Chapter3_LI HONGLIN.pdf

by HONGLIN LI

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is about how to analyze what people feel towards Trump's China 2025 tariff policy on "X". It discusses the entire process of data acquisition and cleaning to determine the feelings using the VADER analysis tool. There are three central concerns this study will focus on: people's expectation of the policy's effects, policy announcements, and policy updates. It will provide real evidence of a shift in public sentiments.

3.2 Research Framework

The research framework follows a standard data science project life cycle and is divided into the following stages:

1. Question definition:Clear sentiment analysis goals consistent with Trump's 2025 tariff policy.

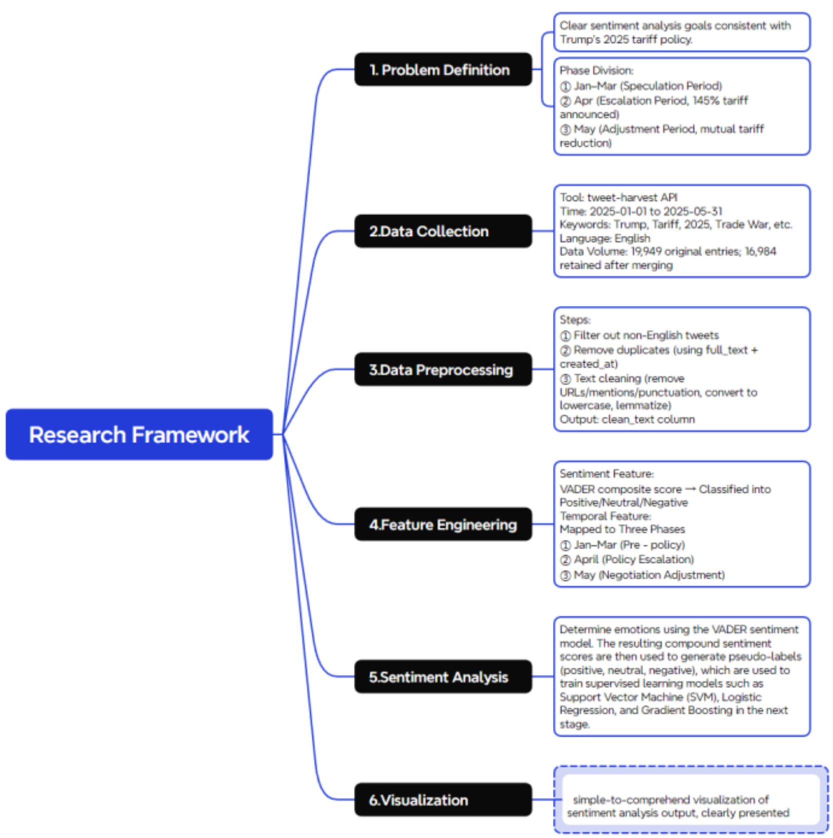
2. Data collection: Collect the significant "X" data with the appropriate keywords and in a particular time span.

3. Data preparation: Prepare the data and clean it thoroughly in order to make it more credible.

4. Feature construction: Develop features from emotions and time in a correct analysis.

5. Sentiment analysis: Determine emotions using VADER emotion model. The resulting sentiment scores are then used to generate pseudo-labels to train a supervised learning model in the next stage.

6. Visualization; simple-to-comprehend visualization of sentiment analysis output, clearly presented



3.1 Research Framework

3.3 Problem Formulation

This research is interested in examining how individuals' perspectives are altered at three phases of policy.

January-March 2025: Retrospection on policies and initial responses

New policy adjustments and 145% tariffs in April 2025 were announced.

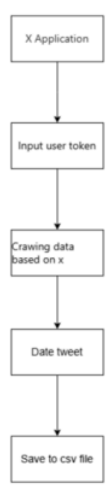
May 2025: Policy changes and reduced tariffs among nations.

Key objectives:

Apply VADER to determine whether tweets are positive, neutral, or negative.

Examine how individuals' attitudes shifted during three different time frames.

3.4 Data Sources & Collection

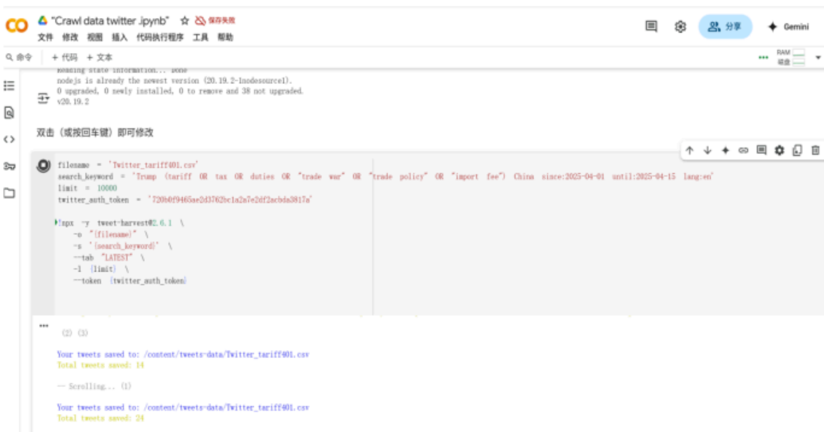


This data was collected from the Twitter (X) platform using Python-based tweet crawler tool ("Tweet harvest").

Keywords used: "Trump", "Tariff", "2025", "China", "Policies", "Trade War"

Duration: January 1, 2025 to May 31, 2025

Language filtering: Only English tweets (' lang:en ').



3.2 Data Collection

The dataset contains:

a.Tweets ("whole text")

b.Timestamp ("create time")

c.Like, share, reply (for user stickiness analysis)

Combine the data mined separately every month into a data set."

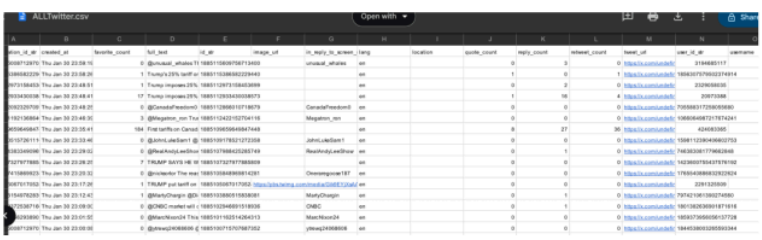
```
[1] # prompt: 加载云端硬盘

from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
import pandas as pd
import os

# Set your folder path
folder_path = '/content/drive/MyDrive/Colab Notebooks/Untitled folder'

# Initialize an empty DataFrame
combined_data = pd.DataFrame()

# Iterate through the folder and merge all Excel files
for file_name in os.listdir(folder_path):
    if file_name.endswith('.csv'):  # Check if the file is an Excel file
        file_path = os.path.join(folder_path, file_name)
        try:
            # Read Excel file
            data = pd.read_csv(file_path)
        except Exception as e:
            print(f"Error reading {file_name}: {e}")
            continue  # Skip the file if there's an error

        # Combine data
        combined_data = pd.concat([combined_data, data], ignore_index=True)

# Save the merged file as a CSV
output_path = '/content/drive/MyDrive/Colab Notebooks/ALLTwitter.csv'
combined_data.to_csv(output_path, index=False)

print(f"Files merged successfully! Merged file saved at: {output_path}")
```

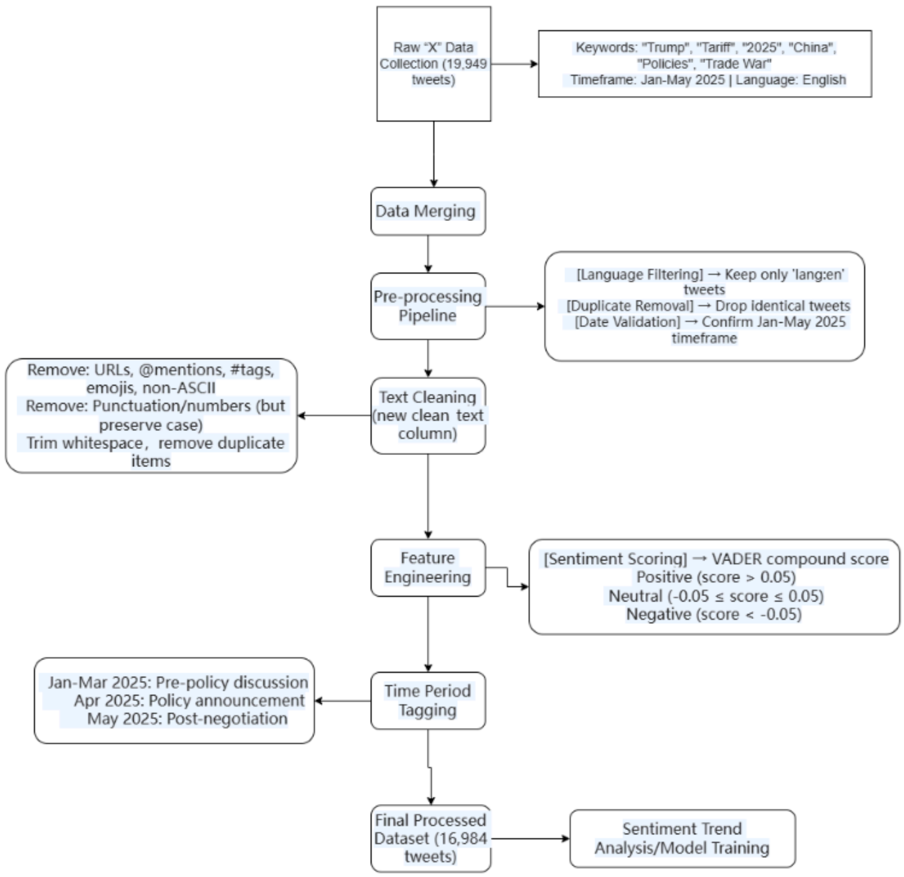
3.3 Data Merging

The total data set collected is 19,949 rows of data, including 15 columns.



3.4 Dataset preview

3.5 Data Pre-processing



Once we filtered the languages, deleted duplicates, and eliminated noise, we had 16,984 tweets. This is our final data set that we will examine in terms of sentiment scores and trends through time.

```
print(df[["created_at", "full_text", "clean_text"]].head())
```

```
                       created_at  \
0  Thu Jan 30 23:59:19 +0000 2025
1  Thu Jan 30 23:58:26 +0000 2025
2  Thu Jan 30 23:48:51 +0000 2025
3  Thu Jan 30 23:48:41 +0000 2025
4  Thu Jan 30 23:48:25 +0000 2025

                                           full_text  \
0  @unusual_whales Threat? He literally did this ...
1  Trump's 25% tariff on Canada and Mexico; a hig...
2  Trump imposes 25% tariffs on Canada and Mexico...
3  Trump imposes 25% tariffs on Canada and Mexico...
4  @CanadaFreedom0 This is why Trump is tariff fo...

                                          clean_text
0  threat he literally did this in  people wake u...
1  trumps  tariff on canada and mexico a higher o...
2  trump imposes  tariffs on canada and mexico fr...
3  trump imposes  tariffs on canada and mexico fr...
4  this is why trump is tariff focused  mexico  t...
```

```
print("Total tweets after cleaning:", len(df))
```

```
Total tweets after cleaning: 16984
```

3.5 Processed data

There are two key steps in data preprocessing. These steps ensure the data is clean, consistent, and prepared for sentiment analysis using the VADER model.

3.5.1 Preliminary analysis

- Verify that the data is correct for the target period (January to May 2025).
- There is a simple check to determine the number of tweets posted during a particular period. This is to ensure the dates listed in the policy (for instance, approximately April 10, 2025) are accurate.
- Ensure the lang field exists and is solely utilized for filtering tweets that are in English.

3.5.2 Data cleaning

To ensure that the tweets are good for the VADER model, we performed some cleaning steps. We retained all the emotional parts but got rid of typical noise in social media text.

Gradually clean the logic:

Filter English tweets

Only the English notes were preserved according to Vader's list of emotional words in the English language.

Remove duplicate data

Use the entire text and place in columns to eliminate duplicate tweets so that every comment is counted once only.

```python
import pandas as pd
import re

# 读取数据文件
df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/ALLTwitter1.csv')
df = df[df["lang"] == "en"].copy()

# 步骤 2：去除重复推文（同文本同时间被视为重复）
df = df.drop_duplicates(subset=["full_text", "created_at"])

# 步骤 3：定义清洗函数
def clean_text(text):
        text = re.sub(r"http\S+|www\.\S+", "", text)      # 删除URL
        text = re.sub(r"@\w+", "", text)                    # 删除@提及
        text = re.sub(r"#\w+", "", text)                    # 删除hashtag
        text = re.sub(r"[^\w\s]", "", text)                 # 删除标点符号
        text = re.sub(r"\d+", "", text)                     # 删除数字
        text = text.lower().strip()                         # 小写化并去空格
        return text

# 步骤 4：应用清洗函数
df["clean_text"] = df["full_text"].astype(str).apply(clean_text)

# 可选：显示前几行结果检查
print(df[["created_at", "full_text", "clean_text"]].head())
```

```
                       created_at  \
0  Thu Jan 30 23:59:19 +0000 2025
1  Thu Jan 30 23:58:26 +0000 2025
2  Thu Jan 30 23:48:51 +0000 2025
3  Thu Jan 30 23:48:41 +0000 2025
4  Thu Jan 30 23:48:25 +0000 2025

                                           full_text  \
0  @unusual_whales Threat? He literally did this ...
1  Trump's 25% tariff on Canada and Mexico; a hig...
2  Trump imposes 25% tariffs on Canada and Mexico...
3  Trump imposes 25% tariffs on Canada and Mexico...
4  @CanadaFreedom0 This is why Trump is tariff fo...
```

3.6 Data cleaning

Text preprocessing

Cleaning text

1. Delete links: VADER does not comprehend links; they will be puzzling.

2. Remove mention (@user): mention feels emotional.

3. Take away tag: Tag sign is removed but the word can be retained to facilitate the understanding.

4. Eliminate emoji and non-ASCII characters: These are excluded since they are not text input.

5. Remove punctuation and numbers: Vader explains words, not symbols or numbers.

6. no conversion to lowercase: standardized text. e.g., "tariffs" is equivalent to "tariffs".

7. Trim blank areas: Remove excess space for consistency.

8. Clean storage results:

9. The cleaned result is saved in a new column called clean_text, which is used as input for sentiment analysis

3.6 Feature Engineering

Improve tweet data to analyze emotions and examine over time trends. Improve the meaning and time components. VADER is frequently employed since it is suitable for social media text (Chavan et al., 2024;) (Gandy et al., 2025), and parts of it were employed in sorting emotions.

In order to further improve the effect of sentiment classification, this study not only uses the Compound scores generated by the VADER model for trend analysis, but also uses them as pseudo-labels for model training. A balanced labeled dataset is constructed from these pseudo-labels, which will be used to train supervised learning models such as support vector machines, random forests, and logistic regression. This semi-supervised modeling strategy will be elaborated in the next chapter.

3.6.1 Emotional Feature Extraction

The cleaned tweet (clean_text) is then analyzed using the VADER sentiment analyzer in order to obtain a score representing the overall mood of a tweet.

Emotional tags are assigned according to these levels of scores:

- Positive:Compound score > 0.05
- Neutral:-0.05 ≤Compound score ≤ 0.05
- Negative: compound score <-0.05

3.6.2 Time feature generation

Each tweet is tagged with a particular date and one of three various policy times:

- January to March 2025: Discuss it and consider thoroughly before legislating.
- April 2025: Peak tariff policy announcement and reactions of other nations.
- May 2025: Post-adjustment period after reciprocity negotiations

3.8 Results visualization

Displaying results The labeled emotional data is plotted on a chart in order to observe public opinion trends over time.

Line graph: It demonstrates how the average rating varies with different months, in relation to significant policy events.

Vertical bar chart: It displays the number of positive, negative, and neutral tweets during each phase of the policy.

Word cloud: Display typical words in various emotional groups so that people can comprehend what the public is interested in.

Python tools such as matplotlib, seaborn, and wordcloud are employed in visualization to represent emotional trends simply and simply.

These tweets are classified based on VADER's (valence-aware dictionary and emotion inference) compound score. This is suitable to classify the brief and informal messages in Twitter tweets.

3.9 Summary

This chapter shows how to set up an analysis process based on the VADER model. In the next chapter, we will further explain not only the three-stage sentiment trend, but also how VADER scores are used to generate pseudo-labels and then build a semi-supervised sentiment classification model.

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