Project: Wrangling and Analyze Data

Data Gathering

In the cell below, gather **all** three pieces of data for this project and load them in the notebook. **Note:** the methods required to gather each data are different.

1. Directly download the WeRateDogs Twitter archive data (twitter_archive_enhanced.csv)

```
#first improt libraries.
import pandas as pd
import numpy as np
import requests
import json
import matplotlib.pyplot as plt
%matplotlib inline
```

```
#1-Twitter Archive
# Read CSV file
twitter_archive = pd.read_csv('twitter-archive-enhanced.csv')
```

2. Use the Requests library to download the tweet image prediction (image_predictions.tsv)

```
# Download file using Requests library via URL provided
url = 'https://d17h27t6h515a5.cloudfront.net/topher/2017/August/599fd2ad_image-predictions/image-predictions.tsv'
response = requests.get(url)
response
```

```
<Response [200]>
```

```
# Save the file
with open('image-predictions.tsv', mode = 'wb') as file:
    file.write(response.content)

# Read TSV file
image_prediction = pd.read_csv('image-predictions.tsv', sep = '\t')

image_prediction.head()
```

	tweet_id	jpg_url	img_num	
0	666020888022790149	https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg	1	Welsh_spr
1	666029285002620928	https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg	1	
2	666033412701032449	https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg	1	Germ
3	666044226329800704	https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg	1	Rhodesi
4	666049248165822465	https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg	1	miniat

3. Use the Tweepy library to query additional data via the Twitter API (tweet_json.txt)

```
#I Dont have access for twitter devloper account
import tweepy
from tweepy import OAuthHandler
from timeit import default_timer as timer

# Query Twitter API for each tweet in the Twitter archive and save JSON in a text file
# These are hidden to comply with Twitter's API terms and conditions
consumer_key = 'HIDDEN'
consumer_secret = 'HIDDEN'
access_token = 'HIDDEN'
```

```
access_secret = 'HIDDEN'

auth = OAuthHandler(consumer_key, consumer_secret)
auth.set_access_token(access_token, access_secret)

api = tweepy.API(auth, wait_on_rate_limit=True)

# NOTE TO STUDENT WITH MOBILE VERIFICATION ISSUES:
# df_1 is a DataFrame with the twitter_archive_enhanced.csv file. You may have to
# change line 17 to match the name of your DataFrame with twitter_archive_enhanced.csv
# NOTE TO REVIEWER: this student had mobile verification issues so the following
# Twitter API code was sent to this student from a Udacity instructor
# Tweet IDs for which to gather additional data via Twitter's API
tweet_ids = df_1.tweet_id.values
len(tweet_ids)

# Query Twitter's API for JSON data for each tweet ID in the Twitter archive
count = 0
fails_dict = {}
start = timer()
# Save each tweet's returned JSON as a new line in a .txt file
with open('tweet_json.txt', 'w') as outfile:
    # This loop will likely take 20-30 minutes to run because of Twitter's rate limit
    for tweet_id in tweet_ids:
        count += 1
        print(str(count) + ": " + str(tweet_id))
        try:
            tweet = api.get_status(tweet_id, tweet_mode='extended')
            print("Success")
            json.dump(tweet._json, outfile)
            outfile.write('\n')
        except tweepy.TweepError as e:
            print("Fail")
            fails_dict[tweet_id] = e
            pass
end = timer()
print(end - start)
print(fails_dict)

# Download file using Requests library via URL provided
url = 'https://video.udacity-data.com/topher/2018/November/5be5fb7d_tweet-json/tweet-json.txt'
response = requests.get(url)

# Save the file
with open('tweet-json.txt', mode = 'wb') as file:
    file.write(response.content)


# Read downloaded txt file line by line into a pandas DataFrame
df_list = []
with open('tweet-json.txt', 'r') as file:
    lines = file.readlines()
    for line in lines:
        parsed_json = json.loads(line)
        df_list.append({'tweet_id': parsed_json['id'],
                        'retweet_count': parsed_json['retweet_count'],
                        'favorite_count': parsed_json['favorite_count']})

tweet_json = pd.DataFrame(df_list, columns = ['tweet_id', 'retweet_count', 'favorite_count'])

tweet_json.head()
```

	tweet_id	retweet_count	favorite_count
0	892420643555336193	8853	39467
1	892177421306343426	6514	33819
2	891815181378084864	4328	25461
3	891689557279858688	8964	42908
4	891327558926688256	9774	41048

Assessing Data

In this section, detect and document at least **eight (8) quality issues and two (2) tidiness issue**. You must use **both** visual assessment programmatic assessement to assess the data.

Note: pay attention to the following key points when you access the data.

- You only want original ratings (no retweets) that have images. Though there are 5000+ tweets in the dataset, not all are dog ratings and some are retweets.
- Assessing and cleaning the entire dataset completely would require a lot of time, and is not necessary to practice and demonstrate your skills in data wrangling. Therefore, the requirements of this project are only to assess and clean at least 8 quality issues and at least 2 tidiness issues in this dataset.
- The fact that the rating numerators are greater than the denominators does not need to be cleaned. This unique rating system is a big part of the popularity of WeRateDogs.
- You do not need to gather the tweets beyond August 1st, 2017. You can, but note that you won't be able to gather the image predictions for these tweets since you don't have access to the algorithm used.

I'll assess the data both visually and programmatically to identify any data quality(content) issues and tidiness(structual) issues.

```
# Assess the twitter_archive visually
twitter_archive.head(2356)
```

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	timestamp	source	
0	892420643555336193	NaN	NaN	2017-08-01 16:23:56 +0000	Twitter for iPhone	This is Phineas. mystical boy. On appears in the hc donut https://t.co/MgUWQ
1	892177421306343426	NaN	NaN	2017-08-01 00:17:27 +0000	Twitter for iPhone	This is Tilly. Sh checking pup c Hopes you're doin not, she's availa pats, snugs, boo whole bit https://t.co/0Xxu
2	891815181378084864	NaN	NaN	2017-07-31 00:18:03	<a href="http://twitter.com/download/iphone"	This is Archie. rare Norwegian Po Corgo. Lives in grass. You neve

```
# Assess the image_prediction visually
image_prediction.head(2075)
```

	tweet_id	jpg_url	img_num	p1	p1_conf	p1_dog	p2
0	666020888022790149	https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg	1	Welsh_springer_spaniel	0.465074	True	collie
1	666029285002620928	https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg	1	redbone	0.506826	True	miniature_pinsche
2	666033412701032449	https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg	1	German_shepherd	0.596461	True	malinois
3	666044226329800704	https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg	1	Rhodesian_ridgeback	0.408143	True	redbone
4	666049248165822465	https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg	1	miniature_pinscher	0.560311	True	Rottweile
...	...	...	...	...	...	...	..
2070	891327558926688256	https://pbs.twimg.com/media/DF6hr6BUMAAzZgT.jpg	2	basset	0.555712	True	English_springe
2071	891689557279858688	https://pbs.twimg.com/media/DF_q7IAWsAEuuN8.jpg	1	paper_towel	0.170278	False	Labrador_retrieve
2072	891815181378084864	https://pbs.twimg.com/media/DGBdLU1WsAANxJ9.jpg	1	Chihuahua	0.716012	True	malamute
2073	892177421306343426	https://pbs.twimg.com/media/DGGmoV4XsAAUL6n.jpg	1	Chihuahua	0.323581	True	Pekinese
2074	892420643555336193	https://pbs.twimg.com/media/DGKD1-bXoAAIAUK.jpg	1	orange	0.097049	False	bage

2075 rows × 12 columns

2015-11- Big fan of well-mair

```
# Assess the tweet_json visually
tweet_json.head(2354)
```

	tweet_id	retweet_count	favorite_count
0	892420643555336193	8853	39467
1	892177421306343426	6514	33819
2	891815181378084864	4328	25461
3	891689557279858688	8964	42908
4	891327558926688256	9774	41048
...	...	...	...
2349	666049248165822465	41	111
2350	666044226329800704	147	311
2351	666033412701032449	47	128
2352	666029285002620928	48	132
2353	666020888022790149	532	2535

2354 rows × 3 columns

Programmatic assessment

1. Archive Dataframe Analysis

```
twitter_archive.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2356 entries, 0 to 2355
Data columns (total 17 columns):
 #   Column                      Non-Null Count  Dtype  
---  ------                      --------------  -----  
 0   tweet_id                    2356 non-null   int64  
 1   in_reply_to_status_id       78 non-null     float64
 2   in_reply_to_user_id         78 non-null     float64
 3   timestamp                   2356 non-null   object 
 4   source                      2356 non-null   object 
 5   text                        2356 non-null   object 
 6   retweeted_status_id         181 non-null    float64
 7   retweeted_status_user_id    181 non-null    float64
 8   retweeted_status_timestamp  181 non-null    object 
 9   expanded_urls               2297 non-null   object 
 10  rating_numerator            2356 non-null   int64  
 11  rating_denominator          2356 non-null   int64  
 12  name                        2356 non-null   object 
 13  doggo                       2356 non-null   object 
 14  floofer                     2356 non-null   object 
 15  pupper                      2356 non-null   object 
 16  puppo                       2356 non-null   object 
dtypes: float64(4), int64(3), object(10)
memory usage: 313.0+ KB
```

```
twitter_archive.describe()
```

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	retweeted_status_id	retweeted_status_user_id	rating_numerator	rating
count	2.356000e+03	7.800000e+01	7.800000e+01	1.810000e+02	1.810000e+02	2356.000000	
mean	7.427716e+17	7.455079e+17	2.014171e+16	7.720400e+17	1.241698e+16	13.126486	
std	6.856705e+16	7.582492e+16	1.252797e+17	6.236928e+16	9.599254e+16	45.876648	
min	6.660209e+17	6.658147e+17	1.185634e+07	6.661041e+17	7.832140e+05	0.000000	
25%	6.783989e+17	6.757419e+17	3.086374e+08	7.186315e+17	4.196984e+09	10.000000	
50%	7.196279e+17	7.038708e+17	4.196984e+09	7.804657e+17	4.196984e+09	11.000000	
75%	7.993373e+17	8.257804e+17	4.196984e+09	8.203146e+17	4.196984e+09	12.000000	
max	8.924206e+17	8.862664e+17	8.405479e+17	8.874740e+17	7.874618e+17	1776.000000	

```
twitter_archive.duplicated().sum()
```

```
0
```

```
twitter_archive.tweet_id.duplicated().sum()
```

```
0
```

```
#Check Formula of rating_numerator
twitter_archive.rating_numerator.value_counts()
```

```
12      558
11      464
10      461
13      351
9       158
8       102
7       55
14      54
5       37
6       32
```

```
3       19
4       17
2       9
1       9
75      2
15      2
420     2
0       2
80      1
144     1
17      1
26      1
20      1
121     1
143     1
44      1
60      1
45      1
50      1
99      1
204     1
1776    1
165     1
666     1
27      1
182     1
24      1
960     1
84      1
88      1
Name: rating_numerator, dtype: int64
```

```
# To Double check is corecte rating
print(twitter_archive.loc[twitter_archive.rating_numerator == 204, 'text'])
print(twitter_archive.loc[twitter_archive.rating_numerator == 144, 'text'])
print(twitter_archive.loc[twitter_archive.rating_numerator == 666, 'text'])
print(twitter_archive.loc[twitter_archive.rating_numerator == 182, 'text'])
print(twitter_archive.loc[twitter_archive.rating_numerator == 960, 'text'])
```

```
1120    Say hello to this unbelievably well behaved squad of doggos. 204/170 would try to pet all at once https://t.co/yGQI3He3xv
Name: text, dtype: object
1779    IT'S PUPPERGEDDON. Total of 144/120 ...I think https://t.co/ZanVtAtvIq
Name: text, dtype: object
189    @s8n You tried very hard to portray this good boy as not so good, but you have ultimately failed. His goodness shines through. 6
Name: text, dtype: object
290    @markhoppus 182/10
Name: text, dtype: object
313    @jonnysun @Lin_Manuel ok jomny I know you're excited but 960/00 isn't a valid rating, 13/10 is tho
Name: text, dtype: object
```

```
#print whole text in order to verify numerators and denominators
#17 dogs
print(twitter_archive['text'][1120])
#12 dogs
print(twitter_archive['text'][1779])
#No picture, this will be ignored when cleaning data
print(twitter_archive['text'][189])
#No picture, this will be ignored when cleaning data and have two rating
print(twitter_archive['text'][290])
##just a tweet to explain actual ratings, this will be ignored when cleaning data
print(twitter_archive['text'][313])
```

```
Say hello to this unbelievably well behaved squad of doggos. 204/170 would try to pet all at once https://t.co/yGQI3He3xv
IT'S PUPPERGEDDON. Total of 144/120 ...I think https://t.co/ZanVtAtvIq
@s8n You tried very hard to portray this good boy as not so good, but you have ultimately failed. His goodness shines through. 666/10
@markhoppus 182/10
@jonnysun @Lin_Manuel ok jomny I know you're excited but 960/00 isn't a valid rating, 13/10 is tho
```

```
#Check Formula of rating_denominator
twitter_archive.rating_denominator.value_counts()
```

```
10     2333
11     3
50     3
20     2
80     2
70     1
```

```
7      1
15     1
150    1
170    1
0      1
90     1
40     1
130    1
110    1
16     1
120    1
2      1
Name: rating_denominator, dtype: int64
```

```
print(twitter_archive.loc[twitter_archive.rating_denominator == 11, 'text'])
print(twitter_archive.loc[twitter_archive.rating_denominator == 2, 'text'])
print(twitter_archive.loc[twitter_archive.rating_denominator == 16, 'text'])
print(twitter_archive.loc[twitter_archive.rating_denominator == 15, 'text'])
print(twitter_archive.loc[twitter_archive.rating_denominator == 7, 'text'])
```

```
784     RT @dog_rates: After so many requests, this is Bretagne. She was the last surviving 9/11 search dog, and our second ever 14/10.
1068    After so many requests, this is Bretagne. She was the last surviving 9/11 search dog, and our second ever 14/10. RIP https://t.
1662    This is Darrel. He just robbed a 7/11 and is in a high speed police chase. Was just spotted by the helicopter 10/10 https://t.c
Name: text, dtype: object
2335    This is an Albanian 3 1/2 legged  Episcopalian. Loves well-polished hardwood flooring. Penis on the collar. 9/10 https://t.co/d
Name: text, dtype: object
1663    I'm aware that I could've said 20/16, but here at WeRateDogs we are very professional. An inconsistent rating scale is simply i
Name: text, dtype: object
342    @docmisterio account started on 11/15/15
Name: text, dtype: object
516    Meet Sam. She smiles 24/7 &amp;amp; secretly aspires to be a reindeer. \nKeep Sam smiling by clicking and sharing this link:\nhttps:
Name: text, dtype: object
```

```
#retweet - it will be deleted when delete all retweets
print(twitter_archive['text'][784])
#actual rating 14/10 need to change manually
print(twitter_archive['text'][1068])
#actual rating 10/10 need to change manually
print(twitter_archive['text'][1662])
#actual rating 9/10 need to change manually
print(twitter_archive['text'][2335])
#tweet to explain rating
print(twitter_archive['text'][1663])
#no rating - delete
print(twitter_archive['text'][342])
#no rating - delete
print(twitter_archive['text'][516])
```

```
RT @dog_rates: After so many requests, this is Bretagne. She was the last surviving 9/11 search dog, and our second ever 14/10. RIP htt
After so many requests, this is Bretagne. She was the last surviving 9/11 search dog, and our second ever 14/10. RIP https://t.co/XAVDN
This is Darrel. He just robbed a 7/11 and is in a high speed police chase. Was just spotted by the helicopter 10/10 https://t.co/7EsP8L
This is an Albanian 3 1/2 legged  Episcopalian. Loves well-polished hardwood flooring. Penis on the collar. 9/10 https://t.co/d9NcXFKwL
I'm aware that I could've said 20/16, but here at WeRateDogs we are very professional. An inconsistent rating scale is simply irrespons
@docmisterio account started on 11/15/15
Meet Sam. She smiles 24/7 &amp;amp; secretly aspires to be a reindeer.
Keep Sam smiling by clicking and sharing this link:
https://t.co/98tB8y7y7t https://t.co/LouL5vdvxx
```

```
twitter_archive['name'].value_counts()
```

```
None          745
a             55
Charlie       12
Cooper        11
Lucy          11
              ..
Dex           1
Ace           1
Tayzie        1
Grizzie       1
Christoper    1
Name: name, Length: 957, dtype: int64
```

```
twitter_archive.doggo.value_counts()
```

```
None     2259
doggo    97
Name: doggo, dtype: int64
```

```
twitter_archive.floofer.value_counts()
```

```
None       2346
floofer    10
Name: floofer, dtype: int64
```

```
twitter_archive.pupper.value_counts()
```

```
None      2099
pupper    257
Name: pupper, dtype: int64
```

```
twitter_archive.puppo.value_counts()
```

```
None     2326
puppo    30
Name: puppo, dtype: int64
```

Quality issues in twitter archive is :

- in_reply_to_status_id, in_reply_to_user_id, retweeted_status_id, retweeted_status_user_id are float, should all be int or remove it
- only need original ratings with pictures, retweets and replies entries should be removed, , related columns should be removed too.
- The picture part will be fixed later.
- Timestamp is str, should be datetime, remove +0000 in timestamp .
- Abnormal values in rating_denominator, e.g., 170, 144, 130, etc. The rating_denominator is almost always 10.
- Abnormal values in rating_numerator, e.g., 1776, 960, 666, 204, 165,etc. make no sense.

2. Image Dataframe Analysis

```
image_prediction.sample(5)
```

	tweet_id	jpg_url	img_num	p1	p1_conf	p1_dog	p2	p
519	676496375194980353	https://pbs.twimg.com/media/CWNI3S9WcAARN34.jpg	1	pug	0.985387	True	Norwegian_elkhound	0.(
370	672975131468300288	https://pbs.twimg.com/media/CVbjRSIWsAElw2s.jpg	1	pug	0.836421	True	Brabancon_griffon	0.(
948	704819833553219584	https://pbs.twimg.com/media/CcgF5ovW8AACrEU.jpg	1	guinea_pig	0.994776	False	hamster	0.(
1110	724004602748780546	https://pbs.twimg.com/media/CgwuWCeW4AAsgbD.jpg	3	Siamese_cat	0.950526	False	pug	0.(
1384	765719090495037 44	https://pbs.twimg.com/media/CqBiMAgWAAEJKgI.jpg	1	golden_retriever	0.969518	True	Labrador_retriever	0.(

```
image_prediction.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2075 entries, 0 to 2074
Data columns (total 12 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   tweet_id  2075 non-null   int64
 1   jpg_url   2075 non-null   object
 2   img_num   2075 non-null   int64
 3   p1        2075 non-null   object
 4   p1_conf   2075 non-null   float64
 5   p1_dog    2075 non-null   bool
 6   p2        2075 non-null   object
 7   p2_conf   2075 non-null   float64
 8   p2_dog    2075 non-null   bool
 9   p3        2075 non-null   object
 10  p3_conf   2075 non-null   float64
 11  p3_dog    2075 non-null   bool
```

```
dtypes: bool(3), float64(3), int64(2), object(4)
memory usage: 152.1+ KB
```

```
image_prediction.describe()
```

	tweet_id	img_num	p1_conf	p2_conf	p3_conf
count	2.075000e+03	2075.000000	2075.000000	2.075000e+03	2.075000e+03
mean	7.384514e+17	1.203855	0.594548	1.345886e-01	6.032417e-02
std	6.785203e+16	0.561875	0.271174	1.006657e-01	5.090593e-02
min	6.660209e+17	1.000000	0.044333	1.011300e-08	1.740170e-10
25%	6.764835e+17	1.000000	0.364412	5.388625e-02	1.622240e-02
50%	7.119988e+17	1.000000	0.588230	1.181810e-01	4.944380e-02
75%	7.932034e+17	1.000000	0.843855	1.955655e-01	9.180755e-02
max	8.924206e+17	4.000000	1.000000	4.880140e-01	2.734190e-01

```
image_prediction.tweet_id.duplicated().sum()
```

```
0
```

```
image_prediction.jpg_url.duplicated().sum()
```

```
66
```

```
image_prediction.p1.value_counts()
```

```
golden_retriever      150
Labrador_retriever    100
Pembroke               89
Chihuahua              83
pug                    57
                      ..
pillow                 1
carousel               1
bald_eagle             1
lorikeet               1
orange                 1
Name: p1, Length: 378, dtype: int64
```

```
image_prediction.p2.value_counts()
```

```
Labrador_retriever    104
golden_retriever      92
Cardigan              73
Chihuahua             44
Pomeranian            42
                     ..
medicine_chest        1
quail                 1
horse_cart            1
waffle_iron           1
bagel                 1
Name: p2, Length: 405, dtype: int64
```

```
image_prediction.p3.value_counts()
```

```
Labrador_retriever    79
Chihuahua             58
golden_retriever      48
Eskimo_dog            38
kelpie                35
                      ..
ox                    1
assault_rifle         1
axolotl               1
pot                   1
banana                1
Name: p3, Length: 408, dtype: int64
```

Quality issues in image prediction is :

- inconsistent capitalization in p1, p2 and p3 columns
- There is a duplicates of 66 times for jpg url
- many entries are not dogs, e.g., jaguar, mailbox, peacock, cloak, etc.
- we only need the most confident prediction for dog breed for this analysis

3. Tweet_json table

```
tweet_json.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2354 entries, 0 to 2353
Data columns (total 3 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   tweet_id        2354 non-null   int64
 1   retweet_count   2354 non-null   int64
 2   favorite_count  2354 non-null   int64
dtypes: int64(3)
memory usage: 55.3 KB
```

```
tweet_json.duplicated().sum()
```

```
0
```

Quality issues in tweet_json is :

- missing data probably due to retweets in twitter_archive

Tidiness issues

1. Doggo, floofer, pupper, puppo are all stages of dog, should be in one column in twitter_archive table.
2. Image prediction should be part of the twitter_archive table
3. Tweet json should be part of the twitter_archive table

Cleaning Data

In this section, clean **all** of the issues you documented while assessing.

Note: Make a copy of the original data before cleaning. Cleaning includes merging individual pieces of data according to the rules of tidy data.
The result should be a high-quality and tidy master pandas DataFrame (or DataFrames, if appropriate).

```
# Make copys for all the data
twitter_archive_clean = twitter_archive.copy()
image_prediction_clean = image_prediction.copy()
tweet_json_clean = tweet_json.copy()
```

Issue #1:

Delete retweets and replies in twitter_archive table

Define:

Use isnull() to filter and only keep rows where retweeted_status_id column is NaN. Same method applies to in_reply_to_status_id

Code

```
# Remove retweets
twitter_archive_clean = twitter_archive_clean[twitter_archive_clean.retweeted_status_id.isnull()]

# Remove replies
twitter_archive_clean = twitter_archive_clean[twitter_archive_clean.in_reply_to_status_id.isnull()]
```

Test

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2097 entries, 0 to 2355
Data columns (total 17 columns):
 #   Column                      Non-Null Count  Dtype  
---  ------                      --------------  -----  
 0   tweet_id                    2097 non-null   int64  
 1   in_reply_to_status_id       0 non-null      float64
 2   in_reply_to_user_id         0 non-null      float64
 3   timestamp                   2097 non-null   object 
 4   source                      2097 non-null   object 
 5   text                        2097 non-null   object 
 6   retweeted_status_id         0 non-null      float64
 7   retweeted_status_user_id    0 non-null      float64
 8   retweeted_status_timestamp  0 non-null      object 
 9   expanded_urls               2094 non-null   object 
 10  rating_numerator            2097 non-null   int64  
 11  rating_denominator          2097 non-null   int64  
 12  name                        2097 non-null   object 
 13  doggo                       2097 non-null   object 
 14  floofer                     2097 non-null   object 
 15  pupper                      2097 non-null   object 
 16  puppo                       2097 non-null   object 
dtypes: float64(4), int64(3), object(10)
memory usage: 294.9+ KB
```

Issue #2:

Drop columns that are related to retweets and replies. After dropping those columns, datatype issue with those columns will no longer be an issue

Define:

Use df.drop to delete in_reply_to_status_id, in_reply_to_user_id, retweeted_status_id, retweeted_status_user_id, retweeted_status_timestamp columns.

Code

```
twitter_archive_clean = twitter_archive_clean.drop(['in_reply_to_status_id',
                           'in_reply_to_user_id',
                           'retweeted_status_id',
                           'retweeted_status_user_id',
                           'retweeted_status_timestamp'],axis=1)
```

Test

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2097 entries, 0 to 2355
Data columns (total 12 columns):
 #   Column              Non-Null Count  Dtype 
---  ------              --------------  ----- 
 0   tweet_id            2097 non-null   int64 
 1   timestamp           2097 non-null   object
 2   source              2097 non-null   object
 3   text                2097 non-null   object
 4   expanded_urls       2094 non-null   object
 5   rating_numerator    2097 non-null   int64 
 6   rating_denominator  2097 non-null   int64 
 7   name                2097 non-null   object
 8   doggo               2097 non-null   object
 9   floofer             2097 non-null   object
 10  pupper              2097 non-null   object
 11  puppo               2097 non-null   object
dtypes: int64(3), object(9)
memory usage: 213.0+ KB
```

Issue #3:

Datatype for timestamp should be datetime, remove +0000

Define:

Remove +0000 and use pd.to_datetime to convert timestamp from str to datetime

Code

```
# Remove +0000
twitter_archive_clean.timestamp = twitter_archive_clean.timestamp.str[:-6]

# Convert to datetime
twitter_archive_clean.timestamp = pd.to_datetime(twitter_archive_clean.timestamp)
```

Test

```
twitter_archive_clean.timestamp.head()
```

```
0   2017-08-01 16:23:56
1   2017-08-01 00:17:27
2   2017-07-31 00:18:03
3   2017-07-30 15:58:51
4   2017-07-29 16:00:24
Name: timestamp, dtype: datetime64[ns]
```

Issue #4:

First Tidiness issue >> Create one column for the various dog types: doggo, floofer, pupper, puppo

Define: Use pd.melt to melt the doggo, floofer, pupper and puppo columns to a type and dog_stage column. Drop the intermediate column.

Code

```
# Melt the doggo, floofer, pupper and puppo columns to type and dogs_stage column
twitter_archive_clean = pd.melt(twitter_archive_clean,
                                id_vars = ['tweet_id', 'timestamp', 'source', 'text', 'expanded_urls', 'rating_numerator', 'rating_denominato
                                value_vars = ['doggo', 'floofer', 'pupper', 'puppo'],
                                var_name = 'type',
                                value_name = 'dog_stage')

# Drop type column
twitter_archive_clean.drop('type', 1, inplace = True)

# Sort by dog_stage and drop duplicates
twitter_archive_clean = twitter_archive_clean.sort_values('dog_stage').drop_duplicates(subset='tweet_id', keep='last')
```

```
<ipython-input-154-449ba7a647d0>:9: FutureWarning: In a future version of pandas all arguments of DataFrame.drop except for the argumen
  twitter_archive_clean.drop('type', 1, inplace = True)
```

Test

```
twitter_archive_clean.dog_stage.value_counts()
```

```
None       1761
pupper     230
doggo      72
puppo      24
```

```
floofer    10
Name: dog_stage, dtype: int64
```

Issue #5:

image_prediction: delete entries that are not dogs. Same with twitter_archive and tweet_json. Many abnormal rating values would be gone, making it easier to fix abnormal rating issues in rating_denominator and rating_numerator.

Define:

use isin and ~ to filter and delete rows that are False in p1_dog, p2_dog, p3_dog column in all three dataframes.

Code

```
# Number of rows before data cleaning
print(image_prediction_clean.shape)
print(twitter_archive_clean.shape)
```

```
(2075, 12)
(2097, 9)
```

```
# Filter posts that are not dogs and put those tweet_id into a drop_list
image_prediction_clean.query('p1_dog == False and p2_dog == False and p3_dog == False').tweet_id
drop_list = image_prediction_clean.query('p1_dog == False and p2_dog == False and p3_dog == False').tweet_id

# Drop the rows with tweet_id in the drop_list in all dataframes
image_prediction_clean = image_prediction_clean[~image_prediction_clean.tweet_id.isin(drop_list)]
twitter_archive_clean = twitter_archive_clean[~twitter_archive_clean.tweet_id.isin(drop_list)]
tweet_json_clean = tweet_json_clean[~tweet_json_clean.tweet_id.isin(drop_list)]
```

Test

```
# Number of rows after data cleaning
print(image_prediction_clean.shape)
print(twitter_archive_clean.shape)
print(tweet_json_clean.shape)
```

```
(1751, 12)
(1792, 9)
(2031, 3)
```

Issue #6:

twitter_archive: abnormal values in rating_denominator. According to the project overview, the ratings almost always have a denominator of 10. Many abnormal rating values were gone after removing ratings not for dogs, making it easier to fix abnormal rating.

Define:

Create new dataframe with tweet_id, text, rating_numerator, rating_denominator columns. Filter rating_denominator not equal to 10 and check the text to correct these ratings.

Code

```
# Create new dataframe with selected columns
df_abnormal_rating = twitter_archive_clean[['tweet_id', 'text', 'rating_numerator', 'rating_denominator']]

# Filter rating_denominator not equal to 10
df_abnormal_denominator = df_abnormal_rating.query('rating_denominator != 10')

# Display full text
pd.set_option('display.max_colwidth', -1)

df_abnormal_denominator
```

```
<ipython-input-159-6208f80cec2f>:8: FutureWarning: Passing a negative integer is deprecated in version 1.0 and will not be supported in
  pd.set_option('display.max_colwidth', -1)
```

	tweet_id	text	rating_numerator	rating_denominator
2076	666287406224695296	This is an Albanian 3 1/2 legged Episcopalian. Loves well-polished hardwood flooring. Penis on the collar. 9/10 https://t.co/d9NcXFKwLv	1	2
3307	697463031882764288	Happy Wednesday here's a bucket of pups. 44/40 would pet all at once https://t.co/HppvrYuamZ	44	40
3496	684222868335505415	Someone help the girl is being mugged. Several are distracting her while two steal her shoes. Clever puppers 121/110 https://t.co/1zfnTJLt55	121	110
3523	682962037429899265	This is Darrel. He just robbed a 7/11 and is in a high speed police chase. Was just spotted by the helicopter 10/10 https://t.co/7EsP8LmSp5	7	11
3133	710658690886586372	Here's a brigade of puppers. All look very prepared for whatever happens next. 80/80 https://t.co/0eb7R1Om12	80	80
3108	713900603437621249	Happy Saturday here's 9 puppers on a bench. 99/90 good work everybody https://t.co/mpvaVxKmc1	99	90
3153	709198395643068416	From left to right:\nCletus, Jerome, Alejandro, Burp, & Titson\nNone know where camera is. 45/50 would hug all at once https://t.co/sedre1ivTK	45	50
3045	722974582966214656	Happy 4/20 from the squad! 13/10 for all https://t.co/eV1diwds8a	4	20
3082	716439118184652801	This is Bluebert. He just saw that both #FinalFur match ups are split 50/50. Amazed af. 11/10 https://t.co/Kky1DPG4iq	50	50
3226	704054845121142784	Here is a whole flock of puppers. 60/50 I'll take the lot https://t.co/9dpcw6MdWa	60	50
3637	677716515794329600	IT'S PUPPERGEDDON. Total of 144/120 ...I think https://t.co/ZanVtAtvIq	144	120
3699	675853064436391936	Here we have an entire platoon of puppers. Total score: 88/80 would pet all at once https://t.co/y93p6FLvVw	88	80
2500	810984652412424192	Meet Sam. She smiles 24/7 & secretly aspires to be a reindeer. \nKeep Sam smiling by clicking and sharing this link:\nhttps://t.co/98tB8y7y7t https://t.co/LouL5vdvxx	24	7
2436	820690176645140481	The floofs have been released I repeat the floofs have been released. 84/70 https://t.co/NIYC820tmd	84	70
2797	758467244762497024	Why does this never happen at my front door... 165/150 https://t.co/HmwrdfEfUE	165	150
2950	740373189193256964	After so many requests, this is Bretagne. She was the last surviving 9/11 search dog, and our second ever 14/10. RIP https://t.co/XAVDNDaVgQ	9	11

```
# Correct ratings by reading through the text, most of the abnormal ratings are associated with multiple dogs.
# tweet_id: 666287406224695296
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 666287406224695296, 'rating_numerator'] = 9
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 666287406224695296, 'rating_denominator'] = 10
# tweet_id: 697463031882764288 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 697463031882764288, 'rating_numerator'] = 11
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 697463031882764288, 'rating_denominator'] = 10
# tweet_id: 684222868335505415 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 684222868335505415, 'rating_numerator'] = 11
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 684222868335505415, 'rating_denominator'] = 10
# tweet_id: 682962037429899265
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 682962037429899265, 'rating_numerator'] = 10
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 682962037429899265, 'rating_denominator'] = 10
# tweet_id: 710658690886586372 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 710658690886586372, 'rating_numerator'] = 10
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 710658690886586372, 'rating_denominator'] = 10
# tweet_id: 713900603437621249 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 713900603437621249, 'rating_numerator'] = 11
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 713900603437621249, 'rating_denominator'] = 10
# tweet_id: 709198395643068416 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 709198395643068416, 'rating_numerator'] = 9
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 709198395643068416, 'rating_denominator'] = 10
# tweet_id: 722974582966214656
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 722974582966214656, 'rating_numerator'] = 13
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 722974582966214656, 'rating_denominator'] = 10
# tweet_id: 716439118184652801
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 716439118184652801, 'rating_numerator'] = 11
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 716439118184652801, 'rating_denominator'] = 10
# tweet_id: 704054845121142784 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 704054845121142784, 'rating_numerator'] = 12
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 704054845121142784, 'rating_denominator'] = 10
```

```
# tweet_id: 677716515794329600 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 677716515794329600, 'rating_numerator'] = 12
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 677716515794329600, 'rating_denominator'] = 10
# tweet_id: 675853064436391936 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 675853064436391936, 'rating_numerator'] = 11
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 675853064436391936, 'rating_denominator'] = 10
# tweet_id: 810984652412424192  no rating
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 810984652412424192, 'rating_numerator'] = 10
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 810984652412424192, 'rating_denominator'] = 10
# tweet_id: 820690176645140481 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 820690176645140481, 'rating_numerator'] = 12
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 820690176645140481, 'rating_denominator'] = 10
# tweet_id: 731156023742988288 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 731156023742988288, 'rating_numerator'] = 12
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 731156023742988288, 'rating_denominator'] = 10
# tweet_id: 758467244762497024 --- Multiple dogs
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 758467244762497024, 'rating_numerator'] = 11
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 758467244762497024, 'rating_denominator'] = 10
# tweet_id: 740373189193256964
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 740373189193256964, 'rating_numerator'] = 14
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 740373189193256964, 'rating_denominator'] = 10
```

Test

```
twitter_archive_clean.rating_denominator.value_counts()
```

```
10    1792
Name: rating_denominator, dtype: int64
```

Issue #7:

twitter_archive: abnormal values in rating_numerator. Many abnormal rating values were gone after removing ratings not for dogs.

Define:

Use value_counts to see abnormal values and check the text to correct the ratings. Use isin and ~ to remove entires that are not dogs

Code

```
twitter_archive_clean.rating_numerator.value_counts()
```

```
12    464
10    380
11    379
13    256
9     136
8      71
7      31
14     27
6      16
5      15
4       6
3       5
2       2
26      1
75      1
0       1
27      1
Name: rating_numerator, dtype: int64
```

```
# rating_numerator 75, 26, 27, 0
df_abnormal_rating.query('rating_numerator == 75 or rating_numerator == 26 or rating_numerator == 27 or rating_numerator == 0')
```

	tweet_id	text	rating_numerator	rating_denominator
3571	680494726643068929	Here we have uncovered an entire battalion of holiday puppers. Average of 11.26/10 https://t.co/eNm2S6p9BD	26	10
2625	786709082849828864	This is Logan, the Chow who lived. He solemnly swears he's up to lots of good. H*ckin magical af 9.75/10 https://t.co/yBO5wuqaPS	75	10

```
# Correct the ratings
# tweet_id: 786709082849828864, rating _numberator should be 9.75 according to the text
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 786709082849828864, 'rating_numerator'] = 9.75
# tweet_id: 680494726643068929, rating _numberator should be 11.26 according to the text
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 680494726643068929, 'rating_numerator'] = 11.26
# tweet_id: 778027034220126208, rating _numberator should be 11.27 according to the text
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 778027034220126208, 'rating_numerator'] = 11.27
# tweet_id: 835152434251116546
twitter_archive_clean.loc[twitter_archive_clean.tweet_id == 835152434251116546, 'rating_numerator'] = 11
```

```
# rating_numerator 3 and 4
df_abnormal_rating.query('rating_numerator == 3 or rating_numerator == 4')
```

	tweet_id	text	rating_numerator	rating_denominator
2030	667176164155375616	These are strange dogs. All have toupees. Long neck for dogs. In a shed of sorts? Work in groups? 4/10 still petable https://t.co/PZxSarAfSN	4	10
2057	666649482315059201	Cool dog. Enjoys couch. Low monotone bark. Very nice kicks. Pisses milk (must be rare). Can't go down stairs. 4/10 https://t.co/vXMKrJC81s	4	10
3128	711306686208872448	What hooligan sent in pictures w/out a dog in them? Churlish af. 3/10 just bc that's a neat fluffy bean bag chair https://t.co/wcwoGOkZvz	3	10
3069	718246886998687744	This is Alexanderson. He's got a weird ass birth mark. Dreadful at fetch. Won't eat kibble. 3/10 wtf @Target https://t.co/FmxOpf2Sgl	3	10
3045	722974582966214656	Happy 4/20 from the squad! 13/10 for all https://t.co/eV1diwds8a	4	20
3181	707420581654872064	This is Keurig. He's a rare dog. Laughs like an idiot tho. Head is basically a weapon. Poorly maintained goatee 4/10 https://t.co/xOrUyj7K30	4	10
3914	671122204919246848	Two miniature golden retrievers here. Webbed paws. Don't walk very efficiently. Can't catch a tennis ball. 4/10s https://t.co/WzVLdSHJU7	4	10
4025	668989615043424256	This is Bernie. He's taking his Halloween costume very seriously. Wants to be baked. 3/10 not a good idea Bernie smh https://t.co/1zBp1moFIX	3	10
3560	680940246314430465	This is Alice. She's an idiot. 4/10 https://t.co/VQXdwJfkyS	4	10
3785	673906403526995968	Guys I'm getting real tired of this. We only rate dogs. Please don't send in other things like this Bulbasaur. 3/10 https://t.co/t5rQHl6W8M	3	10
2684	777885040357281792	This is Wesley. He's clearly trespassing. Seems rather h*ckin violent too. Weaponized forehead. 3/10 wouldn't let in https://t.co/pL7wbMRW7M	3	10
2892	747816857231626240	Viewer discretion is advised. This is a terrible attack in progress. Not even in water (tragic af). 4/10 bad sherk https://t.co/L3U0j14N5R	4	10

rating_numerator = 3, not dog, delete

1. 777885040357281792:
2. 718246886998687744:
3. 673906403526995968:

rating_numerator = 4, not dog, delete

1. 707420581654872064
2. 680940246314430465
3. 671122204919246848
4. 667176164155375616
5. 666649482315059201

```
# Remove entries that are not dogs
id_list = [777885040357281792, 718246886998687744, 673906403526995968, 707420581654872064, 680940246314430465, 671122204919246848, 6671761641
twitter_archive_clean = twitter_archive_clean[~twitter_archive_clean.tweet_id.isin(id_list)]
```

Test

```
twitter_archive_clean.rating_numerator.value_counts()
```

```
12.00    464
11.00    380
10.00    380
13.00    256
9.00     136
8.00     71
7.00     31
14.00    27
6.00     16
5.00     15
2.00     2
3.00     2
11.26    1
9.75     1
4.00     1
11.27    1
Name: rating_numerator, dtype: int64
```

Limitation: there are still other rating issues, for example some rating are not for dogs even after removing many entries in the image prediction table. It's not practical to read each of these.

Issue #8:

image_prediction: we only need the most confident prediction for the image

Define:

Create two columns breed, confident_level Create a function to look through the preditions and find the most confident prediction that is a dog breed. p1 is the most confident prediction, followed by p2 and p3 Remove other columns not needed.

Code

```
# Create a breed column and a confident_level column
breed = []
confident_level = []

# Create a function to find the most confident prediction that is a dog breed
# p1 is the most confident prediction, followed by p2 and p3
def image_pred(image_prediction_clean):
    if image_prediction_clean.p1_dog == True:
        breed.append(image_prediction_clean.p1)
        confident_level.append(image_prediction_clean.p1_conf)
    elif image_prediction_clean.p2_dog == True:
        breed.append(image_prediction_clean.p2)
        confident_level.append(image_prediction_clean.p2_conf)
    elif image_prediction_clean.p3_dog == True:
        breed.append(image_prediction_clean.p3)
        confident_level.append(image_prediction_clean.p3_conf)
    else:
        breed.append('Unknown_breed')
        confident_level.append(0)

# Apply the function by column
image_prediction_clean.apply(image_pred, axis=1)

# Add the breed and confident_level column to image_prediction_clean
image_prediction_clean['breed'] = breed
image_prediction_clean['confident_level'] = confident_level

# Drop columns no longer needed
image_prediction_clean = image_prediction_clean.drop(['img_num',
                                                       'p1','p1_conf','p1_dog',
                                                       'p2','p2_conf','p2_dog',
                                                       'p3','p3_conf','p3_dog'],axis=1)
```

Test

```
image_prediction_clean.head()
```

	tweet_id	jpg_url	breed	confident_level
0	666020888022790149	https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg	Welsh_springer_spaniel	0.465074
1	666029285002620928	https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg	redbone	0.506826
2	666033412701032449	https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg	German_shepherd	0.596461
3	666044226329800704	https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg	Rhodesian_ridgeback	0.408143
4	666049248165822465	https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg	miniature_pinscher	0.560311

Issue #9:

image_prediction: inconsistent capitalization in p1 column

Define:

Use str.capitalize to capitalize the first letter

Code

```
image_prediction_clean.breed = image_prediction_clean.breed.str.capitalize()
```

Test

```
image_prediction_clean.head(10)
```

	tweet_id	jpg_url	breed	confident_level
0	666020888022790149	https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg	Welsh_springer_spaniel	0.465074
1	666029285002620928	https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg	Redbone	0.506826
2	666033412701032449	https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg	German_shepherd	0.596461
3	666044226329800704	https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg	Rhodesian_ridgeback	0.408143
4	666049248165822465	https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg	Miniature_pinscher	0.560311
5	666050758794694657	https://pbs.twimg.com/media/CT5Jof1WUAEuVxN.jpg	Bernese_mountain_dog	0.651137
7	666055525042405380	https://pbs.twimg.com/media/CT5N9tpXIAAifs1.jpg	Chow	0.692517
8	666057090499244032	https://pbs.twimg.com/media/CT5PY90WoAAQGLo.jpg	Golden_retriever	0.007959
9	666058600524156928	https://pbs.twimg.com/media/CT5Qw94XAAA_2dP.jpg	Miniature_poodle	0.201493
10	666063827256086533	https://pbs.twimg.com/media/CT5Vg_wXIAAXfnj.jpg	Golden_retriever	0.775930

Issue #10:

Merge the clean versions of twitter_archive, image_predictions, and tweet_json dataframes to work in one table and fixed all issue easily

Define:

The most clean, comprehensible way of merging multiple dataframe if complex queries aren't involved.

Just simply merge with DATE as the index and merge using OUTER method (to get all the data).

Code

```
# First Merge the retweet_count, favorite_count column to the twitter_archive table, joining on tweet_id .
twitter_archive_clean = pd.merge(twitter_archive_clean, tweet_json_clean,
                           on = ['tweet_id'], how = 'left')


# display The twitter_archive_clean
twitter_archive_clean.head()
```

	tweet_id	timestamp	source	text	expa
0	667405339315146752	2015-11-19 18:13:27	Twitter for iPhone	This is Biden. Biden just tripped... 7/10 https://t.co/3Fm9PwLju1	https://twitter.com/dog_rates/status/667405339315146
1	667435689202614272	2015-11-19 20:14:03	Twitter for iPhone	Ermergerd 12/10 https://t.co/PQni2sjPsm	https://twitter.com/dog_rates/status/667435689202614
2	667453023279554560	2015-11-19 21:22:56	Twitter Web Client	Meet Cupcake. I would do unspeakable things for Cupcake. 11/10 https://t.co/6uLCWR9Efa	https://twitter.com/dog_rates/status/667453023279554
3	667455448082227200	2015-11-19 21:32:34	Twitter Web Client	This is Reese and Twips. Reese protects Twips. Both think they're too good for seat belts. Simply reckless. 7/10s https://t.co/uLzRi1drVK	https://twitter.com/dog_rates/status/667455448082227
4	667470559035432960	2015-11-19 22:32:36	Twitter Web Client	This is a northern Wahoo named Kohl. He runs this town. Chases tumbleweeds. Draws gun wicked fast. 11/10 legendary https://t.co/J4vn2rOYFk	https://twitter.com/dog_rates/status/667470559035432

Test

```
twitter_archive_clean.columns
```

```
Index(['tweet_id', 'timestamp', 'source', 'text', 'expanded_urls',
       'rating_numerator', 'rating_denominator', 'name', 'dog_stage',
       'retweet_count', 'favorite_count'],
      dtype='object')
```

Issue #11:

image_prediction should be part of the twitter_archive table. Since we only want original ratings that have images, only keep rows with images.

Define:

Use merge to merge the image_prediction table to the twitter_archive table, joining on tweet_id. Use notnull to filter nonnull rows and only keep nonnull rows.

Code

```
# Merge tables
twitter_archive_clean = pd.merge(twitter_archive_clean, image_prediction_clean,
                           on = ['tweet_id'], how = 'left')

# number of null values before cleaning
twitter_archive_clean.jpg_url.isnull().sum()
```

```
126
```

```
twitter_archive_clean = (twitter_archive_clean[twitter_archive_clean.jpg_url.notnull()])
```

Test

```
# number of null values after cleaning
twitter_archive_clean.jpg_url.isnull().sum()
```

```
0
```

Storing Data

Save gathered, assessed, and cleaned master dataset to a CSV file named "twitter_archive_master.csv".

```
# View the dataframe
twitter_archive_clean.head()
```

	tweet_id	timestamp	source	text	expa
0	667405339315146752	2015-11-19 18:13:27	Twitter for iPhone	This is Biden. Biden just tripped... 7/10 https://t.co/3Fm9PwLju1	https://twitter.com/dog_rates/status/667405339315146
1	667435689202614272	2015-11-19 20:14:03	Twitter for iPhone	Ermergerd 12/10 https://t.co/PQni2sjPsm	https://twitter.com/dog_rates/status/667435689202614
2	667453023279554560	2015-11-19 21:22:56	Twitter Web Client	Meet Cupcake. I would do unspeakable things for Cupcake. 11/10 https://t.co/6uLCWR9Efa	https://twitter.com/dog_rates/status/667453023279554
3	667455448082227200	2015-11-19 21:32:34	Twitter Web Client	This is Reese and Twips. Reese protects Twips. Both think they're too good for seat belts. Simply reckless. 7/10s https://t.co/uLzRi1drVK	https://twitter.com/dog_rates/status/667455448082227
4	667470559035432960	2015-11-19 22:32:36	Twitter Web Client	This is a northern Wahoo named Kohl. He runs this town. Chases tumbleweeds. Draws gun wicked fast. 11/10 legendary https://t.co/J4vn2rOYFk	https://twitter.com/dog_rates/status/667470559035432

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1658 entries, 0 to 1783
Data columns (total 14 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   tweet_id            1658 non-null   int64
 1   timestamp           1658 non-null   datetime64[ns]
 2   source              1658 non-null   object
 3   text                1658 non-null   object
 4   expanded_urls       1658 non-null   object
 5   rating_numerator    1658 non-null   float64
 6   rating_denominator  1658 non-null   int64
 7   name                1658 non-null   object
 8   dog_stage           1658 non-null   object
 9   retweet_count       1658 non-null   int64
 10  favorite_count      1658 non-null   int64
 11  jpg_url             1658 non-null   object
 12  breed               1658 non-null   object
 13  confident_level     1658 non-null   float64
dtypes: datetime64[ns](1), float64(2), int64(4), object(7)
memory usage: 194.3+ KB
```

```
# Store the clean dataframe in a CSV file named twitter_archive_master.csv
twitter_archive_clean.to_csv('twitter_archive_master.csv')

# load data to a dataframe
df = pd.read_csv('twitter_archive_master.csv')
```

Analyzing and Visualizing Data

In this section, analyze and visualize your wrangled data. You must produce at least **three (3) insights and one (1) visualization.**

Insights:

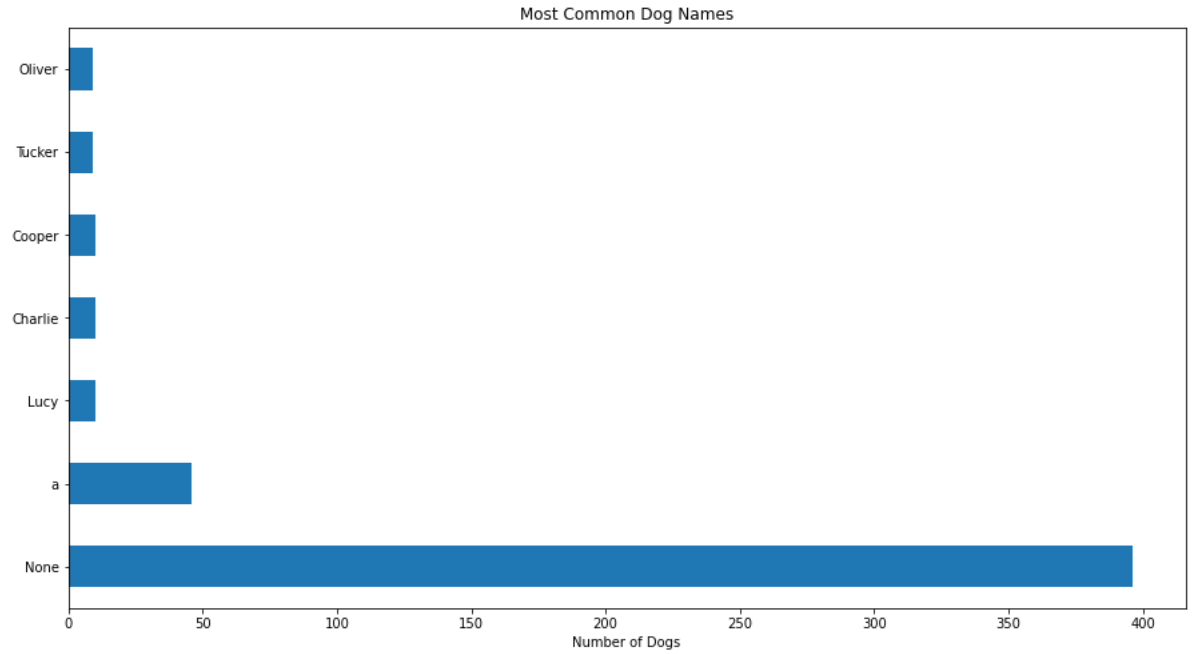
1.The most popular dog names ?

2.What is the most common dog stage?

3.The Max number of retweet counts and favorite counts ?

Visualization

```
# 1. The Most popular dog names
df.name.value_counts()[0:7].plot(kind = 'barh',figsize=(15,8), title='Most Common Dog Names').set_xlabel("Number of Dogs");
```




```
df.name.value_counts()
```

```
None       396
a           46
Lucy        10
Charlie     10
Cooper      10
           ..
Dug          1
Saydee       1
Billl        1
Ronduh       1
Stuart       1
Name: name, Length: 848, dtype: int64
```

The three most popular dog names are:

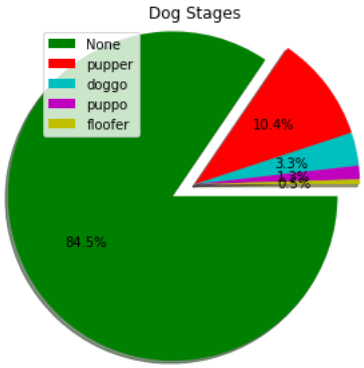
- Lucy - 10
- Charlie - 10
- Cooper - 10 and so on

```
# 2. What is most common dog stage
# Dog stage and count
df.dog_stage.value_counts(normalize=True)
```

```
None       0.844994
pupper     0.104343
doggo      0.032569
puppo      0.013269
floofer    0.004825
Name: dog_stage, dtype: float64
```

```
# Plot pie chart
labels = ['None', 'pupper', 'doggo', 'puppo', 'floofer']
values = df.dog_stage.value_counts(normalize=True)
colors = ['g', 'r', 'c' ,'m', 'y']
explode = (0.2, 0, 0, 0, 0)

plt.pie(values, colors=colors, explode=explode, autopct='%1.1f%%', radius = 1.3, shadow=True, counterclock=False)
plt.legend(labels, loc=0)
plt.title('Dog Stages')
plt.tight_layout()
```



From the pie chart we can see that more than 84% of the tweets do not provide dog stage information in the post. For those have the stage information, pupper is most common stage = 10.4 % among all those tweets.

```
# 3.The Max number of retweet counts and favorite counts?
# Scatterplot of retweets vs favorite count

print("The Max number of retweet counts =",df.retweet_count.max())
print("The Min number of retweet counts =",df.retweet_count.min())
print("The Max number of favorite counts =",df.favorite_count.max())
print("The Min number of favorite counts =",df.favorite_count.min())
```

```
The Max number of retweet counts = 79515
The Min number of retweet counts = 16
The Max number of favorite counts = 132810
The Min number of favorite counts = 81
```

✓ 0s completed at 12:24 AM