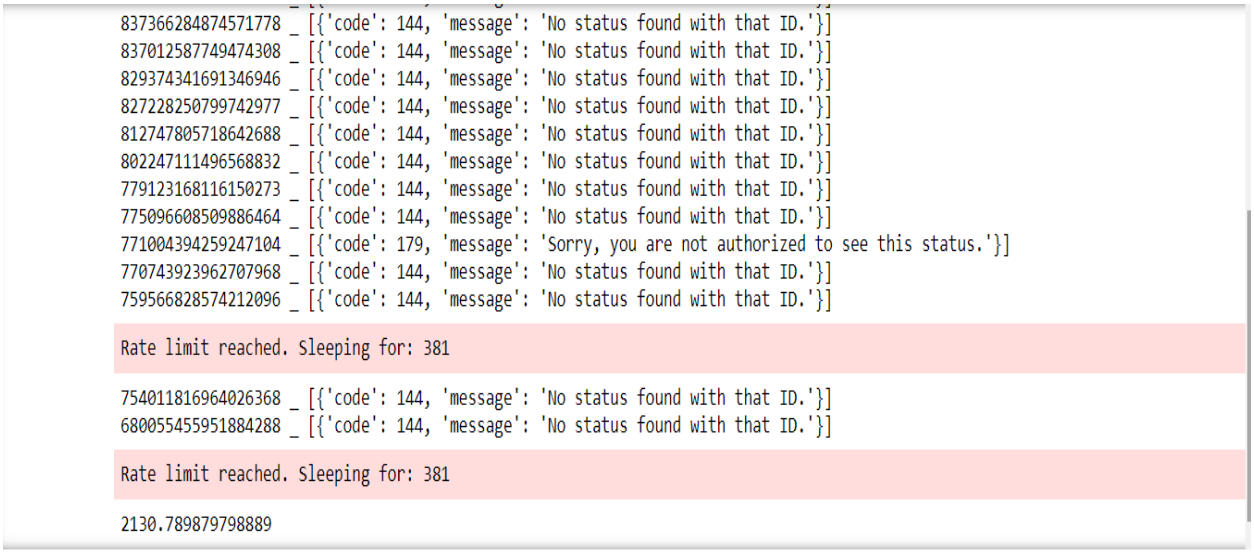
1- Importing the required libraries.
2- Gathering Data
   2-1 Gathering data from twitter-archive csv format
   2-2 Gathering the tweet image predictions programmatically hosted on udacity.
   2-3 Gathering for each tweet's
   How many favorites the tweet had?
   How many Count of the retweet?
   How many followers the user had?
   How many favorites the user had?
   The date and time of the creation?
   Using the tweet IDs in the WeRateDogs Twitter archive
   Using Twitter API




3- Assess
   3-1 Quality Issue

| Dataset | Quality Issue | Quality dimensions |
|---|---|---|
| “twitter_archive” | 1. All dog stages using 'None' instead of 'NaN'. | Consistency |
| | 2. In name change 'None' to NaN. | Consistency |
| | 3. Capitalize the first letter of all names in name. | |
| | 4. Columns pertaining to retweets and expanded URLs are unnecessary. | Consistency |
| | 5. Timestamp is string not date time | Consistency |
| | 6. Rating_numerator there are 39 different numerators<br>[ 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,<br>11, 12, 13, 14, 15, 17, 20, 24, 26, 27, 44,<br>45, 50, 60, 75, 80, 84, 88, 99, 121, 143, 144,<br>165, 182, 204, 420, 666, 960, 1776]<br>two numerators are equal to 0 tweet_id: 835152434251116546 (rating in the text column is 0/10)<br>tweei_id: 746906459439529985 (rating in the text column is 0/10) | Precision |
| | 7. Rating_denominator there are 18 different denumerators ,<br>[ 0, 2, 7, 10, 11, 15, 16, 20, 40, 50, 70, 80, 90,110, 120, 130, 150,170]<br>Valid rates are [2,7,10]<br>one of them is equal to 0 tweet_id: 835246439529840640 (rating in the text column is 13/10) | Precision |
| | 8. There are a few cases, where a dog has more than one style: tweet_id: 854010172552949000 (doggo, floofer) tweet_id: 808106460588765000 (doggo, pupper) tweet_id: 801115127852503000 (doggo, pupper) tweet_id: 781308096455073000 (doggo, pupper) | Validity |
| | 9. There could be encoding problem for<br>757354760399941633 Devón<br>720389942216527872 Ralphé<br>717047459982213120 Flávio<br>694352839993344000 Oliviér | Validity |

| | | |
|---|---|---|
| | 688547210804498433 Frönq<br><br>686050296934563840 Flávio<br><br>669371483794317312 Oliviér<br><br>668872652652679168 Amélie<br><br>668528771708952576 Gòrdón<br>(the name value uses non-English characters) | |
| “image_predictions” | 1. There are a few cases, where a p1_dog, p2_dog, and p3_dog are all "False" in df_image it means there is no correct prediction. | Validity |
| | 2. Values for p1, 2, and p3 not always capitalized | Precision |

## 3-2 Tidiness Issues

| Dataset | Tidiness Issue | Tidiness dimensions |
|---|---|---|
| “twitter_archive” | 1. Doggo, floofer, pupper, puppo are one variable spread across different columns | Each variable forms a column. |
| | 2. Rating_numerator and rating_denominator can be combined into one column | Each variable forms a column. |
| image_predictions | 3. “img_num" contains integer values ranging from 1 to 4 but only 1 img_url is present (this column semantics is not clear). The column may not have any use here. | |
| General | 4. There are too many datasets and their overall structure is untidy | Each type of observational unit forms a table. |
| | 5. After merging data frames date time in “twitter_archive” has the same values as timestamp column in “tweet_json” | Duplicate column |

## 4- Cleaning

Starting with The last tidiness issue

“There are too many datasets and their overall structure is untidy”

Solution:

Merge all data frames into one based on “tweet_id”

Quality issues:

1. All dog stages using 'None' instead of 'NaN'.
   Solution:
   # Change ‘None’ to’ NaN’ for ['doggo', 'floofer', 'pupper', 'puppo'] columns
2. In name change 'None' to NaN.
   Solution:
   # Change ‘None’ to’ NaN’ for [‘name’] columns.

3. Capitalize the first letter of all names in name.
   Solution:
   # Capitalize first letters for ‘name’ column.
4. Columns pertaining to retweets and expanded URLs are unnecessary.
   Solution:
   # Delete the retweets using “retweeted_status_id”.
   # Delete duplicated tweet_id.
   # Delete tweets with no pictures.
   # Delete columns related to retweet [retweeted_status_id, retweeted_status_user_id , retweeted_status_timestamp]

5. Timestamp is string not date time.
   Solution:
   # Convert into datetime.

6. Rating_numerator there are 39 different numerators
   Solution:
   # Standardized rating values.

7. Rating_denominator there are 18 different numerators
   Solution:
   # Standardized rating values.

8. There are a few cases, where a dog has more than one style: tweet_id: 854010172552949000 (doggo, floofer) tweet_id: 808106460588765000 (doggo, pupper) tweet_id: 801115127852503000 (doggo, pupper) tweet_id: 781308096455073000 (doggo, pupper)
   Solution:
   # Standardized rating values.

9. There could be encoding problem for tweet_id = 668528771708952576 (the name value uses non-English characters)

Solution:

# Delete obserations which contain non-English character.

9.1 Function to check if text contain any non-English character

```
# -*- coding: utf-8 -*-check only contain english char
def isEnglish(s):
    try:
        s.encode(encoding='utf-8').decode('ascii')
    except UnicodeDecodeError:
        return False
    else:
        return True
```

Show all observation's tweet id have non-English name

```
NonEnglishlist=[]
for index, row in twitter_archive_Copy.iterrows():
    if  isEnglish(row['name'])==False:
        print(row['tweet_id'],row['name'])
        NonEnglishlist.append(row['tweet_id'])
```

```
757354760399941633 Devón
720389942216527872 Ralphé
717047459982213120 Flávio
694352839993344000 Oliviér
688547210804498433 Frönq
686050296934563840 Flávio
669371483794317312 Oliviér
668872652652679168 Amélie
668528771708952576 Gòrdón
```

Remove all observation which contain non-English character

```
NonEnglishlist
while len(NonEnglishlist)!=0:
    for e in NonEnglishlist:
        try:
            df_merge_Twitter_Image_Archive = df_merge_Twitter_Image_Archive[df_merge_Twitter_Image_Archive.tweet_id == e]
            NonEnglishlist.remove(e)
        except Exception:
            print(e," not removed")
```

10. There are a few cases, where a p1_dog, p2_dog, and p3_dog are all "False" in image_predictions it means there is no correct prediction

Solution:

# Remove entries where p1_dog, p2_dog, and p3_dog are all "False" in image_predictions

```
df_merge_Twitter_Image_Archive = df_merge_Twitter_Image_Archive.query('p1_dog == True or p2_dog == True or p3_dog == True')
df_merge_Twitter_Image_Archive
```

| numerator | rating_denominator | name | ... | p2_dog | p3 | p3_conf | p3_dog | favorite_count | retweet_count | created_at | followers_count | favou |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.0 | 10.0 | Tilly | ... | True | papillon | 0.068957 | True | 33671.0 | 6438.0 | 2017-08-01 00:17:27+00:00 | 4653959.0 | |
| 12.0 | 10.0 | Archie | ... | True | kelpie | 0.031379 | True | 25362.0 | 4270.0 | 2017-07-31 00:18:03+00:00 | 4653959.0 | |
| 13.0 | 10.0 | Darla | ... | True | spatula | 0.040836 | False | 42708.0 | 8872.0 | 2017-07-30 15:58:51+00:00 | 4653960.0 | |
| 12.0 | 10.0 | Franklin | ... | True | German_short-haired_pointer | 0.175219 | True | 40846.0 | 9652.0 | 2017-07-29 16:00:24+00:00 | 4653960.0 | |

```
df_merge_Twitter_Image_Archive.query('p1_dog == False & p2_dog == False & p3_dog == False')
```

| tweet_id | in_reply_to_status_id | in_reply_to_user_id | timestamp | source | text | expanded_urls | rating_numerator | rating_denominator | name | ... | p2_dog | p3 | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

0 rows × 31 columns

11. Values for p1, 2, and p3 not always capitalized

Solution:

# Capitalize first letters for ‘p1,’p2’ and ‘p3’.

```
df_merge_Twitter_Image_Archive[['p1','p2','p3']].sample(1000)
# Capitalize first letters
df_merge_Twitter_Image_Archive['p1'] = [str(p1).capitalize() for p1 in df_merge_Twitter_Image_Archive['p1']]
df_merge_Twitter_Image_Archive['p2'] = [str(p2).capitalize() for p2 in df_merge_Twitter_Image_Archive['p2']]
df_merge_Twitter_Image_Archive['p3'] = [str(p3).capitalize() for p3 in df_merge_Twitter_Image_Archive['p3']]
# Check Capitalize
df_merge_Twitter_Image_Archive[['p1','p2','p3']].sample(1000)
```

favorites

| | p1 | p2 | p3 |
|---|---|---|---|
| **154** | Chow | Pomeranian | Pekinese |
| **1658** | Cocker_spaniel | Soft-coated_wheaten_terrier | Miniature_schnauzer |
| **1945** | German_short-haired_pointer | Kelpie | Labrador_retriever |
| **1081** | Bath_towel | Swab | American_staffordshire_terrier |
| **1885** | Giant_schnauzer | Afghan_hound | Miniature_schnauzer |
| **...** | ... | ... | ... |
| **2284** | Rottweiler | Miniature_pinscher | Black-and-tan_coonhound |
| **765** | Afghan_hound | Basset | Siberian_husky |
| **1982** | Toy_poodle | Miniature_poodle | Airedale |
| **2206** | Miniature_schnauzer | Australian_terrier | Silky_terrier |
| **2230** | Chow | Minivan | Pekinese |

## Tidiness Issues

1. Doggo, floofer, pupper, puppo are one variable spread across different columns
   Solution:
   # Combine Doggo, floofer, pupper, puppo columns into one called "Doggo"

```
df_merge_Twitter_Image_Archive['doggo'] = df_merge_Twitter_Image_Archive['doggo'].fillna(df_merge_Twitter_Image_Archive['floofer'
df_merge_Twitter_Image_Archive['doggo'] = df_merge_Twitter_Image_Archive['doggo'].fillna(df_merge_Twitter_Image_Archive['pupper'
df_merge_Twitter_Image_Archive['doggo'] = df_merge_Twitter_Image_Archive['doggo'].fillna(df_merge_Twitter_Image_Archive['puppo']
df_merge_Twitter_Image_Archive.drop(columns=['floofer','pupper', 'puppo'], inplace=True)
df_merge_Twitter_Image_Archive = df_merge_Twitter_Image_Archive.rename(columns={'doggo': 'dog_style'})
df_merge_Twitter_Image_Archive
```

2. Rating_numerator and rating_denominator can be combined into one column
   Solution:
   #Combine rating numerator and rating denominator in to rating column.

```
# combine rating_denominator and rating_numerator in one column
# Divided rating_denominator on rating_numerator and be sure that rating numerator and denominator are in compatible format
df_merge_Twitter_Image_Archive['rating']=df_merge_Twitter_Image_Archive['rating_numerator'] / df_merge_Twitter_Image_Archive['rat
df_merge_Twitter_Image_Archive[['rating_denominator', 'rating_numerator', 'rating']].T
```

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ... | 2345 | 2346 | 2347 | 2348 | 2350 | 2351 | 2352 | 2353 | 2354 | 2355 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **rating_denominator** | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | ... | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| **rating_numerator** | 13.0 | 12.0 | 13.0 | 12.0 | 13.0 | 13.0 | 13.0 | 13.0 | 14.0 | 13.0 | ... | 10.0 | 8.0 | 9.0 | 10.0 | 10.0 | 5.0 | 6.0 | 9.0 | 7.0 | 8.0 |
| **rating** | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 | ... | 1.0 | 0.8 | 0.9 | 1.0 | 1.0 | 0.5 | 0.6 | 0.9 | 0.7 | 0.8 |

3 rows × 1686 columns

```
df_merge_Twitter_Image_Archive=df_merge_Twitter_Image_Archive.drop(columns=['rating_denominator','rating_numerator'])
df_merge_Twitter_Image_Archive
```

| jpg_url | ... | p3 | p3_conf | p3_dog | favorite_count | retweet_count | created_at | followers_count | favourites_count | dog_style | rating |
|---|---|---|---|---|---|---|---|---|---|---|---|
| moV4XsAAUL6n.jpg | ... | Papillon | 0.068957 | True | 33671.0 | 6438.0 | 2017-08-01 00:17:27+00:00 | 4653959.0 | 125634.0 | NaN | 1.3 |
| dLU1WsAANxJ9.jpg | ... | Kelpie | 0.031379 | True | 25362.0 | 4270.0 | 2017-07-31 00:18:03+00:00 | 4653959.0 | 125634.0 | NaN | 1.2 |

3. “img_num" contains integer values ranging from 1 to 4 but only 1 img_url is present (this column semantics is not clear). The column may not have any use here.
   Solution:
   # Remove img_num column.

```
# Remove img_num column
df_merge_Twitter_Image_Archive.drop(['img_num'], axis=1, inplace=True)
```

```
df_merge_Twitter_Image_Archive.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1686 entries, 1 to 2355
Data columns (total 26 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   tweet_id               1686 non-null   int64
 1   in_reply_to_status_id  20 non-null     float64
 2   in_reply_to_user_id    20 non-null     float64
 3   timestamp              1686 non-null   datetime64[ns, UTC]
 4   source                 1686 non-null   object
 5   text                   1686 non-null   object
 6   expanded_urls          1686 non-null   object
 7   name                   1686 non-null   object
 8   doggo                  260 non-null    object
 9   jpg_url                1686 non-null   object
 10  p1                     1686 non-null   object
 11  p1_conf                1686 non-null   float64
 12  p1_dog                 1686 non-null   object
 13  p2                     1686 non-null   object
 14  p2_conf                1686 non-null   float64
 15  p2_dog                 1686 non-null   object
 16  p3                     1686 non-null   object
 17  p3_conf                1686 non-null   float64
 18  p3_dog                 1686 non-null   object
 19  favorite_count         1686 non-null   float64
 20  retweet_count          1686 non-null   float64
 21  created_at             1686 non-null   datetime64[ns, UTC]
 22  followers_count        1686 non-null   float64
 23  favourites_count       1686 non-null   float64
```

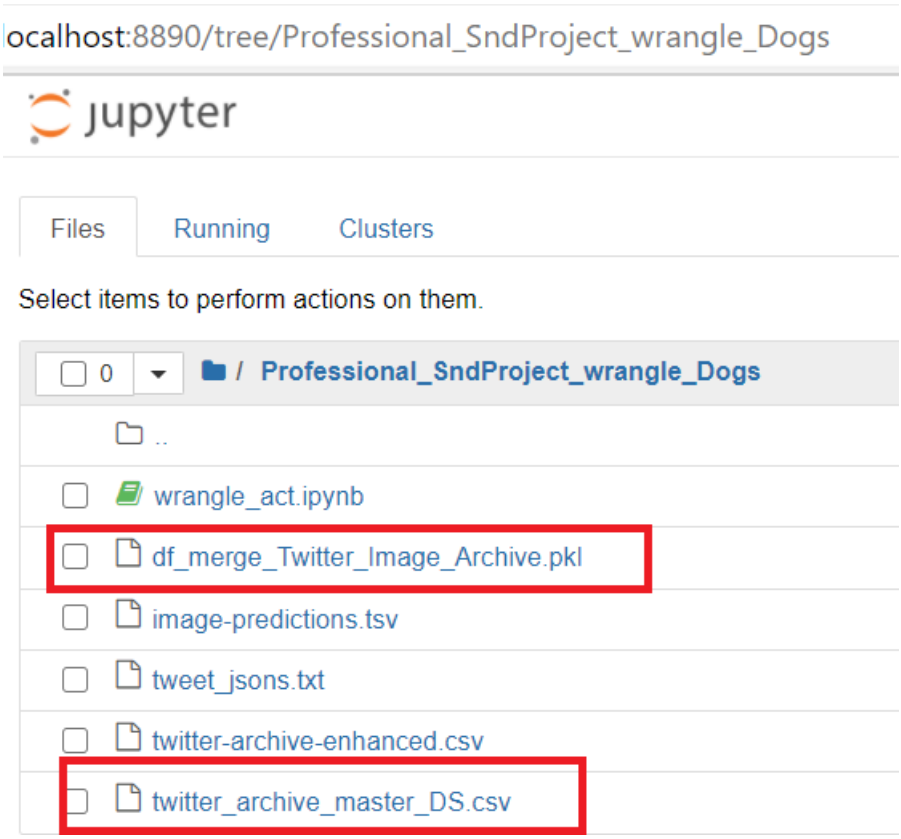
4. After merging data frames date time in “twitter_archive” has the same values as timestamp column in “tweet_json”.
   Solution:
   # drop one of them.

```
df_merge_Twitter_Image_Archive[['timestamp','created_at']]
df_merge_Twitter_Image_Archive=df_merge_Twitter_Image_Archive.drop(columns=['timestamp'])
```

5- Store the clean DataFrame in a CSV file

```
#save cleaned data frame into csv file
df_merge_Twitter_Image_Archive.to_csv('twitter_archive_master_DS.csv', index=False)
```

```
# We save cleaned data in a pickle format not to lose pandas types definitions in a text csv file.
df_merge_Twitter_Image_Archive.to_pickle("./df_merge_Twitter_Image_Archive.pkl")
```




6- Analyzing, and Visualizing Data for this Project

After analyze and visualize wrangled data presented **(4) insights and (4) visualization.**