### IMPORTING LIBRARIES

```
import numpy as np
import pandas as pd
import re
import seaborn as sns
import matplotlib.pyplot as plt
import nltk
import spacy
from nltk.tokenize import word_tokenize
from nltk.stem import PorterStemmer
from nltk.corpus import stopwords
from wordcloud import WordCloud
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
```

```
/usr/local/lib/python3.8/dist-packages/torch/cuda/__init__.py:497: UserWarning: Can't initialize NVML
  warnings.warn("Can't initialize NVML")
```

### STOPWORDS

We use stopwords , because in our text we have many in / is / our / punctuation.

These words doesn't provide benefit to our process so we will be removing those words.

by removing these stopwords, our model performs more efficient

```
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
True
```

```
stop_words = set(stopwords.words('english'))
```

### LOADING THE DATA

```
data = pd.read_csv("/content/vaccination_tweets.csv")
```

### LOAD FIRST 5 DATA

```
data.head()
```

| | id | user_name | user_location | user_description | user_created | user_followers | user_friends | user_favourites |
|---|---|---|---|---|---|---|---|---|
| **0** | 1340539111971516416 | Rachel Roh | La Crescenta-Montrose, CA | Aggregator of Asian American news; scanning di... | 2009-04-08 17:52:46 | 405 | 1692 | 3247 |
| **1** | 1338158543359250433 | Albert Fong | San Francisco, CA | Marketing dude, tech geek, heavy metal & '80s ... | 2009-09-21 15:27:30 | 834 | 666 | 178 |
| **2** | 1337858199140118533 | eliʟᴛᴇᴜ👌 | Your Bed | heil, hydra 🖐☺ | 2020-06-25 23:30:28 | 10 | 88 | 155 |
| **3** | 1337855739918835717 | Charles Adler | Vancouver, BC - Canada | Hosting "CharlesAdlerTonight" Global News Radi... | 2008-09-10 11:28:53 | 49165 | 3933 | 21853 |
| **4** | 1337854064604966912 | Citizen News Channel | NaN | Citizen News Channel bringing you an alternati... | 2020-04-23 17:58:42 | 152 | 580 | 1473 |

### DATASET INFO

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10165 entries, 0 to 10164
Data columns (total 16 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   id                10165 non-null  int64  
 1   user_name         10165 non-null  object 
 2   user_location     8112 non-null   object 
 3   user_description  9534 non-null   object 
 4   user_created      10165 non-null  object 
 5   user_followers    10165 non-null  int64  
 6   user_friends      10165 non-null  int64  
 7   user_favourites   10165 non-null  int64  
 8   user_verified     10165 non-null  bool   
 9   date              10165 non-null  object 
 10  text              10165 non-null  object 
 11  hashtags          7788 non-null   object 
 12  source            10163 non-null  object 
 13  retweets          10164 non-null  float64
 14  favorites         10164 non-null  float64
 15  is_retweet        10164 non-null  object 
dtypes: bool(1), float64(2), int64(4), object(9)
memory usage: 1.2+ MB
```

### CHECKING NULL VALUES

```
data.isnull().sum()
```

```
id                     0
user_name              0
user_location       2053
user_description     631
user_created           0
user_followers         0
user_friends           0
user_favourites        0
user_verified          0
date                   0
text                   0
hashtags            2377
source                 2
retweets               1
favorites              1
is_retweet             1
dtype: int64
```

### LIST OF COLUMN NAMES IN OUR DATASET

```
data.columns
```

```
Index(['id', 'user_name', 'user_location', 'user_description', 'user_created',
       'user_followers', 'user_friends', 'user_favourites', 'user_verified',
       'date', 'text', 'hashtags', 'source', 'retweets', 'favorites',
       'is_retweet'],
      dtype='object')
```

### ROWS AND COLUMN OF DATASET

```
data.shape
```

```
(10165, 16)
```

REMOVING THE COLUMNS

```
data.drop(['id', 'user_name', 'user_location', 'user_description', 'user_created',
       'user_followers', 'user_friends', 'user_favourites', 'user_verified',
       'date', 'hashtags', 'source', 'retweets', 'favorites',
       'is_retweet'], axis=1, inplace=True)
```

```
data.head()
```

|   | text |
|---|---|
| **0** | Same folks said daikon paste could treat a cyt... |
| **1** | While the world has been on the wrong side of ... |
| **2** | #coronavirus #SputnikV #AstraZeneca #PfizerBio... |
| **3** | Facts are immutable. Senator, even when you're |

```
data.columns
```

```
Index(['text'], dtype='object')
```

**FIRST TWEET**

```
data['text'][1]
```

```
'While the world has been on the wrong side of history this year, hopefully, the biggest vaccination effort we've ev… https://t.c
o/dlCHrZjkhm'
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10165 entries, 0 to 10164
Data columns (total 1 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   text    10165 non-null  object
dtypes: object(1)
memory usage: 79.5+ KB
```

**PREPROCESSING**

In this step we will be removing some unecessary words like URL , SPECIAL CHARACTERS , @ , # ,..

For this we will using re library( Regular Expression )

Then we our doing tokenization + removing stop words

Tokenization is the process of splitting text into meaningful segments

```
def preprocess(text):
  text = text.lower()
  text = re.sub(r"https\S+|www\S+https\S+", '',text)
  text = re.sub(r'\@w+|\#','',text)
  text = re.sub(r'[^\w\s]','',text)
  text_tokens = word_tokenize(text)
  text_tokens = word_tokenize(text)
  filtered_text = [w for w in text_tokens if not w in stop_words]
  return " ".join(filtered_text)
```

```
nltk.download('punkt')
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
True
```

```
data['text'] = data['text'].apply(preprocess)
```

```
data = data.drop_duplicates('text')
```

**STEMMING**

Stemming is the process were we use simple rules such as remove ing , able

to derive base word

why we are not using lemmetization means,

for example there is a word ability

and if u do stemming over ability it gives ability

but if u do lemmetization it gives abil instead of ability

it removes the last word lity

in simple words lemmitization does know language knowledge were stemming doesn't have the language knowledge

```
stemmer = PorterStemmer()
def stemming(data):
    text = [stemmer.stem(word) for word in data]
    return data
```

```
data['text'] = data['text'].apply(lambda x: stemming(x))
```

```
data.head()
```

| | text |
|---|---|
| **0** | folks said daikon paste could treat cytokine s... |
| **1** | world wrong side history year hopefully bigges... |
| **2** | coronavirus sputnikv astrazeneca pfizerbiontec... |
| **3** | facts immutable senator even youre ethically s... |
| **4** | explain need vaccine borisjohnson matthancock ... |

```
data['text'][1]
```

```
'world wrong side history year hopefully biggest vaccination effort weve ev'
```

### POLARITY

```
from textblob import TextBlob
```

```
def polarity(text):
    return TextBlob(text).sentiment.polarity
```

```
data['polarity'] = data['text'].apply(polarity)
```

```
data.head(10)
```

| | text | polarity |
|---|---|---|
| **0** | folks said daikon paste could treat cytokine s... | 0.000 |
| **1** | world wrong side history year hopefully bigges... | -0.500 |
| **2** | coronavirus sputnikv astrazeneca pfizerbiontec... | 0.000 |
| **3** | facts immutable senator even youre ethically s... | 0.100 |
| **4** | explain need vaccine borisjohnson matthancock ... | 0.000 |
| **5** | anyone useful adviceguidance whether covid vac... | 0.400 |
| **6** | bit sad claim fame success vaccination patriot... | -0.100 |
| **7** | many bright days 2020 best 1 bidenharris winni... | 0.675 |
| **8** | covid vaccine getting covidvaccine covid19 pfi... | 0.000 |
| **9** | covidvaccine states start getting covid19vacci... | 0.000 |

Then we are creating a column sentiment

based on the polarity value it assigns the label

```
def sentiment(label):
    if label <0:
        return "Negative"
    elif label ==0:
        return "Neutral"
    elif label>0:
        return "Positive"
```

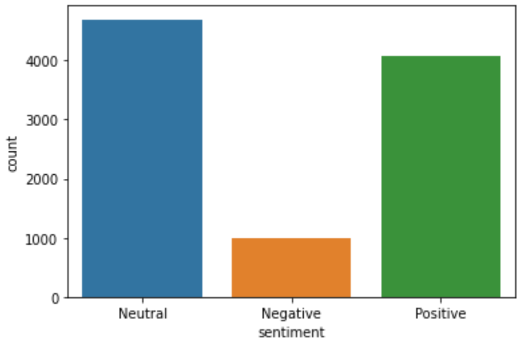
```
data['sentiment'] = data['polarity'].apply(sentiment)
```

```
data.head(10)
```

| | text | polarity | sentiment |
|---|---|---|---|
| **0** | folks said daikon paste could treat cytokine s... | 0.000 | Neutral |
| **1** | world wrong side history year hopefully bigges... | -0.500 | Negative |
| **2** | coronavirus sputnikv astrazeneca pfizerbiontec... | 0.000 | Neutral |
| **3** | facts immutable senator even youre ethically s... | 0.100 | Positive |
| **4** | explain need vaccine borisjohnson matthancock ... | 0.000 | Neutral |
| **5** | anyone useful adviceguidance whether covid vac... | 0.400 | Positive |
| **6** | bit sad claim fame success vaccination patriot... | -0.100 | Negative |
| **7** | many bright days 2020 best 1 bidenharris winni... | 0.675 | Positive |
| **8** | covid vaccine getting covidvaccine covid19 pfi... | 0.000 | Neutral |
| **9** | covidvaccine states start getting covid19vacci... | 0.000 | Neutral |

```
sns.countplot(x='sentiment', data = data)
```

```
<AxesSubplot:xlabel='sentiment', ylabel='count'>
```



listing out the text with positive sentiment

```
pos_tweets = data[data.sentiment == 'Positive']
pos_tweets = pos_tweets.sort_values(['polarity'], ascending= False)
pos_tweets.head()
```

| | text | polarity | sentiment |
|---|---|---|---|
| **8935** | numbertwo magnificent vaccinatedactor vaxxedan... | 1.0 | Positive |
| **5942** | vaccines work excellent news thelancet study p... | 1.0 | Positive |
| **4417** | best feeling got covidvaccine lets keep going ... | 1.0 | Positive |
| **2340** | applying emotion pfizerbiontech based best evi... | 1.0 | Positive |
| **9456** | lets break according cdcgov perfectly acceptab... | 1.0 | Positive |

listing out the text with negative sentiment

```
neg_tweets = data[data.sentiment == 'Negative']
neg_tweets = neg_tweets.sort_values(['polarity'], ascending= False)
neg_tweets.head()
```

| | text | polarity | sentiment |
|---|---|---|---|
| **2912** | work skilled nursing facility got first vaccin... | -0.003333 | Negative |
| **7256** | 200321 752308 vaccinations new daily record da... | -0.003409 | Negative |
| **2073** | ukgovernment cant even vaccinate properly ethi... | -0.004762 | Negative |
| **7715** | got first dose less waiting time airport vacci... | -0.005556 | Negative |
| **7157** | nas_k27 second dose due end next month well fa... | -0.006250 | Negative |

listing out the text with neutral sentiment

```
neutral_tweets = data[data.sentiment == 'Neutral']
neutral_tweets = neutral_tweets.sort_values(['polarity'], ascending= False)
neutral_tweets.head()
```

| | text | polarity | sentiment |
|---|---|---|---|
| **0** | folks said daikon paste could treat cytokine s... | 0.0 | Neutral |
| **6826** | opportunity arises please get vaccine got pfiz... | 0.0 | Neutral |
| **6868** | experience pfizer leads state israel conducted... | 0.0 | Neutral |
| **6865** | predawn dispatch xalapa mexico alls well sunbu... | 0.0 | Neutral |
| **6862** | skeersmaecker course member states agree diffe... | 0.0 | Neutral |

### ENCODING

now we are going to convert categorical value to numerical

As we know ml model doesn't deal with categorical value

for that reason we will converting them to numerical value

there are many technique like, 1) one hot encoding 2) bag of words 3) TF IDF ,....

we are not going to use one hot encoding it has some drawbacks

we will be using bag of words

```
vect = CountVectorizer(ngram_range=(1,2)).fit(data['text'])
```

```
X = data['text']
Y = data['sentiment']
X = vect.transform(X)
```

### SPLIT TRAIN TEST DATASET

```
x_train, x_test, y_train, y_test = train_test_split(X, Y, test_size=0.2, random_state=42)
```

### MACHINE LEARING

we will be using some classification model as this problem deals with classifying whether the tweets is positive | neutral | negative

Models : 1) Logistic Regression 2) SVM 3) Decision Tree

### LOGISTIC REGRESSION

```
log = LogisticRegression()
```

```
log.fit(x_train,y_train)
```

```
    LogisticRegression()
```

```
score = log.score(x_test,y_test)
score = score * 100
print(score)
```

```
    83.61495135688683
```

We got Accuracy : 83%

```
log.predict(x_test)
```

```
    array(['Positive', 'Positive', 'Positive', ..., 'Neutral', 'Positive',
           'Positive'], dtype=object)
```

### SVM

```
from sklearn.svm import SVC
```

```
svm = SVC()
```

```
svm.fit(x_train,y_train)
```

```
    SVC()
```

```
scoree = svm.score(x_test,y_test)
scoree = scoree * 100
print(scoree)
```

```
77.00972862263184
```

We got Accuracy : 77%

```
svm.predict(x_test)
```

```
array(['Positive', 'Positive', 'Positive', ..., 'Neutral', 'Positive',
       'Positive'], dtype=object)
```

**DECISION TREE**

```
from sklearn.tree import DecisionTreeClassifier
```

```
dt = DecisionTreeClassifier()
```

```
dt.fit(x_train,y_train)
```

```
DecisionTreeClassifier()
```

```
scoreee = dt.score(x_test,y_test)
scoreee = scoreee * 100
print(scoreee)
```

```
90.42498719918075
```

We got Accuracy : 90%

```
dt.predict(x_test)
```

```
array(['Positive', 'Positive', 'Positive', ..., 'Neutral', 'Positive',
       'Positive'], dtype=object)
```