wrangle_act

January 18, 2023

1 Project: Wrangling and Analyze Data

Import relevant libraries and dependencies

```
In [1]: import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        %matplotlib inline
        import seaborn as sns
        import tweepy
        import requests
        import os
        import json
        import datetime
```

1.1 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)

```
In [2]: #data is in same directory as the notebook
        data = pd.read_csv('twitter-archive-enhanced.csv')

        #call head function to check first 5 rows of dataframe
        data.head(10)
```

```
Out[2]:              tweet_id  in_reply_to_status_id  in_reply_to_user_id  \
        0  892420643555336193                    NaN                  NaN
        1  892177421306343426                    NaN                  NaN
        2  891815181378084864                    NaN                  NaN
        3  891689557279858688                    NaN                  NaN
        4  891327558926688256                    NaN                  NaN
        5  891087950875897856                    NaN                  NaN
        6  890971913173991426                    NaN                  NaN
        7  890729181411237888                    NaN                  NaN
        8  890609185150312448                    NaN                  NaN
        9  890240255349198849                    NaN                  NaN
```

```
                   timestamp  \
0  2017-08-01 16:23:56 +0000
1  2017-08-01 00:17:27 +0000
2  2017-07-31 00:18:03 +0000
3  2017-07-30 15:58:51 +0000
4  2017-07-29 16:00:24 +0000
5  2017-07-29 00:08:17 +0000
6  2017-07-28 16:27:12 +0000
7  2017-07-28 00:22:40 +0000
8  2017-07-27 16:25:51 +0000
9  2017-07-26 15:59:51 +0000

                                              source  \
0  <a href="http://twitter.com/download/iphone" r...
1  <a href="http://twitter.com/download/iphone" r...
2  <a href="http://twitter.com/download/iphone" r...
3  <a href="http://twitter.com/download/iphone" r...
4  <a href="http://twitter.com/download/iphone" r...
5  <a href="http://twitter.com/download/iphone" r...
6  <a href="http://twitter.com/download/iphone" r...
7  <a href="http://twitter.com/download/iphone" r...
8  <a href="http://twitter.com/download/iphone" r...
9  <a href="http://twitter.com/download/iphone" r...

                                                text  retweeted_status_id  \
0  This is Phineas. He's a mystical boy. Only eve...                  NaN
1  This is Tilly. She's just checking pup on you...                  NaN
2  This is Archie. He is a rare Norwegian Pouncin...                  NaN
3  This is Darla. She commenced a snooze mid meal...                  NaN
4  This is Franklin. He would like you to stop ca...                  NaN
5  Here we have a majestic great white breaching ...                  NaN
6  Meet Jax. He enjoys ice cream so much he gets ...                  NaN
7  When you watch your owner call another dog a g...                  NaN
8  This is Zoey. She doesn't want to be one of th...                  NaN
9  This is Cassie. She is a college pup. Studying...                  NaN

   retweeted_status_user_id retweeted_status_timestamp  \
0                       NaN                        NaN
1                       NaN                        NaN
2                       NaN                        NaN
3                       NaN                        NaN
4                       NaN                        NaN
5                       NaN                        NaN
6                       NaN                        NaN
7                       NaN                        NaN
8                       NaN                        NaN
9                       NaN                        NaN
```

```
                                        expanded_urls  rating_numerator  \
0  https://twitter.com/dog_rates/status/892420643...                13
1  https://twitter.com/dog_rates/status/892177421...                13
2  https://twitter.com/dog_rates/status/891815181...                12
3  https://twitter.com/dog_rates/status/891689557...                13
4  https://twitter.com/dog_rates/status/891327558...                12
5  https://twitter.com/dog_rates/status/891087950...                13
6  https://gofundme.com/ydvmve-surgery-for-jax,ht...                13
7  https://twitter.com/dog_rates/status/890729181...                13
8  https://twitter.com/dog_rates/status/890609185...                13
9  https://twitter.com/dog_rates/status/890240255...                14

   rating_denominator      name  doggo floofer pupper puppo
0                  10   Phineas   None    None   None  None
1                  10     Tilly   None    None   None  None
2                  10    Archie   None    None   None  None
3                  10     Darla   None    None   None  None
4                  10  Franklin   None    None   None  None
5                  10      None   None    None   None  None
6                  10       Jax   None    None   None  None
7                  10      None   None    None   None  None
8                  10      Zoey   None    None   None  None
9                  10    Cassie  doggo    None   None  None
```

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

```
In [3]: images = 'Images folder'
        if not os.path.exists(images):
            os.makedirs(images)
```

```
In [4]: URL = 'https://d17h27t6h515a5.cloudfront.net/topher/2017/August/599fd2ad_image-predictio
        response = requests.get(URL)
```

```
In [5]: with open(os.path.join(images,URL.split('/')[-1]), mode = 'wb') as file:
            file.write(response.content)
```

```
In [6]: link = 'Images folder/image-predictions.tsv'
        #read the data
        df_req = pd.read_csv(link, sep = '\t')

        df_req.head(20)
```

```
Out[6]:             tweet_id                                          jpg_url  \
        0  666020888022790149  https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg
        1  666029285002620928  https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg
        2  666033412701032449  https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg
        3  666044226329800704  https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg
        4  666049248165822465  https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg
```

```
5   666050758794694657  https://pbs.twimg.com/media/CT5Jof1WUAEuVxN.jpg
6   666051853826850816  https://pbs.twimg.com/media/CT5KoJ1WoAAJash.jpg
7   666055525042405380  https://pbs.twimg.com/media/CT5N9tpXIAAifs1.jpg
8   666057090499244032  https://pbs.twimg.com/media/CT5PY90WoAAQGLo.jpg
9   666058600524156928  https://pbs.twimg.com/media/CT5Qw94XAAA_2dP.jpg
10  666063827256086533  https://pbs.twimg.com/media/CT5Vg_wXIAAXfnj.jpg
11  666071193221509120  https://pbs.twimg.com/media/CT5cN_3WEAAlOoZ.jpg
12  666073100786774016  https://pbs.twimg.com/media/CT5d9DZXAAALcwe.jpg
13  666082916733198337  https://pbs.twimg.com/media/CT5m4VGWEAAtKc8.jpg
14  666094000022159362  https://pbs.twimg.com/media/CT5w9gUW4AAsBNN.jpg
15  666099513787052032  https://pbs.twimg.com/media/CT51-JJUEAA6hV8.jpg
16  666102155909144576  https://pbs.twimg.com/media/CT54YGiWUAEZnoK.jpg
17  666104133288665088  https://pbs.twimg.com/media/CT56LSZWoAAlJj2.jpg
18  666268910803644416  https://pbs.twimg.com/media/CT8QCd1WEAADXws.jpg
19  666273097616637952  https://pbs.twimg.com/media/CT8T1mtUwAA3aqm.jpg

    img_num                      p1   p1_conf  p1_dog                  p2  \
0         1  Welsh_springer_spaniel  0.465074    True              collie
1         1                 redbone  0.506826    True  miniature_pinscher
2         1         German_shepherd  0.596461    True            malinois
3         1     Rhodesian_ridgeback  0.408143    True             redbone
4         1      miniature_pinscher  0.560311    True          Rottweiler
5         1    Bernese_mountain_dog  0.651137    True    English_springer
6         1              box_turtle  0.933012   False          mud_turtle
7         1                    chow  0.692517    True      Tibetan_mastiff
8         1           shopping_cart  0.962465   False     shopping_basket
9         1        miniature_poodle  0.201493    True            komondor
10        1        golden_retriever  0.775930    True      Tibetan_mastiff
11        1           Gordon_setter  0.503672    True   Yorkshire_terrier
12        1            Walker_hound  0.260857    True    English_foxhound
13        1                     pug  0.489814    True         bull_mastiff
14        1              bloodhound  0.195217    True     German_shepherd
15        1                   Lhasa  0.582330    True            Shih-Tzu
16        1          English_setter  0.298617    True        Newfoundland
17        1                     hen  0.965932   False                cock
18        1        desktop_computer  0.086502   False                desk
19        1      Italian_greyhound  0.176053    True          toy_terrier

     p2_conf  p2_dog                          p3   p3_conf  p3_dog
0   0.156665    True            Shetland_sheepdog  0.061428    True
1   0.074192    True          Rhodesian_ridgeback  0.072010    True
2   0.138584    True                   bloodhound  0.116197    True
3   0.360687    True           miniature_pinscher  0.222752    True
4   0.243682    True                     Doberman  0.154629    True
5   0.263788    True   Greater_Swiss_Mountain_dog  0.016199    True
6   0.045885   False                     terrapin  0.017885   False
7   0.058279    True                     fur_coat  0.054449   False
8   0.014594   False             golden_retriever  0.007959    True
```

```
9   0.192305    True  soft-coated_wheaten_terrier  0.082086    True
10  0.093718    True           Labrador_retriever  0.072427    True
11  0.174201    True                     Pekinese  0.109454    True
12  0.175382    True                 Ibizan_hound  0.097471    True
13  0.404722    True               French_bulldog  0.048960    True
14  0.078260    True                     malinois  0.075628    True
15  0.166192    True               Dandie_Dinmont  0.089688    True
16  0.149842    True                       borzoi  0.133649    True
17  0.033919   False                    partridge  0.000052   False
18  0.085547   False                     bookcase  0.079480   False
19  0.111884    True                      basenji  0.111152    True
```

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

```
In [ ]: 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)

        tweet_ids = data.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.json', '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)
```

```
In [10]: tweets = []
         for line in open('tweet-json.json', 'r'):
             tweets.append(json.loads(line))
```

```
In [11]: tweets[0]['favorite_count']
```

```
Out[11]: 39467
```

```
In [12]: tweets[0].keys()
```

```
Out[12]: dict_keys(['created_at', 'id', 'id_str', 'full_text', 'truncated', 'display_text_range'
```

```
In [13]: # Creating a dataframe to store the extracted features from the created list
         df_json = pd.DataFrame(columns = ['tweet_id' ,
                                 'retweet_count' ,
                                 'favorite_count'])
         df_json.columns
```

```
Out[13]: Index(['tweet_id', 'retweet_count', 'favorite_count'], dtype='object')
```

```
In [14]: # Storing the selected features in df_json dataframe
         length = len(tweets)
         columns = ['id','retweet_count', 'favorite_count']
         for i in range(length):
             ids = tweets[i]['id']
             retweets = tweets[i]['retweet_count']
             count = tweets[i]['favorite_count']
             dicti = {'tweet_id': int(ids),
                  'retweet_count': retweets,
                  'favorite_count': count}
             dicts = pd.DataFrame(dicti, columns = df_json.columns, index=[i])
             df_json = pd.concat([df_json,dicts], ignore_index = True)
```

```
In [16]: df_json.head(10)
```

```
Out[16]:              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
         5  891087950875897856          3261          20562
         6  890971913173991426          2158          12041
         7  890729181411237888         16716          56848
         8  890609185150312448          4429          28226
         9  890240255349198849          7711          32467
```

1.2 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.

```
In [60]: #getting info of the data from the twitter archive
         data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2356 entries, 0 to 2355
Data columns (total 17 columns):
tweet_id                      2356 non-null int64
in_reply_to_status_id         78 non-null float64
in_reply_to_user_id           78 non-null float64
timestamp                     2356 non-null object
source                        2356 non-null object
text                          2356 non-null object
retweeted_status_id           181 non-null float64
retweeted_status_user_id      181 non-null float64
retweeted_status_timestamp    181 non-null object
expanded_urls                 2297 non-null object
rating_numerator              2356 non-null int64
rating_denominator            2356 non-null int64
name                          2356 non-null object
doggo                         2356 non-null object
floofer                       2356 non-null object
pupper                        2356 non-null object
puppo                         2356 non-null object
dtypes: float64(4), int64(3), object(10)
memory usage: 313.0+ KB
```

There are 181 retweets (retweeted_status_id, retweeted_status_user_id, retweeted_status_timestamp)

There are 78 replies (in_reply_to_status_id, in_reply_to_user_id)

There are 2297 tweets with expanded_urls

The timestamp field is in string format (object) and the tweet_id is integer format. There are 4 columns for dog stages (doggo, floofer, pupper, puppo)

```
In [61]: # Showing null values for each column
         data.isnull().sum()
```

```
Out[61]: tweet_id                         0
         in_reply_to_status_id         2278
         in_reply_to_user_id           2278
         timestamp                        0
         source                           0
         text                             0
         retweeted_status_id           2175
         retweeted_status_user_id      2175
         retweeted_status_timestamp    2175
         expanded_urls                   59
         rating_numerator                 0
         rating_denominator               0
         name                             0
         doggo                            0
         floofer                          0
         pupper                           0
         puppo                            0
         dtype: int64
```

```
In [62]: #checking the number of duplicated values
         data.duplicated().sum()
```

```
Out[62]: 0
```

We have significant amount of missing data in 5 columns and there are no duplicated value

```
In [63]: data.describe()
```

```
Out[63]:            tweet_id  in_reply_to_status_id  in_reply_to_user_id  \
         count  2.356000e+03           7.800000e+01         7.800000e+01
         mean   7.427716e+17           7.455079e+17         2.014171e+16
         std    6.856705e+16           7.582492e+16         1.252797e+17
         min    6.660209e+17           6.658147e+17         1.185634e+07
         25%    6.783989e+17           6.757419e+17         3.086374e+08
         50%    7.196279e+17           7.038708e+17         4.196984e+09
         75%    7.993373e+17           8.257804e+17         4.196984e+09
         max    8.924206e+17           8.862664e+17         8.405479e+17

                retweeted_status_id  retweeted_status_user_id  rating_numerator  \
         count         1.810000e+02              1.810000e+02       2356.000000
         mean          7.720400e+17              1.241698e+16         13.126486
         std           6.236928e+16              9.599254e+16         45.876648
         min           6.661041e+17              7.832140e+05          0.000000
```

```
25%     7.186315e+17          4.196984e+09          10.000000
50%     7.804657e+17          4.196984e+09          11.000000
75%     8.203146e+17          4.196984e+09          12.000000
max     8.874740e+17          7.874618e+17        1776.000000

       rating_denominator
count         2356.000000
mean            10.455433
std              6.745237
min              0.000000
25%             10.000000
50%             10.000000
75%             10.000000
max            170.000000
```

```
In [64]: data['name'].duplicated().sum()
```

```
Out[64]: 1399
```

```
In [65]: data.name.value_counts()
```

```
Out[65]: None          745
         a              55
         Charlie        12
         Cooper         11
         Oliver         11
         Lucy           11
         Tucker         10
         Lola           10
         Penny          10
         Bo              9
         Winston         9
         Sadie           8
         the             8
         Daisy           7
         Buddy           7
         an              7
         Bailey          7
         Toby            7
         Bella           6
         Jack            6
         Jax             6
         Scout           6
         Koda            6
         Oscar           6
         Milo            6
         Rusty           6
         Leo             6
         Dave            6
         Stanley         6
         Alfie           5
                      ...
         Ricky           1
         Rilo            1
         Napolean        1
         Monkey          1
         Rufio           1
         Mary            1
         Tommy           1
         Dug             1
         Arnold          1
         Torque          1
         Ace             1
         Kellogg         1
         Leonard         1
         Alexander       1
         Eugene          1
         Ember           1
         Andru           1
         Clarkus         1
         Nida            1
         Brandonald      1
         Billy           1
         Meatball        1
         Pluto           1
         Orion           1
         Josep           1
         Jaspers         1
         Flurpson        1
         Brockly         1
         Steve           1
         Timofy          1
         Name: name, Length: 957, dtype: int64
```

In the name column, a significant number of names are 'None' and about 55 names are 'a'. This doesn't tell a lot

```
In [66]: # Showing records having more than one dog stage

         data.doggo.value_counts()

Out[66]: None     2259
         doggo      97
         Name: doggo, dtype: int64

In [67]: data.floofer.value_counts()
```

```
Out[67]: None       2346
         floofer      10
         Name: floofer, dtype: int64
```

```
In [68]: data.pupper.value_counts()
```

```
Out[68]: None      2099
         pupper     257
         Name: pupper, dtype: int64
```

```
In [69]: data.puppo.value_counts()
```

```
Out[69]: None     2326
         puppo      30
         Name: puppo, dtype: int64
```

```
In [70]: # No of unique values in rating denominator column
         data.rating_denominator.value_counts()
```

```
Out[70]: 10     2333
         11        3
         50        3
         80        2
         20        2
         2         1
         16        1
         40        1
         70        1
         15        1
         90        1
         110       1
         120       1
         130       1
         150       1
         170       1
         7         1
         0         1
         Name: rating_denominator, dtype: int64
```

```
In [71]: data.source[0]
```

```
Out[71]: '<a href="http://twitter.com/download/iphone" rel="nofollow">Twitter for iPhone</a>'
```

```
In [72]: #getting info of the data from the request info
         df_req.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2075 entries, 0 to 2074
Data columns (total 12 columns):
```

```
tweet_id    2075 non-null int64
jpg_url     2075 non-null object
img_num     2075 non-null int64
p1          2075 non-null object
p1_conf     2075 non-null float64
p1_dog      2075 non-null bool
p2          2075 non-null object
p2_conf     2075 non-null float64
p2_dog      2075 non-null bool
p3          2075 non-null object
p3_conf     2075 non-null float64
p3_dog      2075 non-null bool
dtypes: bool(3), float64(3), int64(2), object(4)
memory usage: 152.1+ KB
```

```
In [73]: # Showing null values for each column
         df_req.isnull().sum()
```

```
Out[73]: tweet_id    0
         jpg_url     0
         img_num     0
         p1          0
         p1_conf     0
         p1_dog      0
         p2          0
         p2_conf     0
         p2_dog      0
         p3          0
         p3_conf     0
         p3_dog      0
         dtype: int64
```

```
In [74]: #checking the number of duplicated values
         df_req.duplicated().sum()
```

```
Out[74]: 0
```

```
In [75]: df_req.describe()
```

```
Out[75]:            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
```

```
In [76]: #getting info of the data from the twitter api
         df_json.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2354 entries, 0 to 2353
Data columns (total 3 columns):
tweet_id          2354 non-null object
retweet_count     2354 non-null object
favorite_count    2354 non-null object
dtypes: object(3)
memory usage: 55.2+ KB
```

```
In [77]: # Showing null values for each column
         df_json.isnull().sum()

Out[77]: tweet_id          0
         retweet_count     0
         favorite_count    0
         dtype: int64
```

```
In [78]: #checking the number of duplicated values
         df_json.duplicated().sum()

Out[78]: 0
```

```
In [79]: df_json.describe()

Out[79]:                   tweet_id  retweet_count  favorite_count
         count                 2354           2354            2354
         unique                2354           1724            2007
         top     667495797102141441           3652               0
         freq                     1              5             179
```

```
In [80]: # Showing all records having 0s in the favorite_count column
         df_json.query("favorite_count == 0")

Out[80]:                 tweet_id retweet_count favorite_count
         31   886054160059072513           108              0
         35   885311592912609280         19297              0
         67   879130579576475649          7181              0
         72   878404777348136964          1349              0
         73   878316110768087041          6965              0
         77   877611172832227328            83              0
         90   874434818259525634         15546              0
         94   873697596434513921         12518              0
         96   873337748698140672          1667              0
         100  872668790621863937            31              0
         108  871166179821445120          5991              0
```

117	869988702071779329	25661	0
123	868639477480148993	2240	0
129	867072653475098625	135	0
131	866816280283807744	32883	0
136	866094527597207552	8952	0
145	863471782782697472	2687	0
154	861769973181624320	37911	0
158	860981674716409858	2334	0
159	860924035999428608	882	0
164	860177593139703809	33421	0
170	858860390427611136	8805	0
179	857062103051644929	183	0
181	856602993587888130	11633	0
184	856330835276025856	731	0
193	855245323840757760	6568	0
194	855138241867124737	50	0
203	852936405516943360	2243	0
210	851953902622658560	10706	0
211	851861385021730816	23	0
...	...	...	...
777	775898661951791106	17621	0
783	775096608509886464	9220	0
793	773336787167145985	5912	0
799	772615324260794368	3914	0
810	771171053431250945	8705	0
816	770743923962707968	52360	0
820	770093767776997377	3520	0
824	769335591808995329	8830	0
827	768909767477751808	3129	0
831	768554158521745409	6719	0
839	766864461642756096	6521	0
845	766078092750233600	2970	0
858	763167063695355904	3484	0
866	761750502866649088	4535	0
870	761371037149827077	20500	0
883	760153949710192640	38	0
888	759566828574212096	24319	0
893	759159934323924993	1359	0
906	757729163776290825	9299	0
909	757597904299253760	336	0
924	754874841593970688	9193	0
935	753298634498793472	6620	0
941	752701944171524096	3291	0
947	752309394570878976	18963	0
1010	747242308580548608	3257	0
1021	746521445350707200	1110	0
1041	743835915802583040	2387	0
1240	711998809858043904	138	0

```
2257  667550904950915073          37             0
2258  667550882905632768          34             0

[179 rows x 3 columns]
```

1.2.1 Quality issues

1. There are significant number of missing values in the twitter archive dataset
2. The name column has a lot of duplicated values and some names are None
3. Tweet ids are currently in integer but they should be strings
4. The timestamp is in integer format rather than datetime
5. Nulls represented as None in name column
6. rating_denominator contains values other than 10, minimum is 0
7. The url still has source display
8. There are Urls in the end of the 'text'.

1.2.2 Tidiness issues

1. The dog stages are in separate columns but they should be in one
2. The three dataset have tweet id in common, hence could be combined

1.3 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).

```
In [98]: # Make copies of original pieces of data
         data_original = data.copy
         df_req_original = df_req.copy()
         df_json_original = df_json.copy()
```

1.3.1 Issue #1: Multiple DataFrame

Define: Merging the dataframes based on tweet_id

Code

```
In [100]: df = pd.merge(data, df_req, how='outer', on='tweet_id', sort=True)
          df_json['tweet_id'] = df_json['tweet_id'].astype(int) #tweet_id in the 3rd dataframe i
          #converting it to int to match the other two, might convert all to object later
          df = pd.merge(df, df_json, how='outer', on='tweet_id', sort=True)
```

```
In [101]: df.columns

Out[101]: Index(['tweet_id', 'in_reply_to_status_id', 'in_reply_to_user_id', 'timestamp',
                 'source', 'text', 'retweeted_status_id', 'retweeted_status_user_id',
                 'retweeted_status_timestamp', 'expanded_urls', 'rating_numerator',
                 'rating_denominator', 'name', 'doggo', 'floofer', 'pupper', 'puppo',
                 'jpg_url', 'img_num', 'p1', 'p1_conf', 'p1_dog', 'p2', 'p2_conf',
                 'p2_dog', 'p3', 'p3_conf', 'p3_dog', 'retweet_count', 'favorite_count'],
                dtype='object')
```

1.3.2 Issue #2: Missing Values

Define: fixing Null and None values

Code

```
In [102]: df.dropna(subset = ['p1', 'p1_conf', 'p1_dog'], how = 'all', inplace=True)

In [103]: df.favorite_count.replace(0, np.nan, inplace=True)

In [104]: mode_ret = df.retweet_count.mode()[0]
          mode_fav = df.favorite_count.mode()[0]
          df.retweet_count.fillna(mode_ret, inplace=True)
          df.favorite_count.fillna(mode_fav, inplace=True)
```

Test

```
In [105]: df.info()

<class 'pandas.core.frame.DataFrame'>
Int64Index: 2075 entries, 0 to 2355
Data columns (total 30 columns):
tweet_id                      2075 non-null int64
in_reply_to_status_id         23 non-null float64
in_reply_to_user_id           23 non-null float64
timestamp                     2075 non-null object
source                        2075 non-null object
text                          2075 non-null object
retweeted_status_id           81 non-null float64
retweeted_status_user_id      81 non-null float64
retweeted_status_timestamp    81 non-null object
expanded_urls                 2075 non-null object
rating_numerator              2075 non-null int64
rating_denominator            2075 non-null int64
name                          2075 non-null object
doggo                         2075 non-null object
floofer                       2075 non-null object
pupper                        2075 non-null object
puppo                         2075 non-null object
```

```
jpg_url                        2075 non-null object
img_num                        2075 non-null float64
p1                             2075 non-null object
p1_conf                        2075 non-null float64
p1_dog                         2075 non-null object
p2                             2075 non-null object
p2_conf                        2075 non-null float64
p2_dog                         2075 non-null object
p3                             2075 non-null object
p3_conf                        2075 non-null float64
p3_dog                         2075 non-null object
retweet_count                  2075 non-null int64
favorite_count                 2075 non-null float64
dtypes: float64(9), int64(4), object(17)
memory usage: 502.5+ KB
```

1.3.3 Issue #3: Source Html Tag in Url

Define: Extracting only URL

Code

```
In [106]: df.source = df.source.str.extract('"([^"]*)" ')
```

Test

```
In [107]: df.source.head()
```

```
Out[107]: 0    http://twitter.com/download/iphone
          1    http://twitter.com/download/iphone
          2    http://twitter.com/download/iphone
          3    http://twitter.com/download/iphone
          4    http://twitter.com/download/iphone
          Name: source, dtype: object
```

1.3.4 Issue #4: rating_denominator column contains values less and larger than 10

Define: Fixing denominator values other than 10

Code

```
In [108]: df.rating_denominator.value_counts()
```

```
Out[108]: 10     2057
          50        3
          11        2
          80        2
          7         1
```

```
         170       1
         150       1
         130       1
         120       1
         110       1
         90        1
         70        1
         40        1
         20        1
         2         1
         Name: rating_denominator, dtype: int64
```

```
In [109]: df.rating_denominator = 10
```

```
In [110]: df.rating_denominator.value_counts()
```

```
Out[110]: 10    2075
          Name: rating_denominator, dtype: int64
```

1.3.5 Issue #5: Existence of retweets therefore there is duplicates

Define: Getting rid of retweets that is causing duplicates

Code

```
In [111]: retweet_ind = df[~df['retweeted_status_id'].isna()].index
          df.drop(index=retweet_ind, inplace = True)
          df.drop(['retweeted_status_id', 'retweeted_status_user_id',
                            'retweeted_status_timestamp'], axis = 1, inplace =True)
```

```
In [112]: df.reset_index(inplace = True)
```

Test

```
In [113]: df.columns
```

```
Out[113]: Index(['index', 'tweet_id', 'in_reply_to_status_id', 'in_reply_to_user_id',
                 'timestamp', 'source', 'text', 'expanded_urls', 'rating_numerator',
                 'rating_denominator', 'name', 'doggo', 'floofer', 'pupper', 'puppo',
                 'jpg_url', 'img_num', 'p1', 'p1_conf', 'p1_dog', 'p2', 'p2_conf',
                 'p2_dog', 'p3', 'p3_conf', 'p3_dog', 'retweet_count', 'favorite_count'],
                dtype='object')
```

1.3.6 Issue #6: Erraneous datatypes in (favorite_count, retweet_count, p_dog, img_num and timestamp) columns

Code

```
In [114]: df['tweet_id'] = df['tweet_id'].astype(str)
In [115]: df.favorite_count = df.favorite_count.astype(int)
          df.retweet_count = df.retweet_count.astype(int)
```

```
In [116]: df.p1_dog = df['p1_dog'].replace({'True': True, 'False': False})
          df['p2_dog'] =  df['p2_dog'].replace({'True': True, 'False': False})
          df.p3_dog = df['p3_dog'].replace({'True': True, 'False': False})
```

```
In [117]: df.timestamp = pd.to_datetime(df.timestamp)
```

```
In [118]: df.img_num = df.img_num.astype(int)
```

Test

```
In [119]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1994 entries, 0 to 1993
Data columns (total 28 columns):
index                        1994 non-null int64
tweet_id                     1994 non-null object
in_reply_to_status_id        23 non-null float64
in_reply_to_user_id          23 non-null float64
timestamp                    1994 non-null datetime64[ns]
source                       1994 non-null object
text                         1994 non-null object
expanded_urls                1994 non-null object
rating_numerator             1994 non-null int64
rating_denominator           1994 non-null int64
name                         1994 non-null object
doggo                        1994 non-null object
floofer                      1994 non-null object
pupper                       1994 non-null object
puppo                        1994 non-null object
jpg_url                      1994 non-null object
img_num                      1994 non-null int64
p1                           1994 non-null object
p1_conf                      1994 non-null float64
p1_dog                       1994 non-null bool
p2                           1994 non-null object
p2_conf                      1994 non-null float64
p2_dog                       1994 non-null bool
p3                           1994 non-null object
p3_conf                      1994 non-null float64
p3_dog                       1994 non-null bool
retweet_count                1994 non-null int64
favorite_count               1994 non-null int64
dtypes: bool(3), datetime64[ns](1), float64(5), int64(6), object(13)
memory usage: 395.4+ KB
```

1.3.7 Issue #7: name column Nulls represented as None

Define : Replacing None values in the name column with NaN

Code

```
In [122]: df.name = df.name.replace('None', np.nan)
```

Test

```
In [123]: df.name.unique()[0:5]

Out[123]: array([nan, 'a', 'an', 'the', 'quite'], dtype=object)
```

1.3.8 Issue #8: name column have multiple invalid values ('a', 'an', 'the')

Define: Replacing the invalid names with NaN

Code

```
In [124]: name_dict = {'a' : np.nan, 'an' : np.nan, 'the' : np.nan}

In [126]: def replace_invalid(ds):
              if ds['name'] in name_dict.keys():
                  valid = name_dict[ds['name']]
                  return valid
              else:
                  return ds['name']

          df['name'] = df.apply(replace_invalid, axis=1)
```

Test

```
In [127]: df.name.unique()[0:5]

Out[127]: array([nan, 'quite', 'Walter', 'Scout', 'Kreggory'], dtype=object)
```

1.3.9 Issue #9: dog stage columns contain multiple dog stage at once

Define: Cleaning the records that contain more than one stage value referring to their text

```
In [128]: df[(df.doggo != 'None') & (df.pupper != 'None')]['text']

Out[128]: 1152    Like father (doggo), like son (pupper). Both 1...
          1198    This is just downright precious af. 12/10 for ...
          1289    Please stop sending it pictures that don't eve...
          1341    Meet Maggie &amp; Lila. Maggie is the doggo, L...
          1483    This is Pinot. He's a sophisticated doggo. You...
          1568    This is Bones. He's being haunted by another d...
          1574    Like doggo, like pupper version 2. Both 11/10 ...
          1596    Here we have Burke (pupper) and Dexter (doggo)...
          1653    This is Dido. She's playing the lead role in "...
          Name: text, dtype: object
```

```
In [131]: df[(df.doggo != 'None') & (df.floofer != 'None')|((df.doggo != 'None') & (df.puppo !=

Out[131]: 1839    At first I thought this was a shy doggo, but i...
          1845    Here's a puppo participating in the #ScienceMa...
          Name: text, dtype: object
```

```
In [133]: df[(df.doggo != 'None') & (df.floofer != 'None')|((df.doggo != 'None') & (df.puppo !=

Out[133]: "At first I thought this was a shy doggo, but it's actually a Rare Canadian Floofer Ow
```

```
In [135]: for i,row in df[(df.doggo != 'None')&(df.floofer != 'None')|((df.doggo != 'None')&(df.
              df.at[i,'doggo'] = 'None'
```

```
In [136]: for i, row in df[(df.doggo != 'None') & (df.pupper != 'None')].iterrows():
              df.at[i,'pupper'] = 'None'
```

Test

```
In [137]: df[(df.doggo != 'None') & (df.floofer != 'None')
                                  | ((df.doggo != 'None') & (df.puppo != 'None'))]

Out[137]: Empty DataFrame
          Columns: [index, tweet_id, in_reply_to_status_id, in_reply_to_user_id, timestamp, sour
          Index: []

          [0 rows x 28 columns]
```

1.3.10 Issue #10: multiple dog stage in different columns

Define: Merge all dog stages into a clumn and convert to categorical variable

```
In [138]: df_test = df[['tweet_id', 'pupper' ,'floofer', 'doggo', 'puppo']].copy()
```

```
In [139]: df_test['stage'] = df_test[['doggo', 'floofer', 'pupper', 'puppo']].max(axis=1)
```

```
In [140]: df_test.drop(['pupper' ,'floofer', 'doggo', 'puppo'], axis= 1 , inplace =True)
```

```
In [141]: df = pd.merge(df, df_test, on = 'tweet_id', sort = True)
```

```
In [142]: df.columns

Out[142]: Index(['index', 'tweet_id', 'in_reply_to_status_id', 'in_reply_to_user_id',
                 'timestamp', 'source', 'text', 'expanded_urls', 'rating_numerator',
                 'rating_denominator', 'name', 'doggo', 'floofer', 'pupper', 'puppo',
                 'jpg_url', 'img_num', 'p1', 'p1_conf', 'p1_dog', 'p2', 'p2_conf',
                 'p2_dog', 'p3', 'p3_conf', 'p3_dog', 'retweet_count', 'favorite_count',
                 'stage'],
                dtype='object')
```

```
In [143]: df.drop(['pupper' ,'floofer', 'doggo', 'puppo'], axis = 1, inplace = True)
```

```
In [144]: df['stage'] = df['stage'].astype('category')
```

```
In [145]: df.reset_index(inplace= True)
```

Test

```
In [146]: df.stage.value_counts()
```

```
Out[146]: None       1688
          pupper      203
          doggo        72
          puppo        23
          floofer       8
          Name: stage, dtype: int64
```

1.3.11 Issue #11: dog_breed must be added based on the img_num and p1_dog

Define: Creating new dog_breed column based on the img_num prediction then dropping all prediction column

```
In [147]: df.img_num.value_counts()
```

```
Out[147]: 1    1711
          2     191
          3      62
          4      30
          Name: img_num, dtype: int64
```

```
In [148]: for i, row in df.iterrows():
              if (row['img_num'] == 1 | row['img_num'] == 4) & row['p1_dog']:
                  p = row['p1']
              elif row['img_num'] == 2 & row['p2_dog'] :
                  p = row['p2']
              elif row['img_num'] == 3 & row['p3_dog'] :
                  p = row['p3']

              df.at[i,'dog_breed'] = p
```

```
In [149]: drop_col = ['index','img_num', 'p1','p1_conf','p1_dog','p2','p2_conf','p2_dog','p3','p
```

```
In [150]: df.drop(drop_col, axis = 1, inplace = True)
```

Test

```
In [151]: df['dog_breed'].value_counts()
```

```
Out[151]: Labrador_retriever                112
          Chihuahua                          79
          golden_retriever                   70
          kuvasz                             51
          Eskimo_dog                         49
          Staffordshire_bullterrier          41
          Chesapeake_Bay_retriever           41
          toy_poodle                         40
```

```
chow                                39
American_Staffordshire_terrier      39
Pomeranian                          38
kelpie                              38
French_bulldog                      37
malamute                            36
Pembroke                            35
basenji                             34
beagle                              34
Great_Pyrenees                      34
cocker_spaniel                      31
Pekinese                            31
Siberian_husky                      29
bull_mastiff                        28
Cardigan                            27
West_Highland_white_terrier         26
Shetland_sheepdog                   25
toy_terrier                         25
standard_poodle                     24
Lakeland_terrier                    24
Boston_bull                         24
pug                                 22
                                  ...
curly-coated_retriever               7
Lhasa                                7
Scottish_deerhound                   7
Dandie_Dinmont                       7
miniature_schnauzer                  6
wire-haired_fox_terrier              6
Old_English_sheepdog                 6
basset                               6
Border_terrier                       6
Gordon_setter                        5
giant_schnauzer                      5
otterhound                           5
Bernese_mountain_dog                 5
bluetick                             4
malinois                             4
standard_schnauzer                   4
Leonberg                             4
Mexican_hairless                     4
Irish_water_spaniel                  4
Walker_hound                         3
affenpinscher                        3
Sealyham_terrier                     3
Blenheim_spaniel                     3
silky_terrier                        2
briard                               2
```

```
Sussex_spaniel                        1
komondor                              1
Kerry_blue_terrier                    1
Bouvier_des_Flandres                  1
Irish_wolfhound                       1
Name: dog_breed, Length: 116, dtype: int64
```

```
In [152]: df.head()
```

```
Out[152]:    level_0            tweet_id  in_reply_to_status_id  in_reply_to_user_id  \
          0        0  666020888022790149                    NaN                  NaN   
          1        1  666029285002620928                    NaN                  NaN   
          2        2  666033412701032449                    NaN                  NaN   
          3        3  666044226329800704                    NaN                  NaN   
          4        4  666049248165822465                    NaN                  NaN   

                      timestamp                               source  \
          0 2015-11-15 22:32:08  http://twitter.com/download/iphone   
          1 2015-11-15 23:05:30  http://twitter.com/download/iphone   
          2 2015-11-15 23:21:54  http://twitter.com/download/iphone   
          3 2015-11-16 00:04:52  http://twitter.com/download/iphone   
          4 2015-11-16 00:24:50  http://twitter.com/download/iphone   

                                                          text  \
          0  Here we have a Japanese Irish Setter. Lost eye...   
          1  This is a western brown Mitsubishi terrier. Up...   
          2  Here is a very happy pup. Big fan of well-main...   
          3  This is a purebred Piers Morgan. Loves to Netf...   
          4  Here we have a 1949 1st generation vulpix. Enj...   

                                                 expanded_urls  rating_numerator  \
          0  https://twitter.com/dog_rates/status/666020888...                 8   
          1  https://twitter.com/dog_rates/status/666029285...                 7   
          2  https://twitter.com/dog_rates/status/666033412...                 9   
          3  https://twitter.com/dog_rates/status/666044226...                 6   
          4  https://twitter.com/dog_rates/status/666049248...                 5   

             rating_denominator name                                          jpg_url  \
          0                  10  NaN  https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg   
          1                  10  NaN  https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg   
          2                  10  NaN  https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg   
          3                  10  NaN  https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg   
          4                  10  NaN  https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg   

             retweet_count  favorite_count stage            dog_breed
          0            532            2535  None    Shetland_sheepdog
          1             48             132  None  Rhodesian_ridgeback
          2             47             128  None           bloodhound
```

```
3              147              311  None   miniature_pinscher
4               41              111  None             Doberman
```

1.4 Storing Data

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

```
In [153]: df.to_csv('twitter_archive_master.csv', index = False)
```

1.5 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.**

```
In [ ]: df = pd.read_csv('twitter_archive_master.csv')
```

```
In [163]: df.describe()
```

```
Out[163]:            level_0  in_reply_to_status_id  in_reply_to_user_id  \
          count  1994.000000           2.300000e+01         2.300000e+01
          mean    996.500000           6.978112e+17         4.196984e+09
          std     575.762538           4.359384e+16         0.000000e+00
          min       0.000000           6.671522e+17         4.196984e+09
          25%     498.250000           6.732411e+17         4.196984e+09
          50%     996.500000           6.757073e+17         4.196984e+09
          75%    1494.750000           7.031489e+17         4.196984e+09
          max    1993.000000           8.558181e+17         4.196984e+09

                 rating_numerator  rating_denominator  retweet_count  favorite_count
          count       1994.000000              1994.0    1994.000000     1994.000000
          mean          12.280843                10.0    2766.753260     8895.725677
          std           41.497718                 0.0    4674.698447    12213.193181
          min            0.000000                10.0      16.000000       81.000000
          25%           10.000000                10.0     624.750000     1982.000000
          50%           11.000000                10.0    1359.500000     4136.000000
          75%           12.000000                10.0    3220.000000    11308.000000
          max         1776.000000                10.0   79515.000000   132810.000000
```

```
In [165]: year= df.groupby(df['timestamp'].dt.year)['retweet_count'].sum()
          year
```

```
Out[165]: timestamp
          2015     717854
          2016    2660493
          2017    2138559
          Name: retweet_count, dtype: int64
```

```
In [169]: df_x = df[df['stage'] != 'None'].copy()
          df_x =  df_x[df_x['rating_numerator'] >= 10]
```

```
In [172]: df_x.stage.replace('None', np.nan, inplace =True)

In [173]: df_x.groupby('stage')['rating_numerator'].mean()

Out[173]: stage
          None             NaN
          doggo      12.044118
          floofer    11.875000
          pupper     11.371951
          puppo      12.181818
          Name: rating_numerator, dtype: float64

In [174]: df_x['year'] = df_x['timestamp'].dt.year

In [175]: df_x.groupby('year')['retweet_count'].sum()

Out[175]: year
          2015     65197
          2016    565351
          2017    475908
          Name: retweet_count, dtype: int64

In [176]: df['name'].value_counts().head()

Out[176]: Charlie    11
          Cooper     10
          Lucy       10
          Oliver     10
          Tucker      9
          Name: name, dtype: int64
```

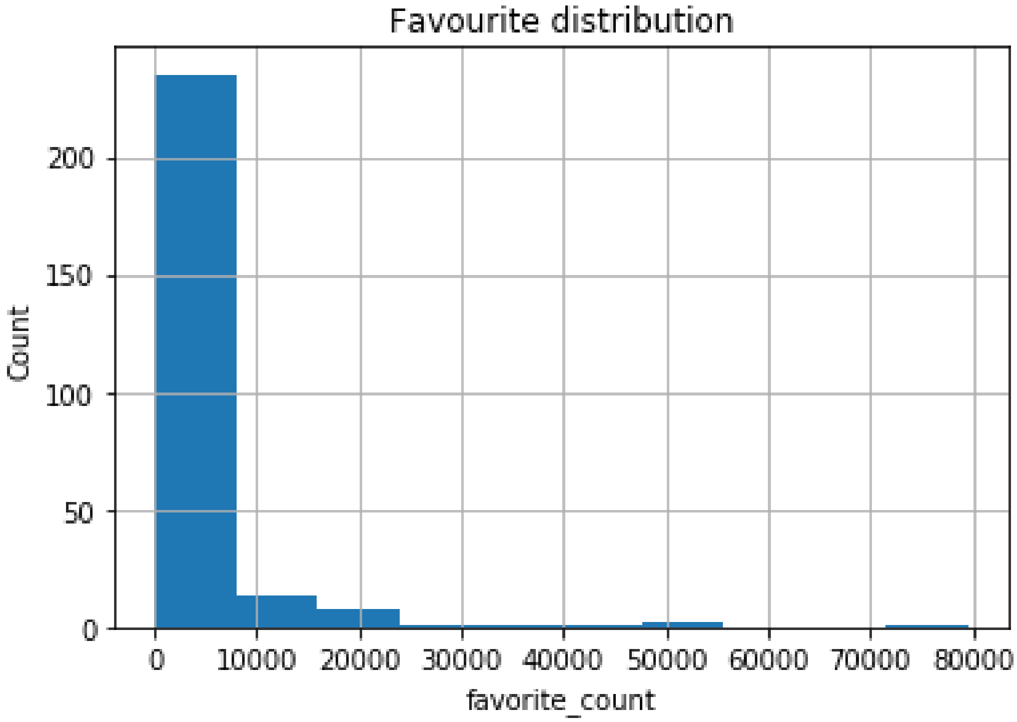
1.5.1 Insights:

1. The highest number of retweet is recorded in 2016
2. Puppo dog stage had the highest average rating
3. The most common name is Charlie followed by Cooper, Lucy and Oliver with the same count
4. For ratings greater or eqaul to 10, there is a large increase in retweet between 2015 to 2016 and then decrease in 2017

1.5.2 Visualization

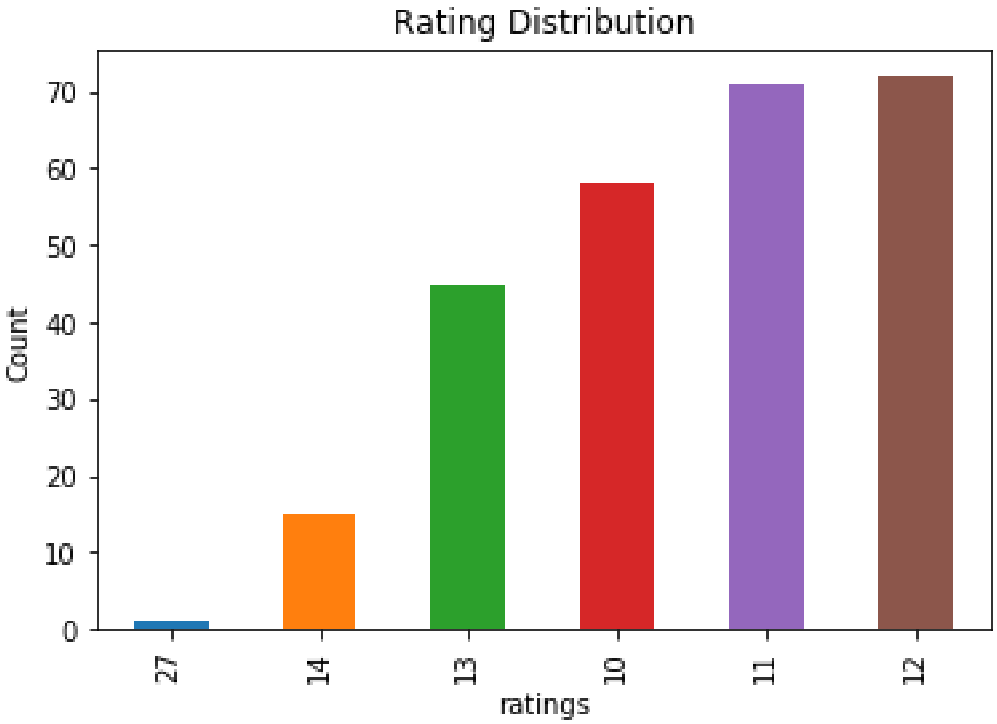
```
In [182]: #distribution
          df_x.retweet_count.hist()
          plt.xlabel('favorite_count')
          plt.ylabel('Count')
          plt.title('Retweet distribution')
```

```
Out[182]: Text(0.5,1,'Favourite distribution')
```



```
In [183]: df_x.rating_numerator.value_counts().sort_values().plot(kind='bar')
          plt.xlabel('ratings')
          plt.ylabel('Count')
          plt.title('Rating Distribution')

Out[183]: Text(0.5,1,'Rating Distribution')
```

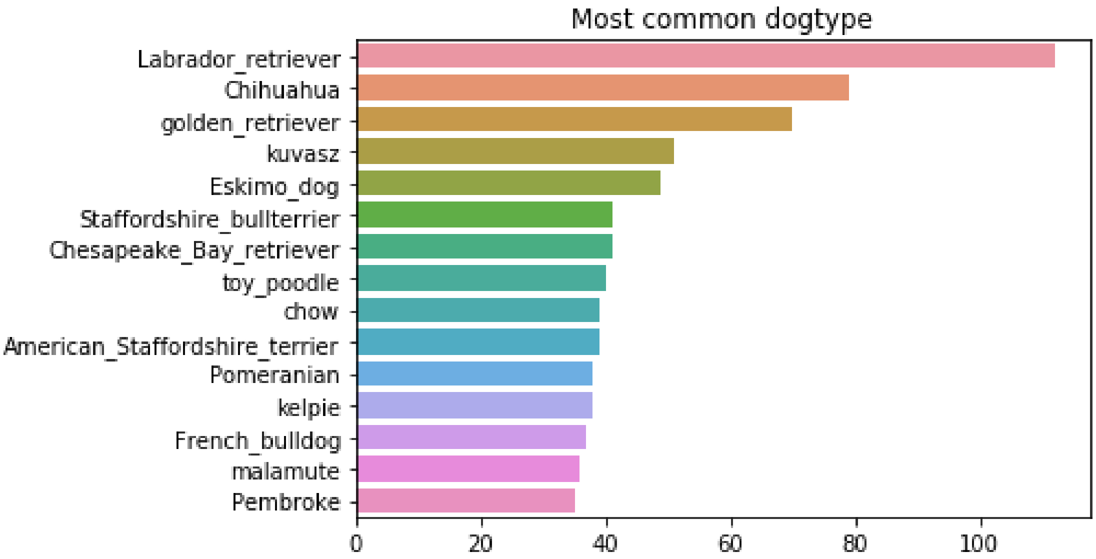


Distribution is left skewed and the outlier isn't really significant

```
In [157]: #most common dog breed
          import seaborn as sns
          import matplotlib.pyplot as plt

          dog_type = df['dog_breed'].value_counts()[:15]
          sns.barplot(dog_type.values, dog_type.index)
          plt.title('Most common dogtype')
```

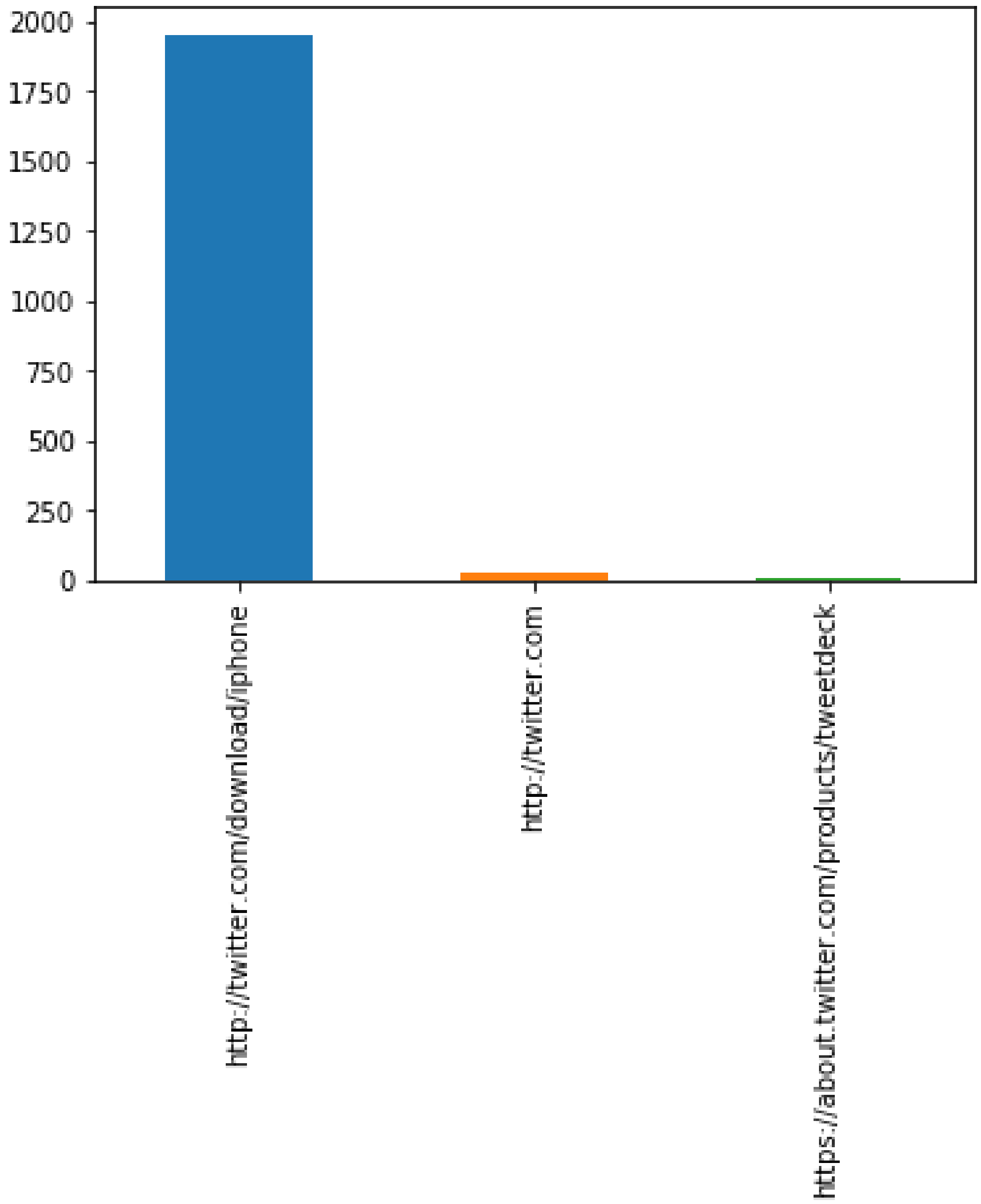
```
Out[157]: Text(0.5,1,'Most common dogtype')
```



The most common dog breed is the Labrador Retriever

```
In [184]: # number of tweet by phones
          df['source'].value_counts().plot(kind ='bar')
          #sns.barplot(plot.values, plot.index)

Out[184]: <matplotlib.axes._subplots.AxesSubplot at 0x7fee26970b00>
```



There are more tweets from iphone compared to other source