[]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import nltk
nltk.download('stopwords')

from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
from nltk.stem import WordNetLemmatizer
from nltk.stem.porter import PorterStemmer

import string
import re
import textblob
from textblob import TextBlob
import os

from wordcloud import WordCloud, STOPWORDS
from wordcloud import ImageColorGenerator
import warnings
%matplotlib inline
```

[]:
```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

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

[]:
```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

[]:
```
tweets_df = pd.read_csv(r'/content/drive/MyDrive/dataset_sma/google (2).csv')
```

[]:
```
tweets_df.head(5)
```

[]:

	Link	Username	Rank	Timeline	Review	Response	Rating
0	https://lh3.googleusercontent.com/a-/ALV-UjWHb...	Saurabh Kanade	Local Guide · 37 reviews · 20 photos	6 months ago	Amezing ClassRooms.\nAir Conditioner & Fan Bot...	Like	4
1	https://lh3.googleusercontent.com/a/ACg8ocKaRp...	Rasika Pujare	Local Guide · 18 reviews · 170 photos	2 years ago	I visited the institute as it was my examinati...	NaN	1
2	https://lh3.googleusercontent.com/a-/ALV-UjV4l...	V S	Local Guide · 22 reviews · 7 photos	2 months ago	This was my CAT exam center. Though exam didn'...	Share	5
3	https://lh3.googleusercontent.com/a-/ALV-UjUV4...	Sneha Yadav	Local Guide · 7 reviews · 61 photos	4 years ago	It's the best college in Thane, growing rapidl...	NaN	3
4	https://lh3.googleusercontent.com/a-/ALV-UjWll...	AJP Travel	Local Guide · 112 reviews · 3,469 photos	2 years ago	It is beside highway so keep check on take in ...	NaN	5

[]:
```
tweets_df.to_csv()
```

[]:
```
',Link,Username,Rank,Timeline,Review,Response,Rating\n0,https://lh3.googleusercontent.com/a-/ALV-UjWHbbHyID9JAf9BHT7KFu3de-6BWe5hYGy8KCYw-eadFX8=w45-h45-p-rp
```

[]:
```
tweets_df.shape
```

[]:
```
(190, 7)
```

[]:
```
tweets_df.head
```

[]:
```
pandas.core.generic.NDFrame.head
def head(n: int=5) -> NDFrameT


Return the first `n` rows.

This function returns the first `n` rows for the object based
on position. It is useful for quickly testing if your object
has the right type of data in it.

For negative values of `n`, this function returns all rows except
the last `|n|` rows, equivalent to ``df[:n]``.
```

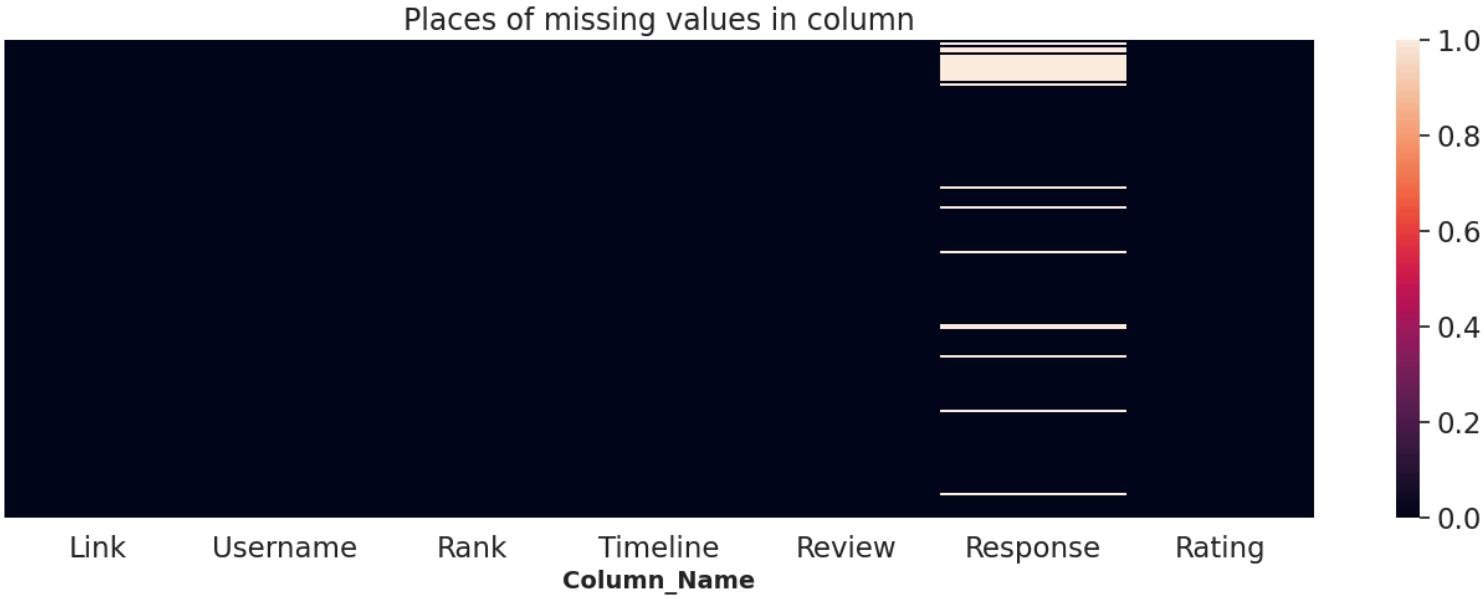
[]:
```
tweets_df.info()
```

[]:
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 190 entries, 0 to 189
Data columns (total 7 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Link      190 non-null    object
 1   Username  190 non-null    object
 2   Rank      190 non-null    object
 3   Timeline  190 non-null    object
 4   Review    190 non-null    object
 5   Response  168 non-null    object
 6   Rating    190 non-null    int64 
dtypes: int64(1), object(6)
memory usage: 10.5+ KB
```

[ ]:
```
tweets_df.value_counts()
```

[ ]:
```
Link                                                                                                  Username              Rank
https://lh3.googleusercontent.com/a-/ALV-UjU3O08mwP5fF5NL_GdAL5O6v-UbzT2OWp14StXYcS1AsTig=w45-h45-p-rp-mo-ba3-br100  Mugdha A              Local Guide · 26 r
https://lh3.googleusercontent.com/a/ACg8ocJWSD7MOEg3dsRC1bX1VYpfjrNqlJcDejS68Hj8wk5qmg=w45-h45-p-rp-mo-br100         Nancy Sinollin        3 reviews
https://lh3.googleusercontent.com/a/ACg8ocJ-Ls6J19MDimJMKzQEUtTnuW_nCEI7UflhNHsXAQO3=w45-h45-p-rp-mo-br100          Sangram Savargave     2 reviews
https://lh3.googleusercontent.com/a/ACg8ocJ-oTl1BPUOBK-P_cFC6OPvih9H19UmuEsfU7PgMwMo=w45-h45-p-rp-mo-br100          ejaj khan             2 reviews
https://lh3.googleusercontent.com/a/ACg8ocJ2Zb38wqXYS3fSt9TrgNI8ps7C28pc9ZEVAVtJikA7LnU=w45-h45-p-rp-mo-ba3-br100  Gaurav Babar          Local Guide · 49 r

https://lh3.googleusercontent.com/a-/ALV-UjWM1YWI7FfB4V4ucRzGAb1km7Vm1B5qDkNH-BhTniI2UEqv=w45-h45-p-rp-mo-ba3-br100  Vaibhav Yavalkar      Local Guide · 8 re
https://lh3.googleusercontent.com/a-/ALV-UjWQQRv_2eK7V6dlQR8_PZ7cUj09R_KOpOQOXcMh_xbEf1s=w45-h45-p-rp-mo-ba3-br100  Samanwita Bagg        Local Guide · 16 r
https://lh3.googleusercontent.com/a-/ALV-UjWSk1vuvBXeBeDlf4tUiR--S-jlJgblk3qYISBKWXWIvA3c=w45-h45-p-rp-mo-br100   MANOJ M. MANIKSHETTI  4 reviews · 4 pho
https://lh3.googleusercontent.com/a-/ALV-UjWVGFXQLlOFgm8g5yixIXbb7O8UNWQQHlFZzM-Odp__etg=w45-h45-p-rp-mo-br100   Kiran Deshpande       1 review
https://lh3.googleusercontent.com/a/ACg8ocLzKeyIeErkD32NjbToZTWal61-LJTCJdIoM_EdqZRT=w45-h45-p-rp-mo-br100         dilip mahajan         3 reviews
Name: count, Length: 168, dtype: int64
```

[ ]:
```
plt.figure(figsize=(17, 5))
sns.heatmap(tweets_df.isnull(), cbar=True, yticklabels=False)
plt.xlabel("Column_Name", size=14, weight="bold")
plt.title("Places of missing values in column",size=17)
plt.show()
```

[ ]:


[ ]:
```
import plotly.graph_objects as go
Top_Location_Of_tweet= tweets_df['Username'].value_counts().head (10)
```

[ ]:
```
print(Top_Location_Of_tweet)
```

[ ]:
```
Username
Samanwita Bagg      2
Saurabh Kanade      1
Gauri Deshpande     1
sonia aneesh        1
Om Bheda            1
Geetanjali Kalme    1
Rutwik Gaikwad      1
Krishna Gupta       1
Renuka Pawar        1
NiKhiL Sawant       1
Name: count, dtype: int64
```

[ ]:
```
from nltk. corpus import stopwords
stop = stopwords.words('english')
tweets_df['Review'].apply(lambda x: [item for item in x if item not in stop])
tweets_df.shape
```

[ ]:
```
(190, 7)
```

[ ]:
```
!pip install tweet-preprocessor
```

[ ]:
```
Requirement already satisfied: tweet-preprocessor in /usr/local/lib/python3.10/dist-packages (0.6.0)
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager. It is recommended to
use a virtual environment instead: https://pip.pypa.io/warnings/venv
```

[ ]:
```
punct  =  ['%','/',':','\\','&','&',';','?']

def remove_punctuations(text):
  for punctuation in punct:
    text = text.replace(punctuation,'')
  return text
```

[ ]:
```
tweets_df['Review'] = tweets_df['Review'].apply(lambda x: remove_punctuations(x))
```

[ ]:
```
tweets_df['Review'].replace( '', np.nan, inplace=True)
tweets_df.dropna(subset=["Review"],inplace=True)
len(tweets_df)
```

[ ]:
190

[ ]:
```
tweets_df = tweets_df.reset_index(drop=True)
tweets_df.head()
```

[ ]:

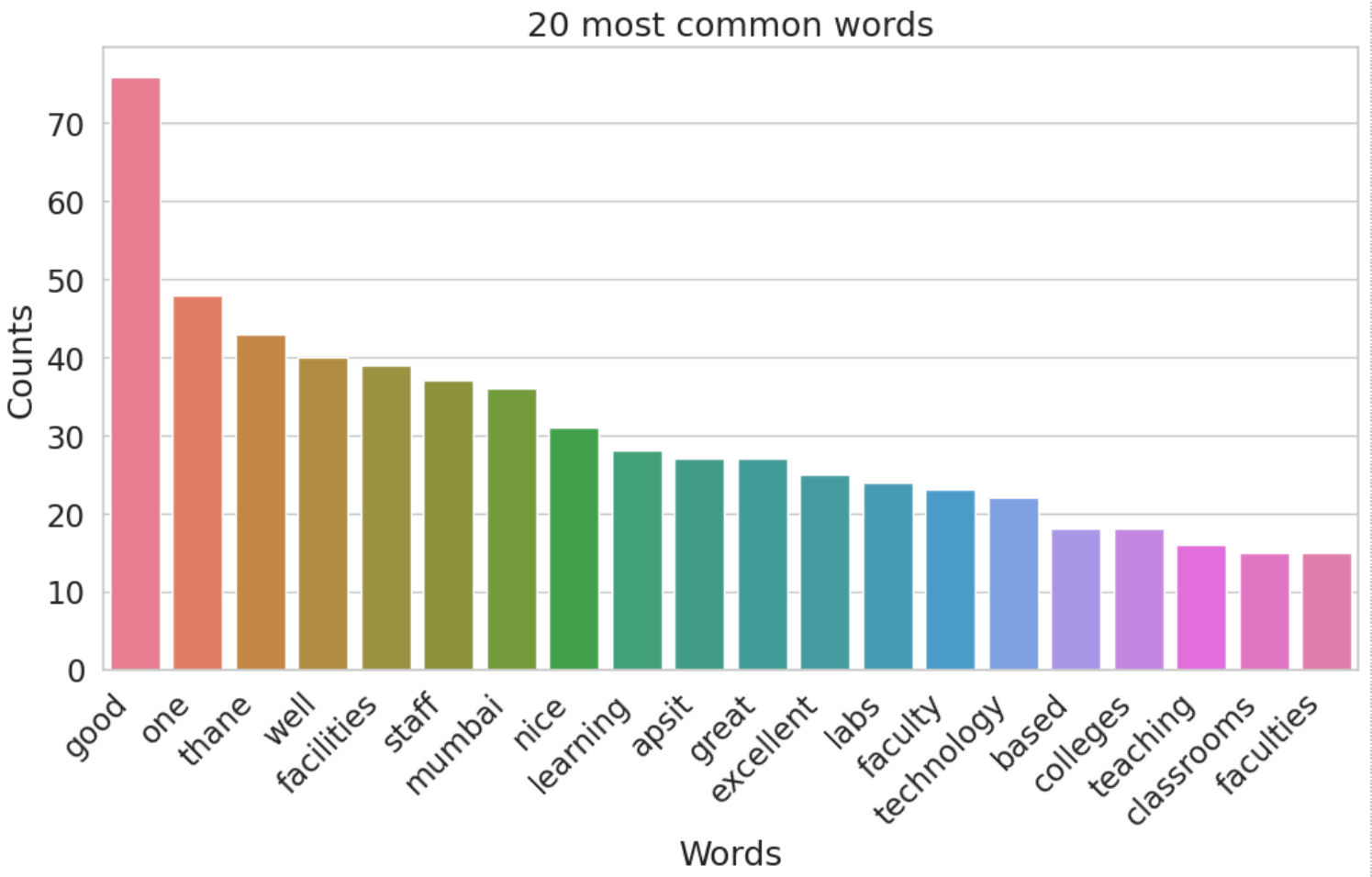
	Link	Username	Rank	Timeline	Review	Response	Rating
0	https://lh3.googleusercontent.com/a-/ALV-UjWHb...	Saurabh Kanade	Local Guide · 37 reviews · 20 photos	6 months ago	Amezing ClassRooms.\nAir Conditioner Fan Both...	Like	4
1	https://lh3.googleusercontent.com/a/ACg8ocKaRp...	Rasika Pujare	Local Guide · 18 reviews · 170 photos	2 years ago	I visited the institute as it was my examinati...	NaN	1
2	https://lh3.googleusercontent.com/a-/ALV-UjV4l...	V S	Local Guide · 22 reviews · 7 photos	2 months ago	This was my CAT exam center. Though exam didn'...	Share	5
3	https://lh3.googleusercontent.com/a-/ALV-UjUV4...	Sneha Yadav	Local Guide · 7 reviews · 61 photos	4 years ago	It's the best college in Thane, growing rapidl...	NaN	3
4	https://lh3.googleusercontent.com/a-/ALV-UjWll...	AJP Travel	Local Guide · 112 reviews · 3,469 photos	2 years ago	It is beside highway so keep check on take in ...	NaN	5

[ ]:
```
from sklearn.feature_extraction. text import TfidfVectorizer, CountVectorizer
```

[ ]:
```
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.feature_extraction.text import CountVectorizer

sns.set_style('whitegrid')
%matplotlib inline

stop = stop + ['best' , 'college' , 'engineer' , 'engineering', 'AP' ,'shah' ,'institute', 'APSIT', 'AP Shah' , 'AP shah' , 'infrastructure', 'students','s

def plot_20_most_common_words(count_data, count_vectorizer):
    words = count_vectorizer.get_feature_names_out()
    total_counts = np.zeros(len(words))

    for t in count_data:
        total_counts += t.toarray()[0]

    count_dict = dict(zip(words, total_counts))
    count_dict = sorted(count_dict.items(), key=lambda x: x[1], reverse=True)[:20]

    words = [w[0] for w in count_dict]
    counts = [w[1] for w in count_dict]

    x_pos = np.arange(len(words))

    plt.figure(figsize=(12, 6))
    sns.set_context('notebook', font_scale=1.5)
    sns.barplot(x=x_pos, y=counts, palette='husl')
    plt.title('20 most common words')
    plt.xticks(x_pos, words, rotation=45, ha='right')
    plt.xlabel('Words')
    plt.ylabel('Counts')
    plt.show()


count_vectorizer = CountVectorizer(stop_words=stop)
count_data = count_vectorizer.fit_transform(tweets_df['Review'])
plot_20_most_common_words(count_data, count_vectorizer)
```

[ ]:
```
/usr/local/lib/python3.10/dist-packages/sklearn/feature_extraction/text.py:409: UserWarning:

Your stop_words may be inconsistent with your preprocessing. Tokenizing the stop words generated tokens ['ap', 'apsit'] not in stop_words.

<ipython-input-103-f445acaa6acc>:28: FutureWarning:



Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the
same effect.
```

[ ]:



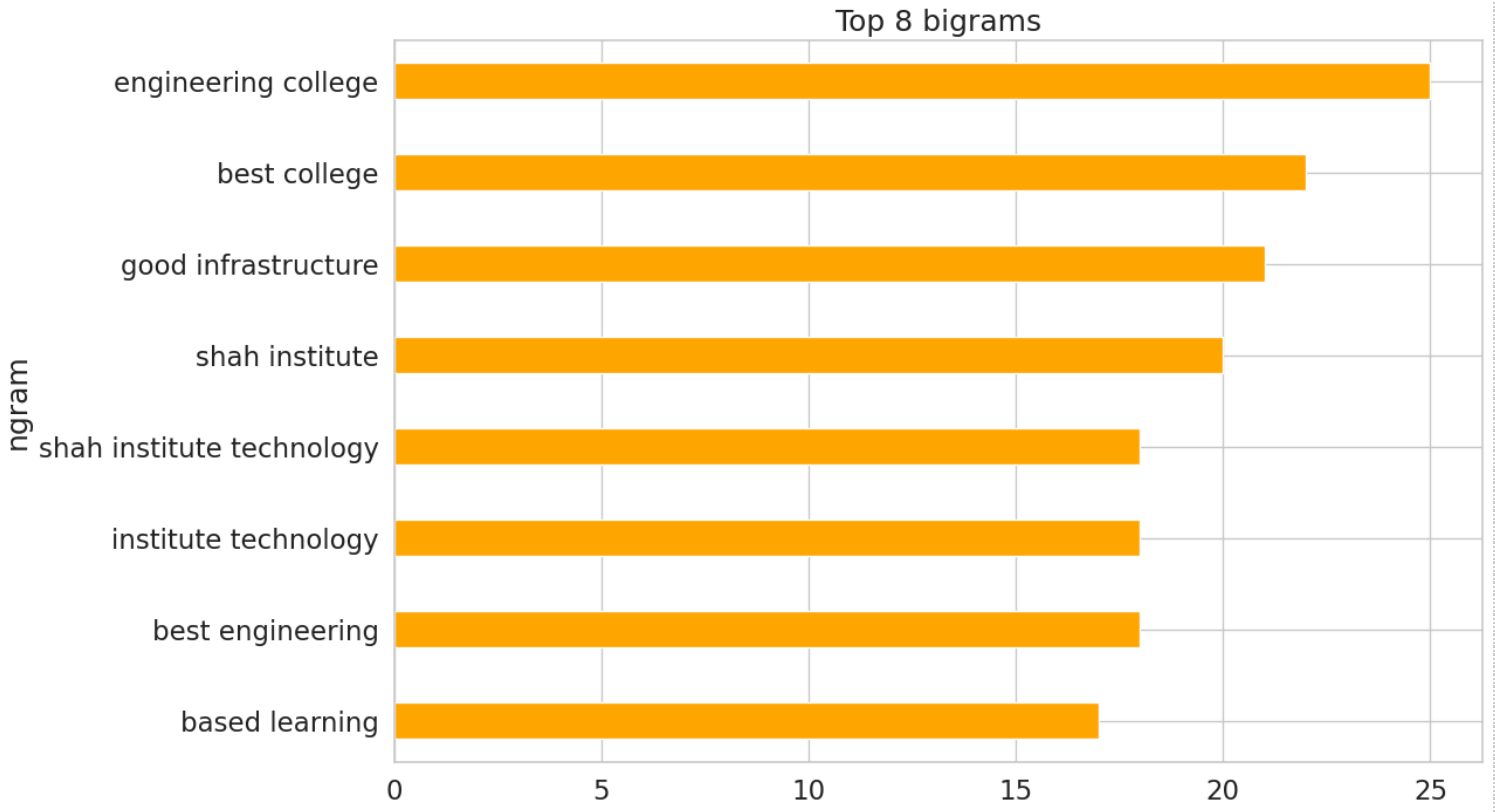
[ ]:

```
import cufflinks as cf
cf.go_offline()
cf.set_config_file(offline=False, world_readable=True)

def get_top_n_bigram(corpus, n=None) :
  vec = CountVectorizer(ngram_range=(2, 4), stop_words="english").fit(corpus)
  bag_of_words = vec.transform(corpus)
  sum_words = bag_of_words.sum(axis=0)
  words_freq =[(word, sum_words[0, idx]) for word, idx in vec.vocabulary_.items()]
  words_freq =sorted(words_freq, key = lambda x: x[1], reverse=True)
  return words_freq[:n]

common_words = get_top_n_bigram(tweets_df['Review'] , 8)
mydict={}
for word, freq in common_words:
  bigram_df = pd.DataFrame(common_words,columns = ['ngram', 'count'])

bigram_df.groupby( 'ngram' ).sum()['count'].sort_values(ascending=False).sort_values().plot.barh(title = 'Top 8 bigrams',color='orange' , width=.4, figsize
```

[ ]:

[ ]:

[ ]:



[ ]:

```
def get_subjectivity(text):
  return TextBlob(text).sentiment.subjectivity
def get_polarity(text):
  return TextBlob(text).sentiment.polarity
```

[ ]:

```
tweets_df['subjectivity']=tweets_df[ 'Review'].apply(get_subjectivity)
tweets_df['polarity']=tweets_df[ 'Review'].apply(get_polarity)
tweets_df.loc[:,['Username','Timeline','Response']].head(20)
```

[ ]:

	Username	Timeline	Response
0	Saurabh Kanade	6 months ago	Like
1	Rasika Pujare	2 years ago	NaN
2	V S	2 months ago	Share
3	Sneha Yadav	4 years ago	NaN
4	AJP Travel	2 years ago	NaN
5	HARSH SHIRKE	4 months ago	Share
6	Akansha Rawat	3 years ago	NaN
7	Rajat Bopalkar	4 years ago	NaN
8	Yash Chavan	4 years ago	NaN
9	anagha aher	4 years ago	NaN
10	Kiran Gourshete	4 years ago	NaN
11	AMOL SHINDE	a year ago	NaN
12	Amogh Kadam	4 years ago	NaN
13	Shreya Bhutada	4 years ago	NaN
14	AVISHKAR RAUT	4 years ago	NaN
15	Selvin Furtado	5 years ago	NaN
16	Siddhi Sawant	11 months ago	Share
17	Sankett Mhatre	4 years ago	NaN
18	Himanshu Behra	4 years ago	Share
19	anushri tambe	4 years ago	Share

Polarity Scores

Polarity scores are numerical values that range from -1 to 1, where -1 indicates a very negative sentiment, 0 indicates a neutral sentiment, and 1 indicates a very positive sentiment. Polarity scores can help you quickly identify the overall mood of a text, whether it is a product review, a social media post, or a customer feedback. Polarity scores may not capture the nuances and context of a text, such as sarcasm, irony, humor, or mixed emotions. Polarity scores may not reflect the intensity or importance of a sentiment, such as how strongly or weakly a person feels about something

Subjectivity Score

Subjectivity scores are numerical values that range from 0 to 1, where 0 indicates a very objective text, and 1 indicates a very subjective text. Objective texts are based on facts, evidence, or logic, while subjective texts are based on opinions, feelings, or personal views. Subjectivity scores can help you filter out irrelevant or biased texts, and focus on the ones that express genuine sentiments.

5. Sentiment Analysis

[ ]:

```
tweets_df['textblob_score'] =tweets_df['Review'].apply(lambda x: TextBlob(x).sentiment.polarity)
```

[ ]:

```
neutral_threshold=0.05
```

[ ]:

```
tweets_df['textblob_sentiment']=tweets_df[ 'textblob_score'].apply(lambda c:'positive' if c >= neutral_threshold else ('Negative' if c <= -(neutral_thresho
```

[ ]:
```
textblob_df =  tweets_df[['Review','textblob_sentiment','Rating']]
textblob_df
```

[ ]:

	Review	textblob_sentiment	Rating
0	Amezing ClassRooms.\nAir Conditioner Fan Both...	positive	4
1	I visited the institute as it was my examinati...	positive	1
2	This was my CAT exam center. Though exam didn'...	positive	5
3	It's the best college in Thane, growing rapidl...	positive	3
4	It is beside highway so keep check on take in ...	positive	5
...	...	...	...
185	College with great infrastructure and all the ...	positive	4
186	Greenery from all side, AC classroom, best ins...	positive	2
187	Very nice place and it is situated near main r...	positive	5
188	Nice infrastructure .Bank and food available n...	positive	4
189	Went to take admission in the college, great s...	positive	4

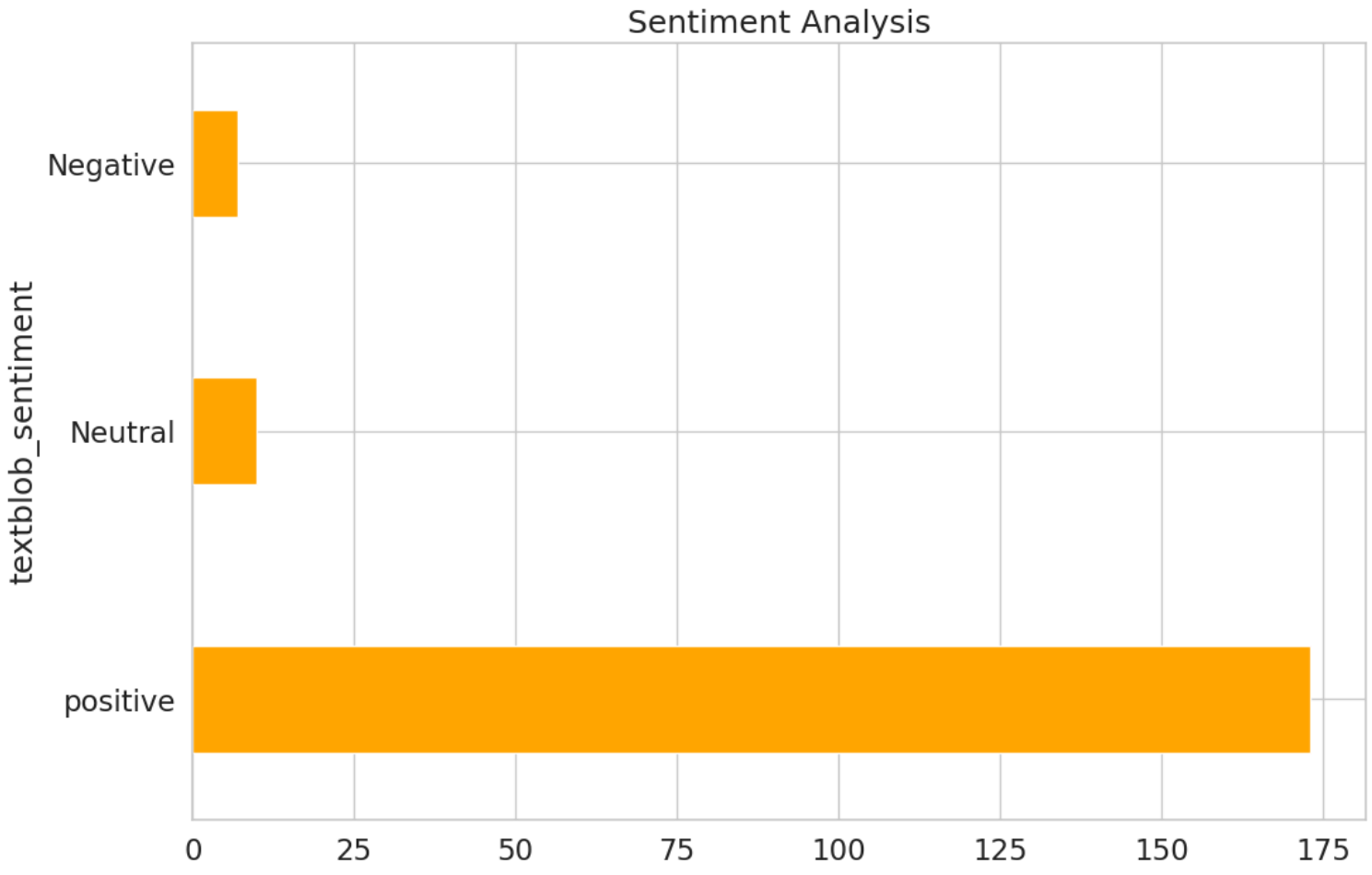
190 rows × 3 columns

[ ]:
```
textblob_df["textblob_sentiment"].value_counts()
```

[ ]:
```
textblob_sentiment
positive    173
Neutral      10
Negative      7
Name: count, dtype: int64
```

[ ]:
```
textblob_df["textblob_sentiment"].value_counts().plot.barh(title = 'Sentiment Analysis',color='orange' , width=.4, figsize=(12,8),stacked = True)
```

[ ]:



[ ]:
```
df_positive=textblob_df[textblob_df['textblob_sentiment']=='positive' ]
```

[ ]:
```
df_very_positive=df_positive[df_positive['Rating']>0]
```

[ ]:
```
df_very_positive.head()
```

[ ]:

	Review	textblob_sentiment	Rating
0	Amezing ClassRooms.\nAir Conditioner Fan Both...	positive	4
1	I visited the institute as it was my examinati...	positive	1
2	This was my CAT exam center. Though exam didn'...	positive	5
3	It's the best college in Thane, growing rapidl...	positive	3
4	It is beside highway so keep check on take in ...	positive	5

[ ]:
```
df_negative=textblob_df[textblob_df['textblob_sentiment']=='Negative' ]
```

[ ]:
```
df_negative
```

[ ]:

	Review	textblob_sentiment	Rating
110	Do you aspire to become an Engineer If your an...	Negative	0
137	This is my neet exam center\nI hope they will ...	Negative	1
142	There is no proper management for recruitment ...	Negative	3
143	Impossible for you to reach without google ma....	Negative	5
147	Located on express Highway Thane west...just o...	Negative	4
149	At present on 3 N9v 2019 there is construction...	Negative	2
151	I have go here for pool campus drive... Our re...	Negative	4

[ ]:
```
df_neutral=textblob_df[textblob_df['textblob_sentiment']=='Neutral' ]
```

[ ]:
```
df_neutral
```

[ ]:

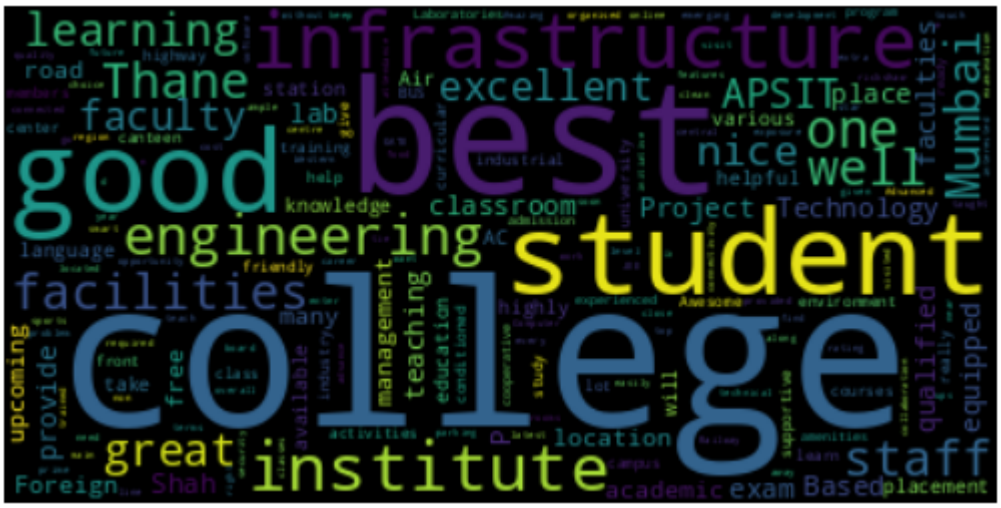
	Review	textblob_sentiment	Rating
44	A college that helps its students stand in com...	Neutral	2
83	APSIT has lot of initiatives in the form of co...	Neutral	2
116	A.P.Shah Institute Of Technology is an enginee...	Neutral	2
124	I have visited this to give exam of railway, e...	Neutral	3
146	College dint conduct convocation ceremony for ...	Neutral	4
163	Take public transport to reach Thane railway s...	Neutral	5
164	I was there for Exam... Its easier to reach he...	Neutral	1
174	2019-20 batch have not yet received their conv...	Neutral	1
179	Hey there I completed my diploma in engineerin...	Neutral	5
184	Sai shradha fabrication and alluminium work	Neutral	1

Create a Word Cloud

[ ]:
```
from wordcloud import WordCloud, STOPWORDS
from PIL import Image
```

[ ]:
```
positive_tw =" ".join(t for t in df_very_positive.Review)
word_cloud1 = WordCloud(collocations = False, background_color = 'black') .generate(positive_tw)
plt. imshow(word_cloud1, interpolation='bilinear')
plt.axis('off')
plt.show()
```

[ ]:



[ ]:
```
positive_tw
```

[ ]:
```
"Amezing ClassRooms.\nAir Conditioner  Fan Both are Available In Each Class.\n5 Floors Building. … I visited the institute as it was my examination center f
```

[ ]:
```
!pip install --upgrade pip
```

[ ]:
```
Requirement already satisfied: pip in /usr/local/lib/python3.10/dist-packages (24.0)
WARNING: Running pip as the 'root' user can result in broken permissions and conflicting behaviour with the system package manager. It is recommended to
use a virtual environment instead: https://pip.pypa.io/warnings/venv
```

[ ]:
```
!pip install wordcloud==1.8.0
```

[ ]:
```
Collecting wordcloud==1.8.0
  Using cached wordcloud-1.8.0.tar.gz (217 kB)
  Preparing metadata (setup.py) ... ?25lent already satisfied: numpy>=1.6.1 in /usr/local/lib/python3.10/dist-packages (from wordcloud==1.8.0) (1.25.2)
Requirement already satisfied: pillow in /usr/local/lib/python3.10/dist-packages (from wordcloud==1.8.0) (9.4.0)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-packages (from wordcloud==1.8.0) (3.7.1)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (1.2.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (4.51.0)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (1.4.5)
```

```
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (24.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (3.1.2)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib->wordcloud==1.8.0) (2.8.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib->wordcloud==1.8.0) (1.16.0)
Building wheels for collected packages: wordcloud
  error: subprocess-exited-with-error

  × python setup.py bdist_wheel did not run successfully.
  │ exit code: 1
  ╰─> See above for output.

  note: This error originates from a subprocess, and is likely not a problem with pip.
  Building wheel for wordcloud (setup.py) ... ?25lerror
  ERROR: Failed building wheel for wordcloud
?25h  Running setup.py clean for wordcloud
Failed to build wordcloud
ERROR: Could not build wheels for wordcloud, which is required to install pyproject.toml-based projects
```

[]:
```
negative_tw =" ".join(t for t in df_negative.Review)
word_cloud2 = WordCloud(collocations = False, background_color = 'black') .generate(negative_tw)
plt. imshow(word_cloud2, interpolation='bilinear')
plt.axis('off')
plt.show()
```

[]:


[]:
```
neutral_tw =" ".join(t for t in df_neutral.Review)
word_cloud2 = WordCloud(collocations = False, background_color = 'black') .generate(neutral_tw)
plt. imshow(word_cloud2, interpolation='bilinear')
plt.axis('off')
plt.show()
```

[]: