# FIN3210 Week 5 Assignment

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[1]:
```
import numpy as np
import pandas as pd
import nltk
import matplotlib.pyplot as plt
from nltk.tokenize import word_tokenize
from nltk.stem import WordNetLemmatizer
from wordcloud import WordCloud
from readability import Readability
```

### 0.0.1 Q1. Present word cloud

[2]:
```
# Design a function in order to transfer the tag generated by nltk to
# input in the WordNetLemmatizer
def transfer_to_pos(df):
    if df['Tag'].startswith('J'):
        df['Pos'] = 'a'
    elif df['Tag'].startswith('V'):
        df['Pos'] = 'v'
    elif df['Tag'].startswith('N'):
        df['Pos'] = 'n'
    elif df['Tag'].startswith('R'):
        df['Pos'] = 'r'
    else:
        df['Pos'] = 'x'
    return df
```

[3]:
```
article_str = """
Tesla's third-quarter sales jumped 44%\ as
global demand for its electric vehicles outpaced
that of most other automakers. The company reported
Friday that it had delivered 139,000 SUVs and sedans
from July through September, compared with 97,000
deliveries during the same period a year ago. The
sales topped even some of the most optimistic projections
coming from Wall Street. Analysts polled by data provider
FactSet expected the company to sell closer to 137,000.
Tesla has been rewriting the script throughout the year
amidst a pandemic that has closed factories and scrambled
```

```
supply lines. This puts Musk & Co. in prime position to
hit the area code of 500k units for the year which six months
ago was not even on the map for the bulls, Daniel Ives of
Wedbush wrote Friday. China was likely a major source of
strength in the quarter, Ives said. Tesla could post its fifth
consecutive quarter of profits later this month.
"""
```

[4]:
```
words_list = word_tokenize(article_str)
words_list[:10]
```

[4]:
```
['Tesla',
 "'s",
 'third-quarter',
 'sales',
 'jumped',
 '44',
 '%',
 '\\',
 'as',
 'global']
```

[5]:
```
# Generate the pos_tag of the words list
words_tags = nltk.pos_tag(words_list)
words_tags[:10]
```

[5]:
```
[('Tesla', 'NNP'),
 ("'s", 'POS'),
 ('third-quarter', 'JJ'),
 ('sales', 'NNS'),
 ('jumped', 'VBD'),
 ('44', 'CD'),
 ('%', 'NN'),
 ('\\', 'CC'),
 ('as', 'IN'),
 ('global', 'JJ')]
```

[6]:
```
words_tags_df = pd.DataFrame(words_tags, columns=['Word_original', 'Tag'])
words_tags_df = words_tags_df.apply(transfer_to_pos, axis=1)
# Only preserve the relevant tags of words
words_tags_df = words_tags_df[words_tags_df['Pos'] != 'x']
words_tags_df = words_tags_df.reset_index(drop=True)
words_tags_df
```

[6]:
```
    Word_original  Tag Pos
0           Tesla  NNP   n
1   third-quarter   JJ   a
```

```
2            sales  NNS   n
3           jumped  VBD   v
4                %   NN   n
..             …  …  ..
94     consecutive   JJ   a
95         quarter   NN   n
96         profits  NNS   n
97           later   RB   r
98           month   NN   n

[99 rows x 3 columns]
```

[7]:
```
# Lemmatize the words
words_tags_df['words_lemmatized'] = words_tags_df.apply(lambda x:␣
 ↪WordNetLemmatizer().lemmatize(x['Word_original'], pos=x['Pos']), axis=1)
words_tags_df
```

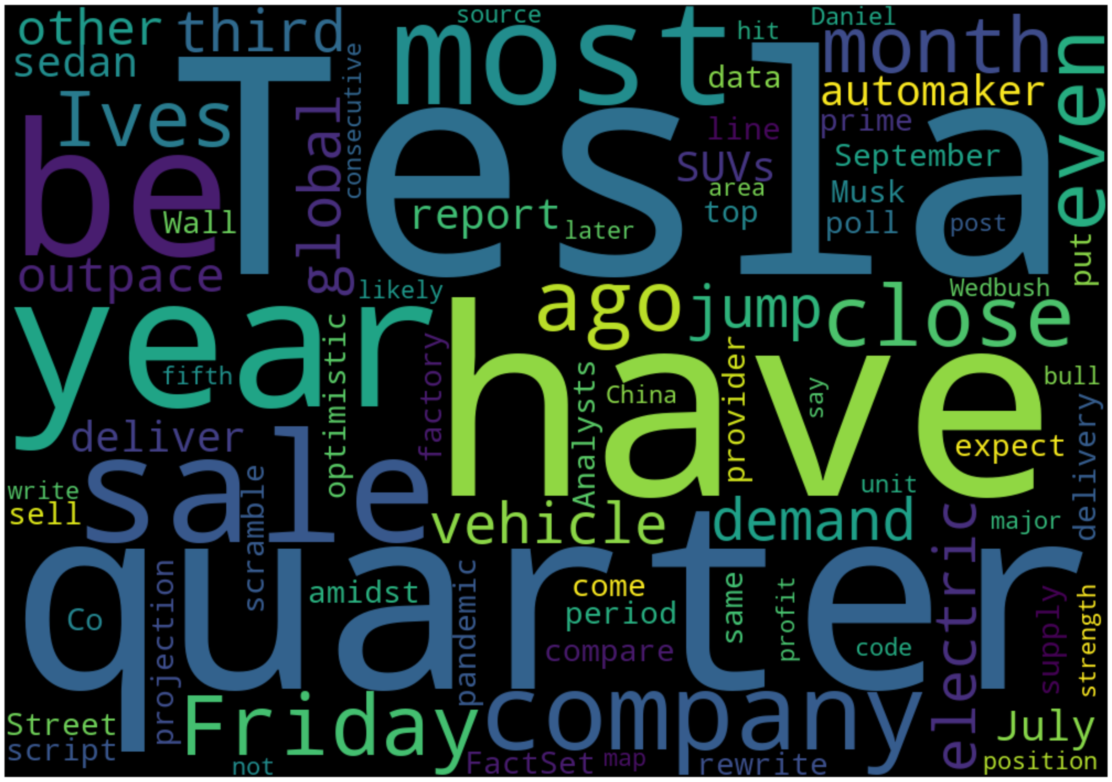
[7]:
```
    Word_original  Tag Pos words_lemmatized
0           Tesla  NNP   n            Tesla
1   third-quarter   JJ   a    third-quarter
2           sales  NNS   n             sale
3          jumped  VBD   v             jump
4               %   NN   n                %
..            …  …  ..                …
94    consecutive   JJ   a      consecutive
95        quarter   NN   n          quarter
96        profits  NNS   n           profit
97          later   RB   r            later
98          month   NN   n            month

[99 rows x 4 columns]
```

[8]:
```
# Convert the result dataframe of words into a list
lemmatized_list = words_tags_df['words_lemmatized'].tolist()
lemmatized_str = ' '.join(lemmatized_list)
lemmatized_str
```

[8]:
```
'Tesla third-quarter sale jump % global demand electric vehicle outpace most
other automaker company report Friday have deliver SUVs sedan July September
compare delivery same period year ago sale top even most optimistic projection
come Wall Street Analysts poll data provider FactSet expect company sell close
Tesla have be rewrite script year amidst pandemic have close factory scramble
supply line put Musk Co. prime position hit area code unit year month ago be not
even map bull Daniel Ives Wedbush write Friday China be likely major source
strength quarter Ives say Tesla post fifth consecutive quarter profit later
month'
```

```
[9]: wordcloud = WordCloud(width = 1000, height = 700, background_color = 'black',␣
       ↪stopwords = 'set', min_font_size = 10).generate(lemmatized_str)
     plt.figure(figsize=(10, 7), facecolor=None)
     plt.imshow(wordcloud)
     plt.axis("off")
     plt.tight_layout(pad=0)
     plt.show()
```



```
349         WIN
350      WINNER
351     WINNERS
352     WINNING
353      WORTHY

[354 rows x 1 columns]
```

[11]:
```
neg_words_list = pd.read_excel('LoughranMcDonald_SentimentWordLists_2018.xlsx',␣
 ↪sheet_name='Negative', header=None)
neg_words_list
```

[11]:
```
                 0
0          ABANDON
1        ABANDONED
2       ABANDONING
3      ABANDONMENT
4     ABANDONMENTS
…              …
2350    WRONGDOING
2351   WRONGDOINGS
2352      WRONGFUL
2353    WRONGFULLY
2354       WRONGLY

[2355 rows x 1 columns]
```

[12]:
```
# If positive, give a 1; If negative give -1; Else 0
def judge_sentiment(df):
    if df['words_lemmatized'].upper() in pos_words_list[0].tolist():
        df['sentiment'] = 1
    elif df['words_lemmatized'].upper() in neg_words_list[0].tolist():
        df['sentiment'] = -1
    else:
        df['sentiment'] = 0
    return df
```

[13]:
```
words_tags_df = words_tags_df.apply(judge_sentiment, axis=1)
# Sum the positive and negative weights together
num = words_tags_df['sentiment'].sum()
denom = len(words_tags_df)
new_sentiment = num / denom
new_sentiment
```

[13]:
```
0.020202020202020204
```

### 0.0.3 Q3. Calculate the Fog index

```
[14]: # Calculate the Gunning Fog Index using Readability
r = Readability(article_str)
fog_index = r.gunning_fog().score
fog_index
```

```
[14]: 12.928205128205128
```

### 0.0.4 Q4. Using the data set of Tesla, a) report the summary statistics of sentiment, novelty, and impact; b) present the correlation coefficient among sentiment, novelty, and impact; and c) show the frequency and fraction of top 10 news categories.

```
[15]: # Provide the statistics required in the Homework requirement
tesla_data = pd.read_excel('FIN3210 Week 5 Tesla.xlsx')
summary_stat_data = tesla_data[['Sentiment','Novelty','Impact']]
summary_stat = summary_stat_data.describe()
summary_stat
```

```
[15]:          Sentiment      Novelty       Impact
count  1292.000000  1292.000000  1292.000000
mean     53.845975    28.877709    45.277864
std      14.824257    38.537946     9.996097
min       2.000000     0.000000    13.000000
25%      40.000000     0.000000    39.000000
50%      50.000000     3.000000    45.000000
75%      64.000000    56.000000    52.000000
max     100.000000   100.000000    77.000000
```

```
[16]: summary_stat_data.corr()
```

```
[16]:            Sentiment   Novelty    Impact
Sentiment   1.000000  0.165557 -0.130972
Novelty     0.165557  1.000000 -0.064844
Impact     -0.130972 -0.064844  1.000000
```

```
[17]: news_categories = tesla_data['Category'].value_counts().reset_index()
news_categories.columns = ['Category', 'Frequency']
news_categories['Fractions'] = news_categories['Frequency'] /␣
  ↪news_categories['Frequency'].sum()
news_categories[:10]
```

```
[17]:                        Category  Frequency  Fractions
0                     stock-loss        409   0.316563
1                     stock-gain        232   0.179567
2                product-release        111   0.085913
3              business-contract         63   0.048762
```

```
4               capital-increase          55   0.042570
5          legal-verdict-favored          42   0.032508
6            price-target-upgrade         40   0.030960
7                     fundraising          33   0.025542
8  acquisition-interest-acquirer          33   0.025542
9               product-price-cut          30   0.023220
```