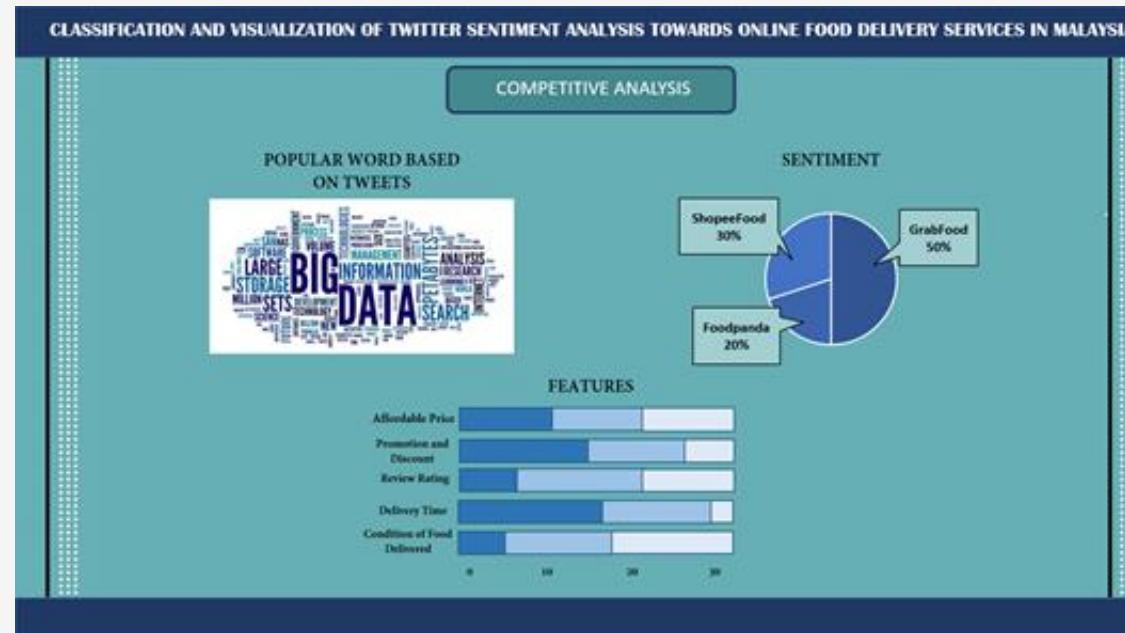
Home Page



Dashboard Page



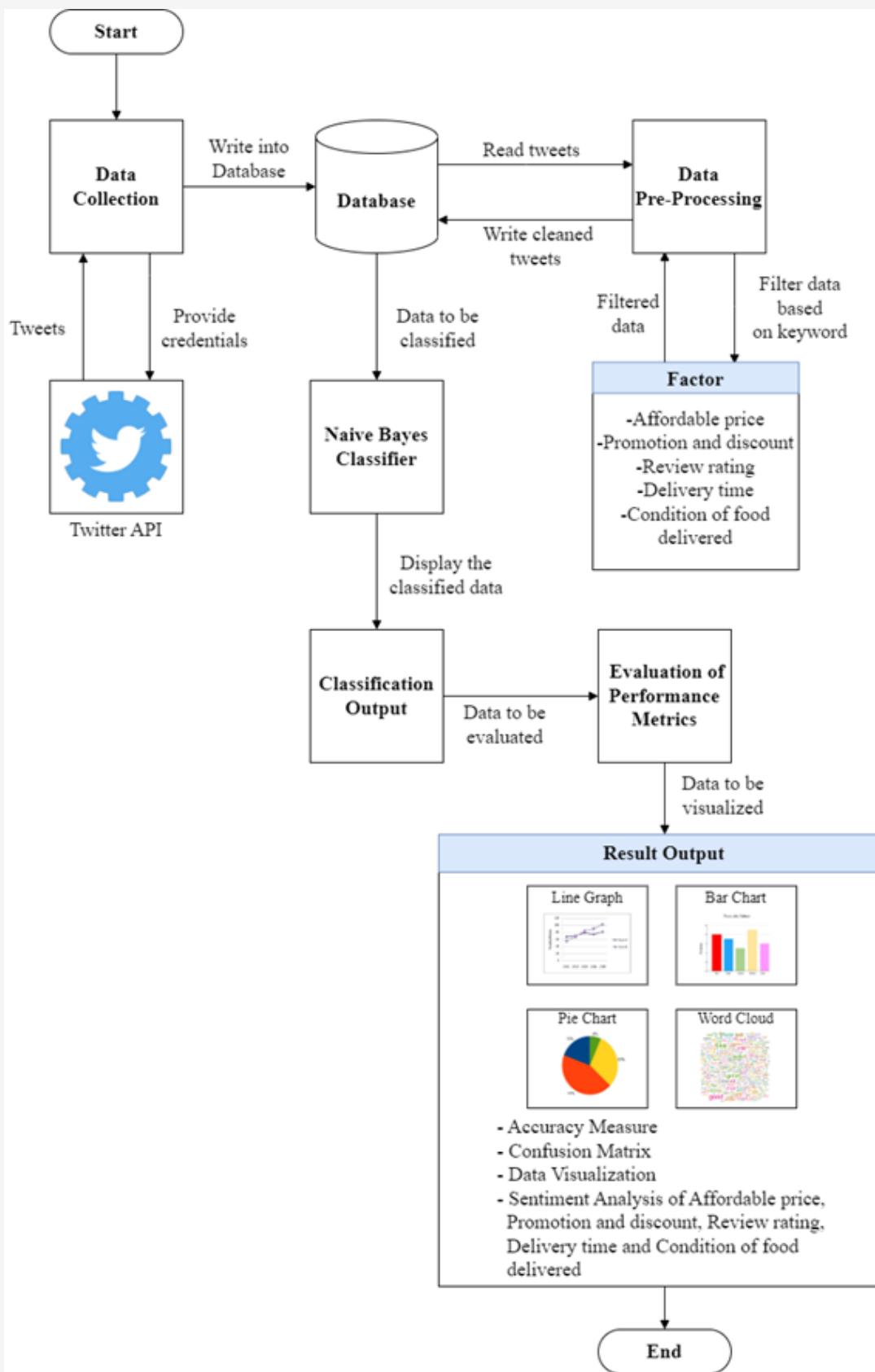
Individual OFD Page



Competitive Analysis  
Page



Real Time Twitter  
Page



- The process starts with data collection. The data is collected from Tweets using Snscreape and Twitter API is given credentials. The data that have been collected is written to the database. Data in the database need to be pre-processed then the cleaned data is written back to the database. During data pre-processing, data will be filtered based on keyword for each factor which are affordable price, promotion and discount, review rating, delivery time and condition of food delivered. Next, data to be classify will undergo the classification process using Naïve Bayes Classifier.
- After classification, data visualization is implemented using Plotly. The data will be visualized using four data visualization techniques which are bar chart, line graph, pie chart and word cloud. Lastly, the tweet produced an accuracy measures and a confusion matrix.

Software	Description
Draw io	To create a flowchart and use a case diagram
Jupyter Notebook	As the IDE for data pre-processing and model development
Microsoft Excel	To perform data pre-processing
Microsoft Powerpoint	To create user interface design
Microsoft Word	To write the project report and Gantt Chart to visualize the progress of the project
Notepad++	As the IDE for application development using Hypertext Markup Language (HTML)

## Software Requirement

Hardware	Description
Laptop Model	Aspire A514-52G
Processor	Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz 2.11 GHz
Operating System	Windows 11
Memory (RAM)	12.00 GB
Hard Disk Drive (HDD)	500 GB
Solid State Drive (SSD)	1.00 TB
System Type	64-bit

## Hardware Requirement

## List of Functionality Test Cases

Test Case	Expected Result	Success / Failure
View Landing Page	The system will display the landing page of the OFD services	
View Home Page	The system will display the home page of the OFD services which contain the history of each OFD	
View Dashboard Page	The system will display the dashboard page of the OFD services. This page will show total sentiment dataset for all three OFD, pie chart of sentiment as well as a bar chart that summarizes the results of the analysis performed on all three OFD based on factors	
View Foodpanda Page	The sentiment analysis on the Foodpanda is portrayed, and the data are visualized through data visualization techniques on the Foodpanda page	
View GrabFood Page	The sentiment analysis on the GrabFood is portrayed, and the data are visualized through data visualization techniques on the GrabFood page	
View ShopeeFood Page	The sentiment analysis on the ShopeeFood is portrayed, and the data are visualized through data visualization techniques on the ShopeeFood page	
View Competitive Analysis Page	The system will visualize the comparison of sentiment between the OFD to the user	
View Real-Time Twitter Updates Page	The real-time updates of Twitter OFD services updates are illustrated to the user	

## The System Usability Scale Questions

Number	Overall Reaction of the System	Scale				
		1	2	3	4	5
1	I think that I would like to use this system frequently					
2	I found the system unnecessarily complex	1	2	3	4	5
3	I thought the system was easy to use	1	2	3	4	5
4	I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5	The interface of this system is pleasant	1	2	3	4	5
6	The content presented was not in the right format	1	2	3	4	5
7	I can navigate to other pages easily	1	2	3	4	5
8	I found the system very awkward to use	1	2	3	4	5
9	I found this system was meaningful	1	2	3	4	5
10	Overall, I am not satisfied with this system	1	2	3	4	5

## Data Collection

```
import snscrepe.modules.twitter as sntwitter
import pandas as pd

pd.options.display.max_colwidth =500

query = "(foodpanda) lang:en OR lang:id until:2022-12-31 since:2022-01-01"
tweets = []
limit = 200

%time
try:
    print("Start crawling")
    for tweet in sntwitter.TwitterSearchScraper(query=query).get_items():
        if len(tweets) == limit:
            break
        else:
            tweets.append([tweet.date, tweet.user.username, tweet.user.displayname, tweet.content, tweet.lang, tweet.url])
    df = pd.DataFrame(tweets, columns=[ 'Date Created', 'Username', 'Name', 'Tweets', 'Language', 'Url'])
except Exception as e:
    print(e)

print("Finished")
print("-----")
```

- The dataset for the three online food delivery services, which are Foodpanda, GrabFood, and ShopeeFood, was obtained from Twitter by utilizing a Python Twitter scraping application known as Snscrepe
- The time range covered by the gathered tweets is from January 1, 2022, to December 31, 2022
- The total of raw data collected in English and Malay is 4,677, with 1,922 data collected for Foodpanda, 1,640 data collected for GrabFood, and 1,115 data collected for ShopeeFood
- The raw data includes six variables, including the date the tweet was created, the username, the name, the tweet, the language, and the URL link

## Text Pre-Processing

```
import re
def text_cleaning(Tweets):
    Tweets = str(Tweets).lower() #convert to Lowercase
    Tweets = re.sub(r'\&\w*', '', Tweets) #remove HTML special entities (e.g. &amp;)
    Tweets = re.sub('((www\.[^s]+)|(https?://[^s]+))', '', Tweets) #remove URLs
    Tweets = re.sub('@[^s]+', '', Tweets) #remove usernames
    Tweets = re.sub(r'\$\$\\w*', '', Tweets) #remove stickers
    Tweets = re.sub(r'#\\w*', '', Tweets) #remove hashtags
    Tweets = re.sub(r'[\w\s]', ' ', Tweets) #remove punctuation
    Tweets = re.sub('[(!)!?!]', ' ', Tweets)
    Tweets = re.sub('\[.*?\]', ' ', Tweets)
    Tweets = re.sub(r'https?:\/\/.*\/\w*', '', Tweets) #remove hyperlinks
    Tweets = Tweets.lstrip(' ') #remove single space infront of the tweet
    Tweets = re.sub(r'\b\w{1,2}\b', '', Tweets) #remove words with 2 or fewer letters
    Tweets = re.sub('[0-9]+', '', Tweets)

    Tweets = Tweets.split()
    Tweets = [word for word in Tweets if not word in set(stopwords.words('english')) | set(stopwords.words('indonesian'))]
    Tweets = ' '.join(Tweets)

    # remove characters beyond Basic Multilingual Plane (BMP) of unicode
    # (contains characters for almost all modern Languages, and a Large number of symbols):
    Tweets = ''.join(c for c in Tweets if c <= '\uFFFF')
    return Tweets
#clean dataframe's text column
dfCSV['CleanTweets'] = dfCSV['Tweets'].apply(text_cleaning)
dfCSV.head(15)
```

- The completed dataset consists of only three columns, which are labelled data created, username, and tweet
- Text cleaning is conducted on the dataset by changing all characters to lowercase, characters such as emojis, punctuation marks, and excessive whitespace, were eliminated
- The elimination process includes removing terms such as links, hashtags, and mentions
- Stop words are removed from the data to reduce the dataset's dimensionality. Words such as “the”, “and”, “of”, and “on” are examples of stop words in the English language
- Words such as “ada”, “akan” and “bukan” are examples of stop words in the Indonesian language

## Text Pre-Processing

```
import string
def process_text(CleanTweets):
    nopunc = [char for char in list(CleanTweets) if char not in string.punctuation]
    nopunc = ''.join(nopunc)
    return [word for word in nopunc.lower().split() if word.lower() not in set(stopwords.words('english'))|
            set(stopwords.words('indonesian'))]

def remove_words (word_list):
    remove = ['com', 'pic', 'twitter', '...', '...', '...', '\\']
    return [w for w in word_list if w not in remove]

def lemmatize_tokenize(CleanTweets):
    lemmatizer = WordNetLemmatizer()
    return [lemmatizer.lemmatize(token) for token in word_tokenize(CleanTweets)]

# tokenize message column and create a column for tokens
dfCSV2 = dfCSV.copy()
dfCSV2['Tokens'] = dfCSV2['CleanTweets'].apply(process_text)
dfCSV2['Words'] = dfCSV2['Tokens'].apply(remove_words)
dfCSV2['Lemmatize'] = dfCSV2['CleanTweets'].apply(lemmatize_tokenize)
dfCSV2.head()
```

- The data were tokenized to produce a BOW, which refers to the process of separating the words from the remaining text
- Lemmatizing is the process of text normalization, which removes suffixes from the text. It cuts down on the total number of words, making the text even less three-dimensional

```
train, test = train_test_split(dfCSV, test_size=0.2, shuffle=False)
train
```

```
from sklearn import metrics
from sklearn.naive_bayes import MultinomialNB
from sklearn.naive_bayes import BernoulliNB
from sklearn.naive_bayes import GaussianNB
from sklearn.naive_bayes import ComplementNB
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.metrics import accuracy_score

vectorizer = TfidfVectorizer()
tfidf_text = vectorizer.fit_transform(train['cleanTweets'].fillna(' '))
Xdata = tfidf_text.toarray()
tf_df = pd.DataFrame(data = Xdata, columns = vectorizer.get_feature_names())
tf_df.head()
```

```
x = Xdata
ylabels = train['Analysis']

X_train, X_test, y_train, y_test = train_test_split(x, ylabels, test_size=0.2, random_state=45)

classifier = MultinomialNB()
classifier.fit(X_train, y_train)
ac = metrics.accuracy_score(y_test, classifier.predict(X_test))
print('Accuracy score = {:.2f}'.format(ac*100)+' %')
```

## Naïve Bayes Classification Model

- The data is divided into training and testing in the proportion of 80:20, with training data representing 80 percent of the whole data set and testing data making up the remaining 20 percent
- The expression “`classifier = MultinomialNB()`” is used as the training model for the Naive Bayes classification
- The model is constructed with the help of the code “`classifier.fit(X_train, y_train)`,” which is passed the `X_train`, which contains the feature vector, and the `y_train`, which contains the desired variable

Categorize for Five Factors

```

with open('/Users/User/Desktop/factor_foopanda2.csv', 'w') as out:
    flog = text
    price = ['cheap','expensive','mahal','affordable','murah','tax','delivery charge']
    out.write("cleanTweets \n")
    count1=0

    for line in flog:
        for fstr in price:
            if line.find(fstr) != -1:
                count1 = count1+1
                lines = [''.join(line) for line in line.split(' ')]
                line = ''.join(lines)
                out.write(line + "\n")
    print(count1)

    promotion = ['voucher','promotion','celebration','discount','reward']
    out.write("\n")
    count2=0
    for line in flog:
        for fstr in promotion:
            if line.find(fstr) != -1:
                count2 = count2+1
                lines = [''.join(line) for line in line.split(' ')]
                line = ''.join(lines)
                out.write(line + "\n")
    print(count2)

    review= ['bagus','senang','worth','disappointing','susah','uninstall','bad service','cancel']
    out.write("\n")
    count3=0
    for line in flog:
        for fstr in review:
            if line.find(fstr) != -1:
                count3 = count3+1
                lines = [''.join(line) for line in line.split(' ')]
                line = ''.join(lines)
                out.write(line + "\n")
    print(count3)

    deliverytime = ['fast','slow','lambat','cepat','laju']
    out.write("\n")
    count4=0
    for line in flog:
        for fstr in deliverytime:
            if line.find(fstr) != -1:
                count4 = count4+1
                lines = [''.join(line) for line in line.split(' ')]
                line = ''.join(lines)
                out.write(line + "\n")
    print(count4)

    condition= ['spill','tumpah','salah','wrong']
    out.write("\n")
    count5=0
    for line in flog:
        for fstr in condition:
            if line.find(fstr) != -1:
                count5 = count5+1
                lines = [''.join(line) for line in line.split(' ')]
                line = ''.join(lines)
                out.write(line + "\n")
    print(count5)

    factors=[count1,count2,count3,count4,count5]
    print(factors)

```

- Tweets that contained particular keywords were analyzed to see whether or not they were relevant to the multiple factors that were being considered for this categorization.

Landing Page

## Classification and Visualization of Twitter Sentiment Analysis towards Online Food Delivery Services in Malaysia

[Go to Home](#)



Home Page

≡  
 Home

## Classification and Visualization of Twitter Sentiment Analysis towards Online Food Delivery Services in Malaysia



### foodpanda

#### FOOD PANDA

Foodpanda Malaysia was established in 2012 as part of the on-demand international food delivery service. Since then, the company has seen exponential growth, especially in the past 3 years.

In October 2019, foodpanda launched groceries for the first time in Malaysia by partnering with some of



### GrabFood

#### GRAB FOOD

GrabFood officially launched their on-demand food delivery in Malaysia back in May 2018. Today, they're the second largest food delivery service provider. GrabFood features all types of F&B businesses, whether a start-up restaurant or a well-established eatery.



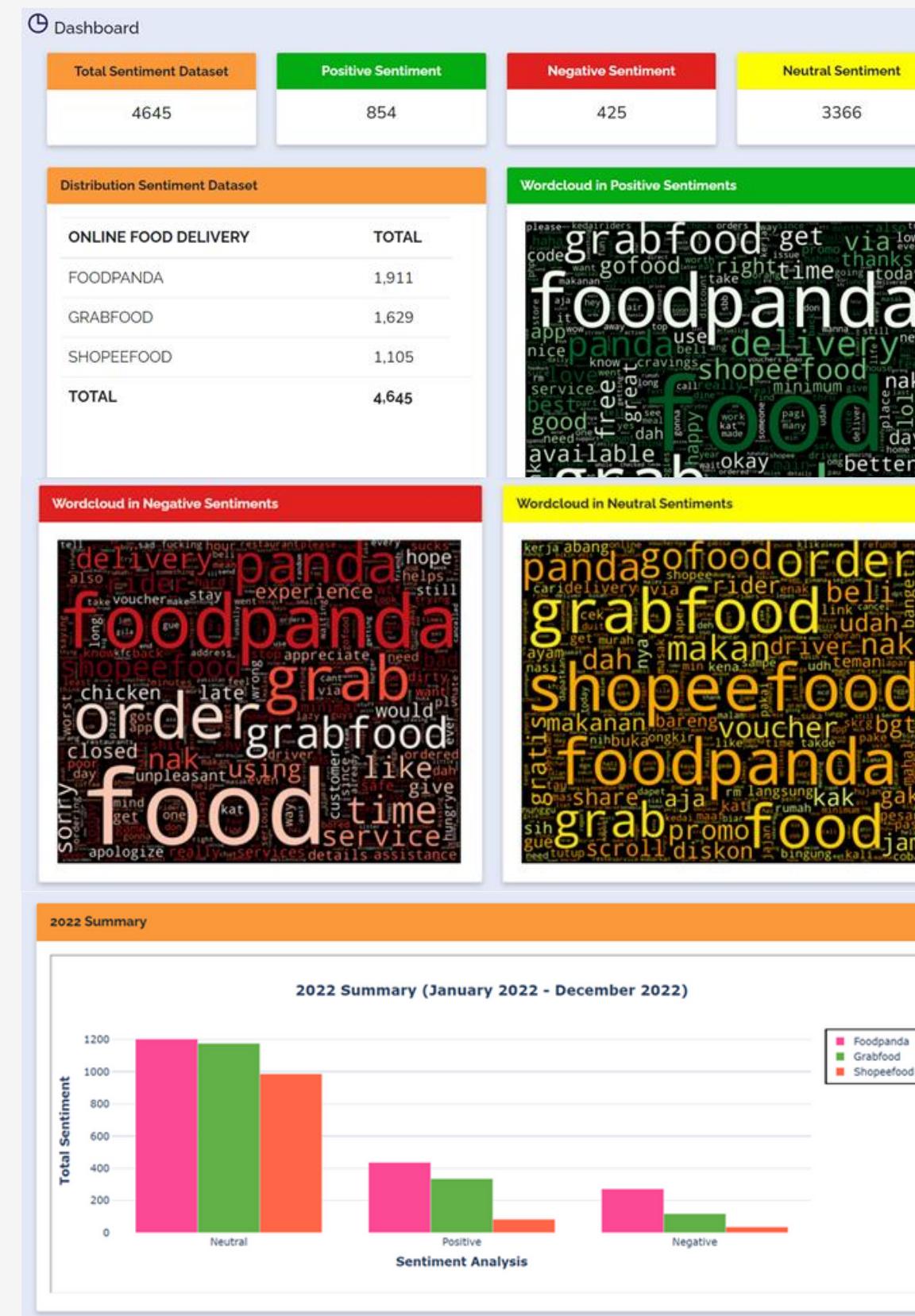
### ShopeeFood

#### SHOPEE FOOD

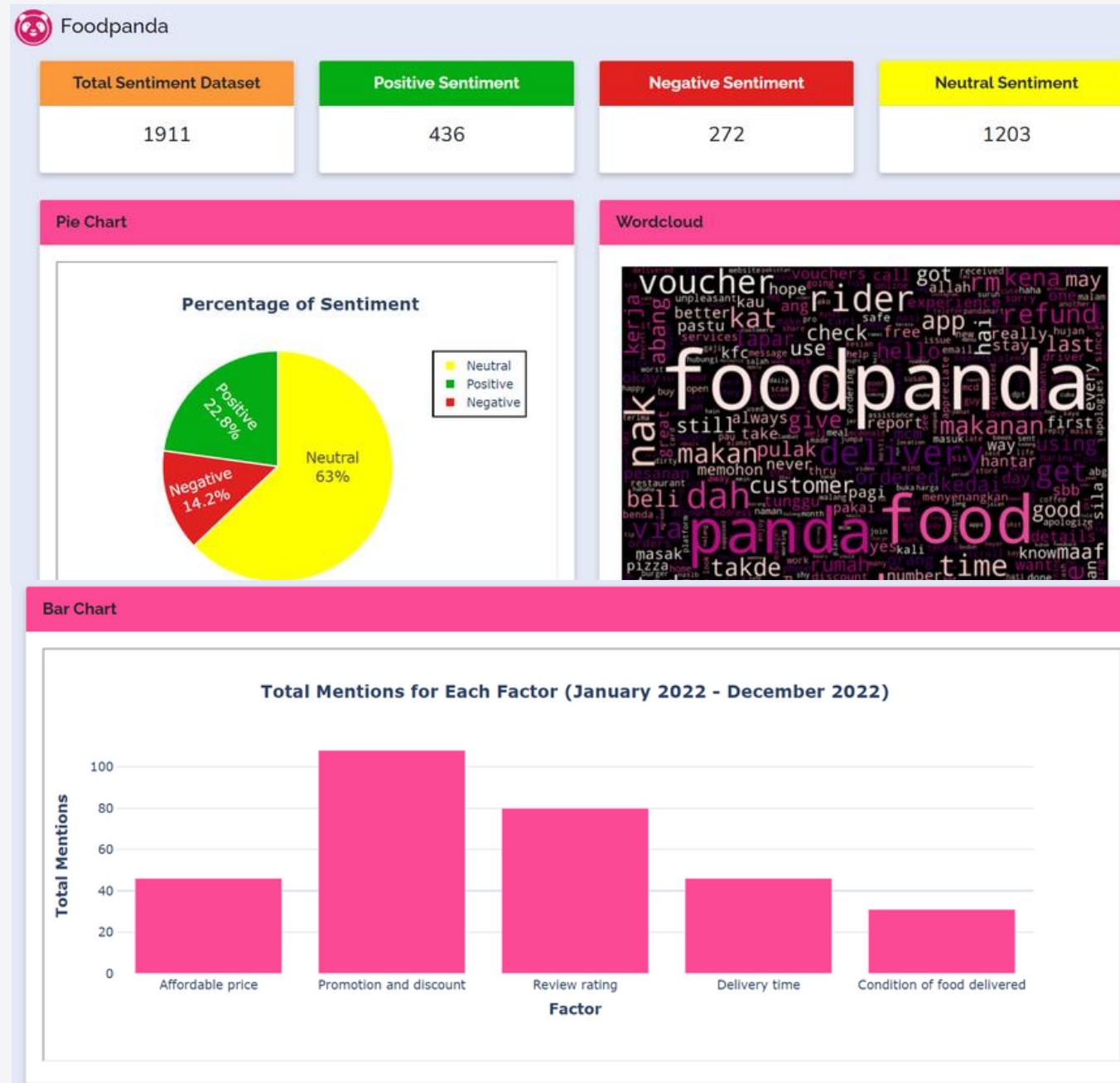
Shopee has expanded its services with the latest addition of ShopeeFood in Malaysia, accessible via the ShopeeFood icon on Shopee's homepage. Through this, users can shop for all their needs, including food delivery, on Shopee.

The service, which will be rolled out in batches, will

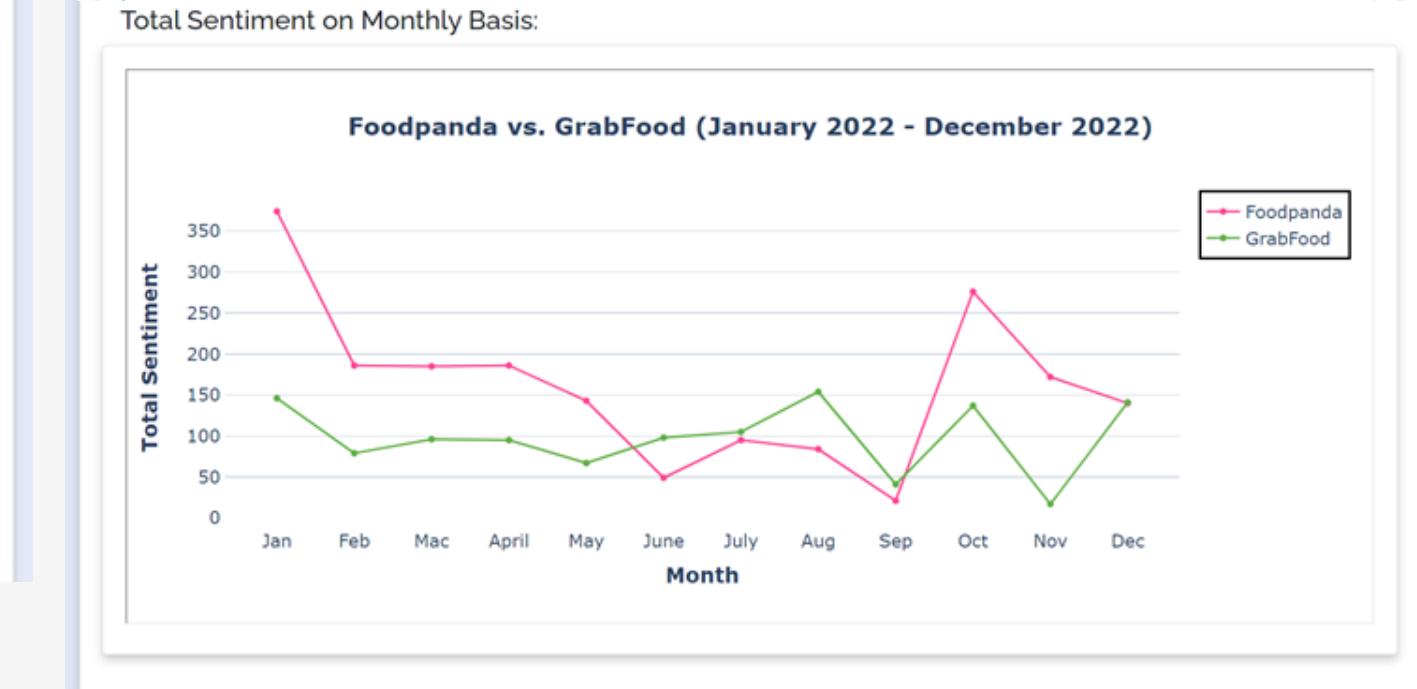
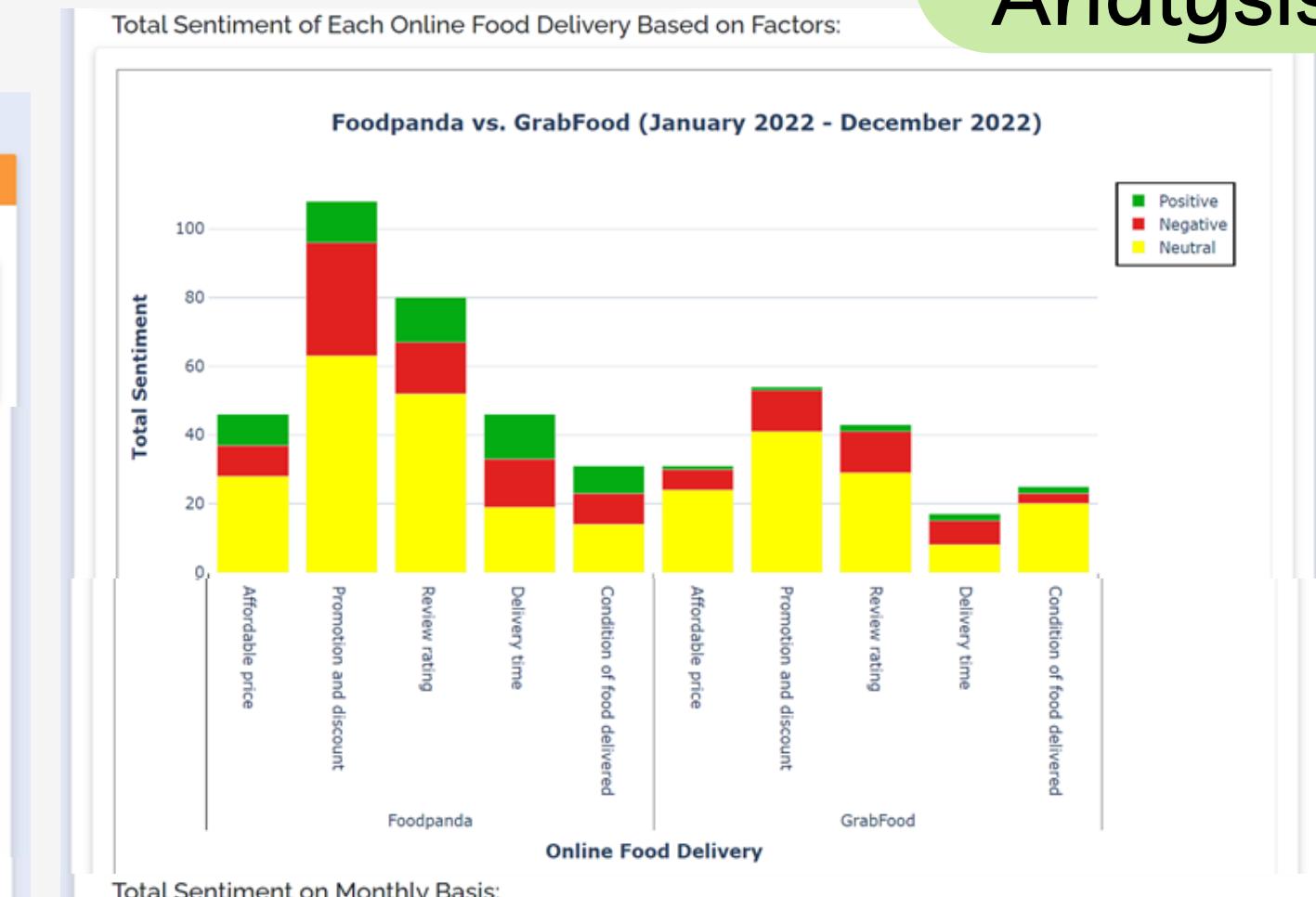
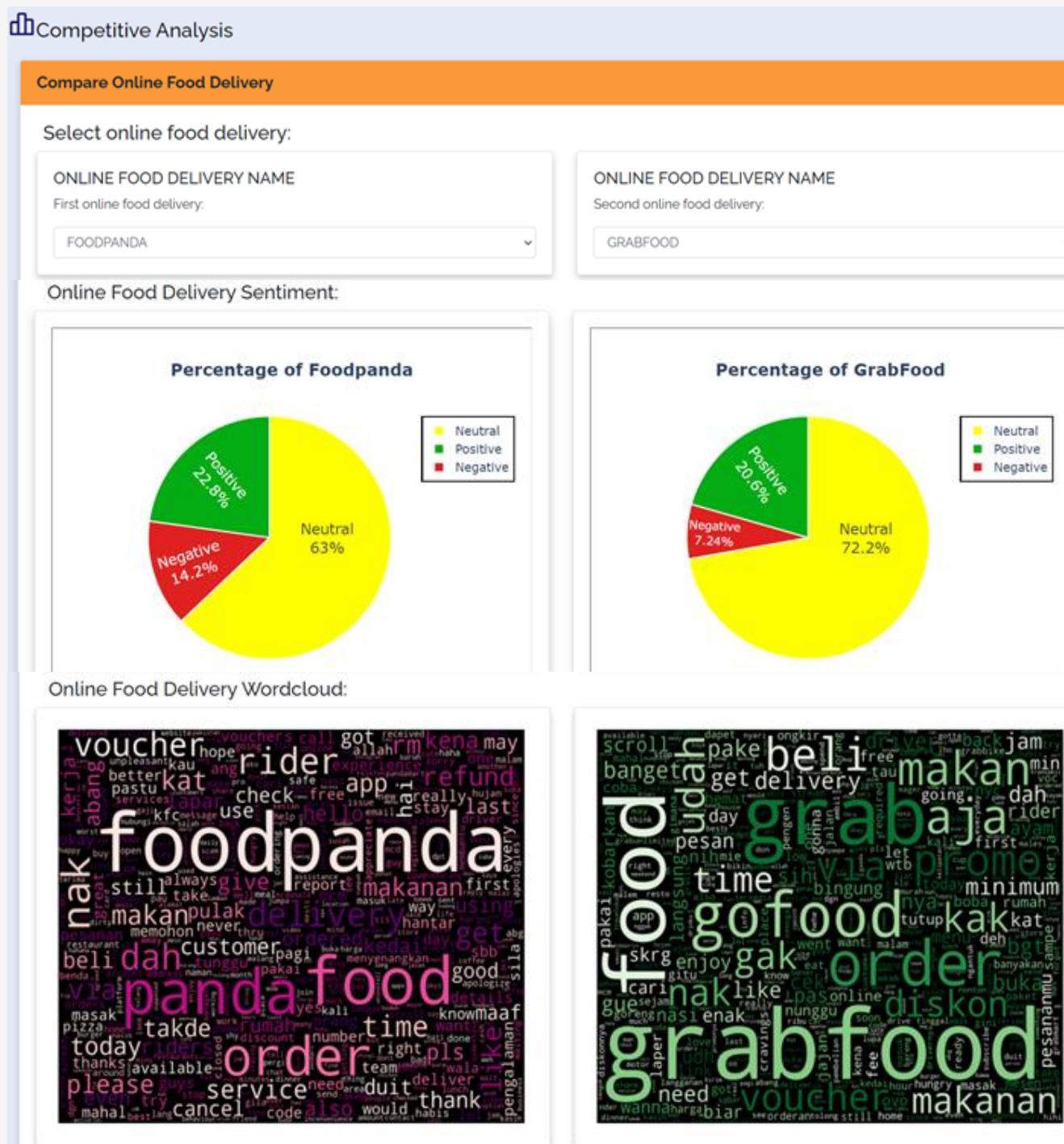
## Dashboard Page



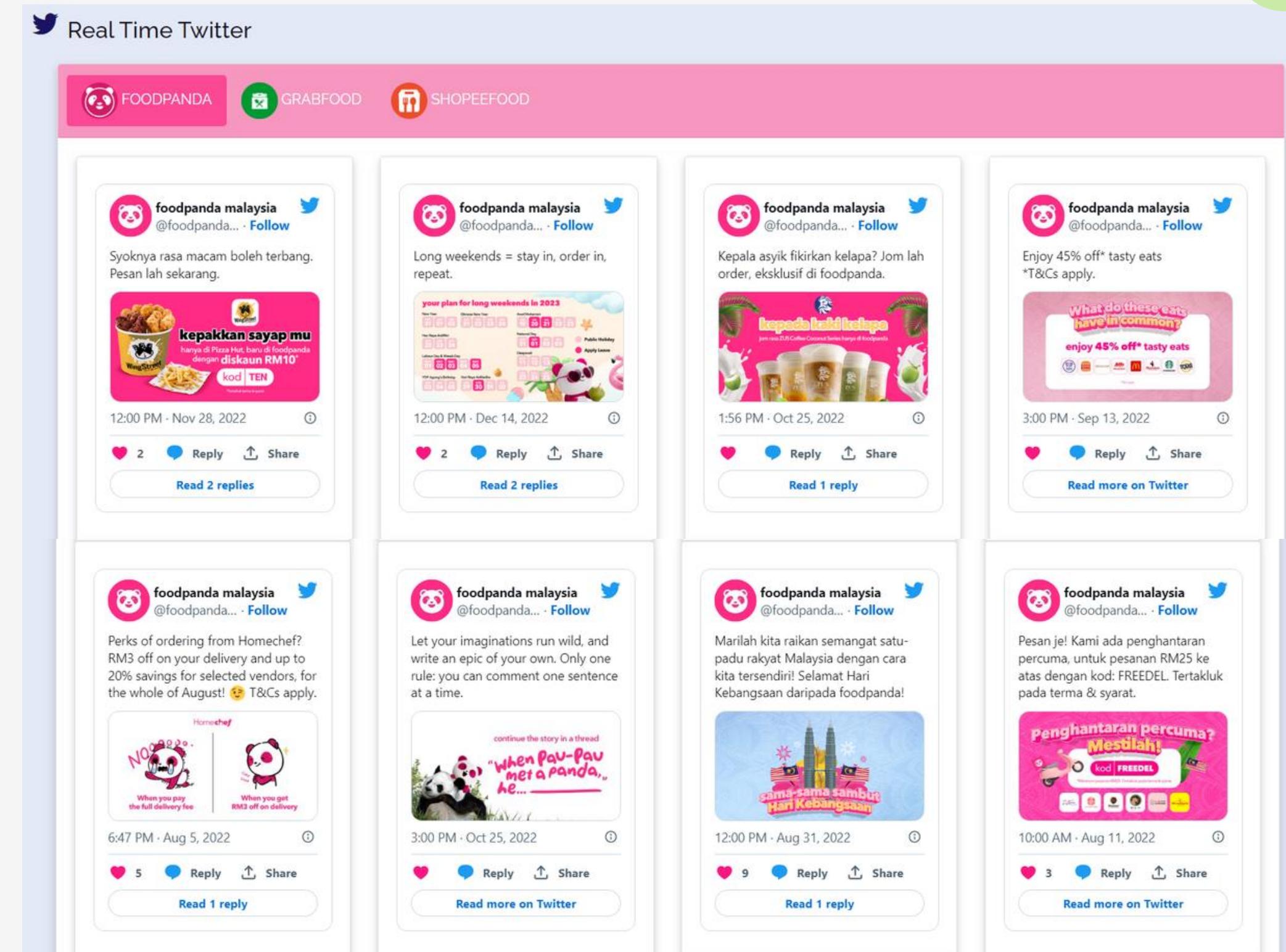
Individual OFD  
Page



## Competitive Analysis Page



Real Time  
Twitter Page



# MODEL ACCURACY

Model accuracy score: 0.7167

Confusion matrix

```
[[ 31  10   7]
 [ 21 121  25]
 [ 12  10  63]]
```

	precision	recall	f1-score	support
0	0.48	0.65	0.55	48
1	0.86	0.72	0.79	167
2	0.66	0.74	0.70	85
accuracy			0.72	300
macro avg	0.67	0.70	0.68	300
weighted avg	0.74	0.72	0.72	300

English  
71.67 %

Model accuracy score: 0.7629

Confusion matrix

```
[[  7   6   4]
 [ 30 289  40]
 [  2  19  29]]
```

	precision	recall	f1-score	support
0	0.18	0.41	0.25	17
1	0.92	0.81	0.86	359
2	0.40	0.58	0.47	50
accuracy			0.76	426
macro avg	0.50	0.60	0.53	426
weighted avg	0.83	0.76	0.79	426

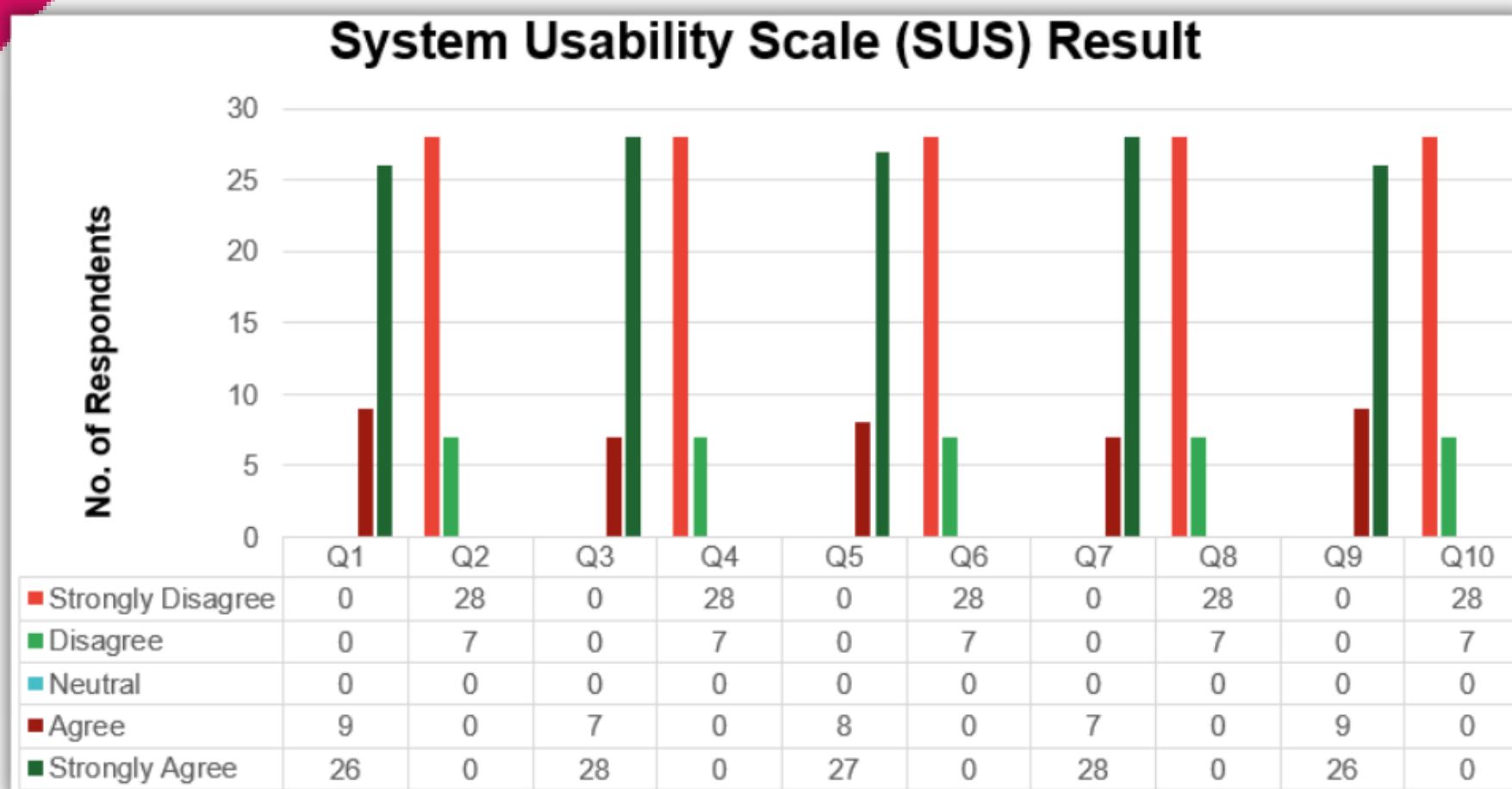
Bahasa  
Melayu  
76.29 %

# SYSTEM USABILITY SCALE

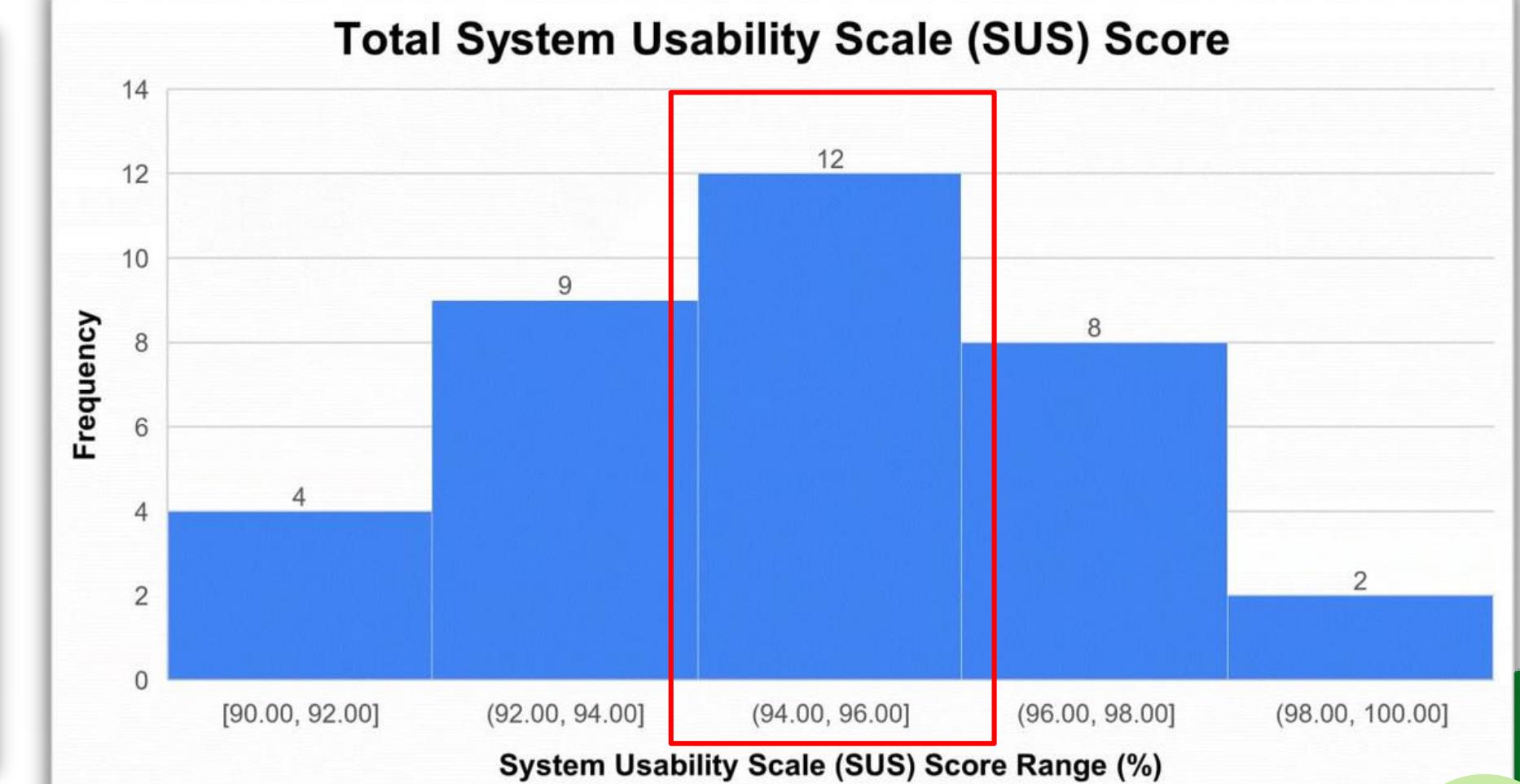
EXCELLENT

Average SUS Score =  94.64%

Bar chart of SUS Result



Histogram of SUS Result



SUCCESS

Test Case	Expected Result	Success/Failure	Test Case	Expected Result	Success/Failure
View Landing Page	A landing page will be displayed by the system.	Success	View GrabFood Page	The system will display the GrabFood page to the user. This page displays the findings of the analysis conducted on GrabFood using a variety of data visualization techniques, such as a pie chart, bar chart, word cloud, and line chart.	Success
View Home Page	A home page will be displayed by the system. This page displays the history of each OFD.	Success	View ShopeeFood Page	The system will display the ShopeeFood page to the user. This page displays the findings of the analysis conducted on ShopeeFood using a variety of data visualization techniques, such as a pie chart, bar chart, word cloud, and line chart.	Success
View Dashboard Page	A dashboard page will be displayed by the system. This page will show the total sentiment dataset for all three OFDs, a pie chart of sentiment, and a bar chart that summarizes the results of the analysis performed on all three OFDs based on factors.	Success	View Competitive Analysis Page	The system will display the competitive analysis page to the user. This page displays the sentiment comparison between the OFD where the analysis results are visualized.	Success
View Foodpanda Page	The system will display the Foodpanda page to the user. This page displays the findings of the analysis conducted on Foodpanda using a variety of data visualization techniques, such as a pie chart, bar chart, word cloud, and line chart.	Success	View Real-Time Twitter Updates Page	The system will display the Display real-time updates from Twitter OFD to users	Success

## Limitations

### 1 Data restriction

This study utilized unprocessed Twitter data. It contains various language usage, including slang, emoticons, abbreviations, and insulting phrases

### 2 Time constraint

The number of extracted tweets is limited. The restricted data may result in an unbalanced output for the system's data representation

## Recommendations

1 A lexicon for various language uses, such as slang, shorter versions, and sarcastic words should be developed so that these uses can be translated into meaningful values that can assist in determining sentiment

2 More information can be included by extending the time it takes to scrape data from Twitter

# DEMONSTRATION