

wrangle_act

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1 Wrangle and Analyze Data

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1.0.2 Importing Important libraries

```
In [1]: import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import requests
import tweepy
from tweepy import OAuthHandler
import json
from timeit import default_timer as timer
import time
%matplotlib inline
```

1.1 Data Gathering

In the cell below, **all** three pieces of data for this project are gathered and loaded them in the notebook. 1. Directly download the WeRateDogs Twitter archive data (twitter_archive_enhanced.csv)

```
In [2]: #load data into a Dataframe
df = pd.read_csv('twitter-archive-enhanced.csv')
df.head()
```

```
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	

	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

```

```

                                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...

```

```

                                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

```

```

retweeted_status_user_id retweeted_status_timestamp \
0                          NaN                      NaN
1                          NaN                      NaN
2                          NaN                      NaN
3                          NaN                      NaN
4                          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

```

```

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

```

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

```

In [3]: import io
        url = 'https://d17h27t6h515a5.cloudfront.net/topher/2017/August/599fd2ad_image-predictions.tsv'
        data=requests.get(url)
        with open (url.split('/')[ -1], mode='wb') as file:
            file.write(data.content)

In [4]: df_img= pd.read_csv('image_predictions.tsv', sep='\t')
        df_img.head()

```

```

Out[4]:
      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

      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

      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

```

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

```

In [8]: access_token = 'hidden'
        access_token_secret = 'hidden'
        consumer_key = 'hidden'
        consumer_secret = 'hidden'

        authenticate = tweepy.OAuthHandler(consumer_key, consumer_secret)

        authenticate.set_access_token(access_token, access_token_secret)

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

        tweet_ids = df.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)

```

```

1: 892420643555336193
Success
2: 892177421306343426
Success
3: 891815181378084864
Success
4: 891689557279858688
Success
5: 891327558926688256
Success
6: 891087950875897856
Success
7: 890971913173991426
Success
8: 890729181411237888
Success
9: 890609185150312448
Success
10: 890240255349198849
Success
11: 890006608113172480
Success
12: 889880896479866881
Success
13: 889665388333682689
Success
14: 889638837579907072
Success
15: 889531135344209921
Success
16: 889278841981685760
Success
17: 888917238123831296
Success
18: 888804989199671297
Success

```

19: 888554962724278272
Success
20: 888202515573088257
Fail
21: 888078434458587136
Success
22: 887705289381826560
Success
23: 887517139158093824
Success
24: 887473957103951883
Success
25: 887343217045368832
Success
26: 887101392804085760
Success
27: 886983233522544640
Success
28: 886736880519319552
Success
29: 886680336477933568
Success
30: 886366144734445568
Success
31: 886267009285017600
Success
32: 886258384151887873
Success
33: 886054160059072513
Success
34: 885984800019947520
Success
35: 885528943205470208
Success
36: 885518971528720385
Success
37: 885311592912609280
Success
38: 885167619883638784
Success
39: 884925521741709313
Success
40: 884876753390489601
Success
41: 884562892145688576
Success
42: 884441805382717440
Success

43: 884247878851493888
Success
44: 884162670584377345
Success
45: 883838122936631299
Success
46: 883482846933004288
Success
47: 883360690899218434
Success
48: 883117836046086144
Success
49: 882992080364220416
Success
50: 882762694511734784
Success
51: 882627270321602560
Success
52: 882268110199369728
Success
53: 882045870035918850
Success
54: 881906580714921986
Success
55: 881666595344535552
Success
56: 881633300179243008
Success
57: 881536004380872706
Success
58: 881268444196462592
Success
59: 880935762899988482
Success
60: 880872448815771648
Success
61: 880465832366813184
Success
62: 880221127280381952
Success
63: 880095782870896641
Success
64: 879862464715927552
Success
65: 879674319642796034
Success
66: 879492040517615616
Success

67: 879415818425184262
Success
68: 879376492567855104
Success
69: 879130579576475649
Success
70: 879050749262655488
Success
71: 879008229531029506
Success
72: 878776093423087618
Success
73: 878604707211726852
Success
74: 878404777348136964
Success
75: 878316110768087041
Success
76: 878281511006478336
Success
77: 878057613040115712
Success
78: 877736472329191424
Success
79: 877611172832227328
Success
80: 877556246731214848
Success
81: 877316821321428993
Success
82: 877201837425926144
Success
83: 876838120628539392
Success
84: 876537666061221889
Success
85: 876484053909872640
Success
86: 876120275196170240
Success
87: 875747767867523072
Success
88: 875144289856114688
Success
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90: 875021211251597312
Success

91: 874680097055178752
Success
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Success
93: 874296783580663808
Success
94: 874057562936811520
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95: 874012996292530176
Success
96: 873697596434513921
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97: 873580283840344065
Success
98: 873337748698140672
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99: 873213775632977920
Success
100: 872967104147763200
Success
101: 872820683541237760
Success
102: 872668790621863937
Fail
103: 872620804844003328
Success
104: 872486979161796608
Success
105: 872261713294495745
Fail
106: 872122724285648897
Success
107: 871879754684805121
Success
108: 871762521631449091
Success
109: 871515927908634625
Success
110: 871166179821445120
Success
111: 871102520638267392
Success
112: 871032628920680449
Success
113: 870804317367881728
Success
114: 870726314365509632
Success

115: 870656317836468226
Success
116: 870374049280663552
Success
117: 870308999962521604
Success
118: 870063196459192321
Success
119: 869988702071779329
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120: 869772420881756160
Success
121: 869702957897576449
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122: 869596645499047938
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123: 869227993411051520
Success
124: 868880397819494401
Success
125: 868639477480148993
Success
126: 868622495443632128
Success
127: 868552278524837888
Success
128: 867900495410671616
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129: 867774946302451713
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130: 867421006826221569
Success
131: 867072653475098625
Success
132: 867051520902168576
Success
133: 866816280283807744
Fail
134: 866720684873056260
Success
135: 866686824827068416
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136: 866450705531457537
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149: 863427515083354112
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304: 836397794269200385
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311: 835309094223372289
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312: 835297930240217089
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Success
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Success
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Success
333: 832769181346996225
Success
334: 832757312314028032
Success
335: 832682457690300417
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338: 832397543355072512
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Success
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Success
342: 832215726631055365
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353: 831315979191906304
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Success

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357: 830583320585068544
Success
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Success
359: 830097400375152640
Success
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Success
361: 829861396166877184
Success
362: 829501995190984704
Success
363: 829449946868879360
Success
364: 829374341691346946
Fail
365: 829141528400556032
Success
366: 829011960981237760
Success
367: 828801551087042563
Success
368: 828770345708580865
Success
369: 828708714936930305
Success
370: 828650029636317184
Success
371: 828409743546925057
Success
372: 828408677031882754
Success
373: 828381636999917570
Success
374: 828376505180889089
Success
375: 828372645993398273
Success
376: 828361771580813312
Success
377: 828046555563323392
Success
378: 828011680017821696
Success

379: 827933404142436356
Success
380: 827653905312006145
Success
381: 827600520311402496
Success
382: 827324948884643840
Success
383: 827228250799742977
Fail
384: 827199976799354881
Success
385: 826958653328592898
Success
386: 826848821049180160
Success
387: 826615380357632002
Success
388: 826598799820865537
Success
389: 826598365270007810
Success
390: 826476773533745153
Success
391: 826240494070030336
Success
392: 826204788643753985
Success
393: 826115272272650244
Success
394: 825876512159186944
Success
395: 825829644528148480
Success
396: 825535076884762624
Success
397: 825147591692263424
Success
398: 825120256414846976
Success
399: 825026590719483904
Success
400: 824796380199809024
Success
401: 824775126675836928
Success
402: 824663926340194305
Success

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2029: 671866342182637568
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2041: 671544874165002241
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2042: 671542985629241344
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2063: 671163268581498880
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2073: 671109016219725825
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2074: 670995969505435648
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2075: 670842764863651840
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2076: 670840546554966016
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2085: 670807719151067136
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2086: 670804601705242624
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2087: 670803562457407488
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2088: 670797304698376195
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2089: 670792680469889025
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2090: 670789397210615808
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2091: 670786190031921152
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2092: 670783437142401025
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2093: 670782429121134593
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2094: 670780561024270336
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2095: 670778058496974848
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2096: 670764103623966721
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2105: 670668383499735048
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2106: 670474236058800128
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2107: 670468609693655041
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2109: 670452855871037440
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2112: 670442337873600512
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2113: 670435821946826752
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2114: 670434127938719744
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2115: 670433248821026816
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2116: 670428280563085312
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2117: 670427002554466305
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2118: 670421925039075328
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2188: 668979806671884288
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2190: 668967877119254528
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2237: 668154635664932864
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2245: 667886921285246976
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2246: 667885044254572545
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2247: 667878741721415682
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2248: 667873844930215936
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2249: 667866724293877760
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2256: 667773195014021121
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2275: 667455448082227200
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2293: 667160273090932737
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2294: 667152164079423490
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2295: 667138269671505920
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2297: 667090893657276420
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2298: 667073648344346624
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2299: 667070482143944705
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2300: 667065535570550784
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2306: 666837028449972224
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2307: 666835007768551424
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2308: 666826780179869698
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2309: 666817836334096384
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2312: 666781792255496192
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2313: 666776908487630848
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2314: 666739327293083650
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2316: 666691418707132416
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2317: 666649482315059201
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2318: 666644823164719104
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2320: 666447344410484738
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2321: 666437273139982337
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2323: 666430724426358785
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2325: 666421158376562688
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2326: 666418789513326592
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2329: 666396247373291520
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2332: 666353288456101888
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2333: 666345417576210432
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2334: 666337882303524864
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2335: 666293911632134144
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2336: 666287406224695296
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2339: 666104133288665088
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2343: 666082916733198337
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2344: 666073100786774016
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2345: 666071193221509120
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2346: 666063827256086533
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2347: 666058600524156928
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2348: 666057090499244032
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2349: 666055525042405380
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2350: 666051853826850816
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2351: 666050758794694657
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2352: 666049248165822465
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2353: 666044226329800704
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2354: 666033412701032449
Success
2355: 666029285002620928
Success
2356: 666020888022790149
Success
2022.001613539
{888202515573088257: TweepError([{'code': 144, 'message': 'No status found with that ID.'}]), 87

```

```

In [9]: temp = []
import json

with open('tweet_json.txt', encoding='utf-8') as js_file:
    for i in js_file:
        data = json.loads(i)
        tweet_id = data['id']
        tweet = data['full_text']
        url1 = tweet[tweet.find('https'):]
        favorite_count = data['favorite_count']
        retweet_count = data['retweet_count']
        retweet_status = data['retweet_status'] = data.get('retweet_status', 'Original tweet')
        if retweet_status == 'Original tweet':
            url = url1
        else:
            retweeted_status = 'A retweet'
            url = 'A retweet'

        temp.append({'tweet_id': tweet_id, 'favorite_count': favorite_count, 'retweet_status': retweet_status,
                    'url': url, 'retweet_count': retweet_count})

# create a new DataFrame
df_json= pd.DataFrame(temp, columns = ['tweet_id', 'favorite_count', 'retweet_count', 'retweet_status', 'url'])

```

```

df_json.head()

df_json.to_csv('tweet_json.txt', index=False)

In [10]: df_json = pd.read_csv('tweet_json.txt')

In [15]: df_json.to_csv('tweet_json.csv')

In [12]: df_json.head()

Out[12]:
      tweet_id  favorite_count  retweet_count  retweet_status \
0  892420643555336193         34189          7092  Original tweet
1  892177421306343426         29642          5345  Original tweet
2  891815181378084864         22322          3517  Original tweet
3  891689557279858688         37358          7295  Original tweet
4  891327558926688256         35706          7833  Original tweet

      url
0  https://t.co/MgUWQ76dJU
1  https://t.co/OXxu71qeIV
2  https://t.co/wUnZnhtVJB
3  https://t.co/tD36da7qLQ
4  https://t.co/AtUZn91f7f

```

2 Assessing Data

- Each DataFrame resulted from gathered data phase is being assessed visually

2.0.1 Exploring df

```

In [17]: #displaying information about df DataFrame
df.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

```

```

In [18]: #Check how many nulls is there in df
         df.isna().sum()

```

```

Out[18]: 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 [19]: #check for duplicates
         df.duplicated().sum()

```

```

Out[19]: 0

```

```

In [20]: #diplays the descriptve statistics
         df.describe()

```

```

Out[20]:
         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 [23]: #how many unqiue values in df?
df.nunique()
```

```
Out[23]: tweet_id          2356
in_reply_to_status_id      77
in_reply_to_user_id        31
timestamp                  2356
source                      4
text                       2356
retweeted_status_id        181
retweeted_status_user_id    25
retweeted_status_timestamp  181
expanded_urls              2218
rating_numerator            40
rating_denominator          18
name                        957
doggo                       2
floofer                     2
pupper                     2
puppo                       2
dtype: int64
```

```
In [25]: df['rating_numerator'].value_counts()
```

```
Out[25]: 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

```
In [24]: df['rating_denominator'].value_counts()
```

```
Out[24]: 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

```

2.0.2 Exploring image-prediction DataFrame

```
In [39]: df_img.shape
```

```
Out[39]: (2075, 12)
```

```
In [40]: df_img.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

```

```
In [41]: df_img.isna().sum()
```

```

Out[41]: 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 [42]: df_img.duplicated().sum()
```

```
Out[42]: 0
```

```
In [43]: df_img.nunique()
```

```

Out[43]: tweet_id      2075
         jpg_url       2009
         img_num        4
         p1           378
         p1_conf      2006
         p1_dog        2
         p2           405
         p2_conf      2004
         p2_dog        2
         p3           408
         p3_conf      2006
         p3_dog        2
         dtype: int64

```

2.0.3 Exploring Tweet-Json DataFrame

```
In [44]: df_json.shape
```

```
Out[44]: (2327, 5)
```

```
In [45]: df_json.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2327 entries, 0 to 2326
Data columns (total 5 columns):
#   Column          Non-Null Count  Dtype
---  -
0   tweet_id        2327 non-null  int64
1   favorite_count  2327 non-null  int64
2   retweet_count   2327 non-null  int64
3   retweet_status  2327 non-null  object
4   url             2327 non-null  object
dtypes: int64(3), object(2)
memory usage: 91.0+ KB

```

```
In [46]: df_json.duplicated().sum()
```

```
Out[46]: 0
```

```
In [47]: df_json.isna().sum()
```

```
Out[47]: tweet_id      0
         favorite_count  0
         retweet_count   0
         retweet_status  0
         url            0
         dtype: int64
```

```
In [48]: df_json.nunique()
```

```
Out[48]: tweet_id      2327
         favorite_count  2002
         retweet_count   1651
         retweet_status    1
         url            2168
         dtype: int64
```

2.0.4 Quality issues

1. Remove columns that are not needed
2. Change tweet-id from int to string
3. Change Timestamp into a datetime format
4. Delete rewteets
5. Change Name into a string type
6. Drop columns with missing values
7. Feature enginnering: extracting rating column from (rating_numerator, rating_denominator)

2.0.5 Tidiness issues

1. Doggo, floofer, pupper and puppo should be combined under a variable named Dog Type
2. Merge the three dataframes into one

2.1 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).

Create a copy of all datasets for cleaning phase

```
In [57]: tweets = df.copy()
        img = df_img.copy()
        json = df_json.copy()
```

2.1.1 Merge all datasets together using Concat function

```
In [61]: dfs = [tweets, img, json]
        df2= pd.concat(dfs, join='outer', axis=1)
```

```
In [62]: df2.head()
```

```
Out[62]:
```

	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	

	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	

	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...	

	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	

	retweeted_status_user_id	retweeted_status_timestamp	\
0	NaN	NaN	
1	NaN	NaN	
2	NaN	NaN	
3	NaN	NaN	
4	NaN	NaN	

	expanded_urls	...	p2_conf	p2_dog	\
--	---------------	-----	---------	--------	---

```

0 https://twitter.com/dog_rates/status/892420643... 0.156665 True
1 https://twitter.com/dog_rates/status/892177421... 0.074192 True
2 https://twitter.com/dog_rates/status/891815181... 0.138584 True
3 https://twitter.com/dog_rates/status/891689557... 0.360687 True
4 https://twitter.com/dog_rates/status/891327558... 0.243682 True

```

	p3	p3_conf	p3_dog	tweet_id	favorite_count	\
0	Shetland_sheepdog	0.061428	True	8.924206e+17	34189.0	
1	Rhodesian_ridgeback	0.072010	True	8.921774e+17	29642.0	
2	bloodhound	0.116197	True	8.918152e+17	22322.0	
3	miniature_pinscher	0.222752	True	8.916896e+17	37358.0	
4	Doberman	0.154629	True	8.913276e+17	35706.0	

	retweet_count	retweet_status	url
0	7092.0	Original tweet	https://t.co/MgUWQ76dJU
1	5345.0	Original tweet	https://t.co/0Xxu71qeIV
2	3517.0	Original tweet	https://t.co/wUnZnhtVJB
3	7295.0	Original tweet	https://t.co/tD36da7qLQ
4	7833.0	Original tweet	https://t.co/AtUZn91f7f

```
[5 rows x 34 columns]
```

```
In [63]: df2.shape
```

```
Out[63]: (2356, 34)
```

```
In [66]: df2.columns
```

```
Out[66]: 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',
               'tweet_id', 'jpg_url', 'img_num', 'p1', 'p1_conf', 'p1_dog', 'p2',
               'p2_conf', 'p2_dog', 'p3', 'p3_conf', 'p3_dog', 'tweet_id',
               'favorite_count', 'retweet_count', 'retweet_status', 'url'],
              dtype='object')
```

```
In [67]: df.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

```

2.1.2 Drop unwanted columns and columns containing missing values

```
In [68]: df2.drop(['in_reply_to_status_id', 'in_reply_to_user_id', 'retweeted_status_id', 'retweet
```

```
In [74]: df2.drop(['retweet_status', 'url', 'source'], axis=1, inplace= True)
```

```
In [75]: df2.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2356 entries, 0 to 2355
Data columns (total 26 columns):
#   Column                Non-Null Count  Dtype
---  -
0   tweet_id              2356 non-null   int64
1   timestamp             2356 non-null   object
2   text                  2356 non-null   object
3   expanded_urls         2297 non-null   object
4   rating_numerator      2356 non-null   int64
5   rating_denominator    2356 non-null   int64
6   name                  2356 non-null   object
7   doggo                 2356 non-null   object
8   floofer               2356 non-null   object
9   pupper                2356 non-null   object
10  puppo                 2356 non-null   object
11  tweet_id              2075 non-null   float64
12  jpg_url                2075 non-null   object
13  img_num                2075 non-null   float64
14  p1                     2075 non-null   object
15  p1_conf                2075 non-null   float64
16  p1_dog                 2075 non-null   object
17  p2                     2075 non-null   object
18  p2_conf                2075 non-null   float64
19  p2_dog                 2075 non-null   object

```



```

20 p3                2075 non-null object
21 p3_conf           2075 non-null float64
22 p3_dog            2075 non-null object
23 tweet_id          2327 non-null float64
24 favorite_count    2327 non-null float64
25 retweet_count     2327 non-null float64
dtypes: float64(8), int64(3), object(15)
memory usage: 478.7+ KB

```

2.1.3 doggo, floofer, pupper, puppo these 4 variables should be combined into one categorical variable Dog Type

```
In [80]: df2['dog_type'] = df2['text'].str.extract('(doggo|floofer|pupper|puppo)')
```

```
In [82]: df2.dog_type.value_counts()
```

```

Out[82]: pupper      265
         doggo       93
         puppo       37
         floofer      4
         Name: dog_type, dtype: int64

```

```
In [84]: df2.drop(['doggo', 'pupper', 'puppo', 'floofer'], axis=1, inplace = True)
```

```
In [85]: df2.info()
```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2356 entries, 0 to 2355
Data columns (total 23 columns):
#   Column                Non-Null Count  Dtype
---  -
0   tweet_id              2356 non-null  int64
1   timestamp             2356 non-null  object
2   text                  2356 non-null  object
3   expanded_urls         2297 non-null  object
4   rating_numerator      2356 non-null  int64
5   rating_denominator    2356 non-null  int64
6   name                  2356 non-null  object
7   tweet_id              2075 non-null  float64
8   jpg_url               2075 non-null  object
9   img_num               2075 non-null  float64
10  p1                    2075 non-null  object
11  p1_conf               2075 non-null  float64
12  p1_dog                2075 non-null  object
13  p2                    2075 non-null  object
14  p2_conf               2075 non-null  float64
15  p2_dog                2075 non-null  object
16  p3                    2075 non-null  object

```

```

17  p3_conf          2075 non-null   float64
18  p3_dog           2075 non-null   object
19  tweet_id         2327 non-null   float64
20  favorite_count   2327 non-null   float64
21  retweet_count    2327 non-null   float64
22  dog_type         399 non-null    object
dtypes: float64(8), int64(3), object(12)
memory usage: 423.5+ KB

```

```
In [86]: df2.sample(20)
```

```

Out[86]:
      tweet_id      timestamp \
709  785170936622350336  2016-10-09 17:31:53 +0000
637  793286476301799424  2016-11-01 03:00:09 +0000
1221 714485234495041536  2016-03-28 16:12:09 +0000
19    888202515573088257  2017-07-21 01:02:36 +0000
661  791026214425268224  2016-10-25 21:18:40 +0000
56    881536004380872706  2017-07-02 15:32:16 +0000
417  822489057087389700  2017-01-20 17:00:46 +0000
1801  676957860086095872  2015-12-16 02:51:45 +0000
1907  674447403907457024  2015-12-09 04:36:06 +0000
912   757596066325864448  2016-07-25 15:19:12 +0000
1426  697881462549430272  2016-02-11 20:34:41 +0000
669   790227638568808452  2016-10-23 16:25:25 +0000
628   794926597468000259  2016-11-05 15:37:24 +0000
933   753655901052166144  2016-07-14 18:22:23 +0000
1526  690374419777196032  2016-01-22 03:24:22 +0000
2255  667773195014021121  2015-11-20 18:35:10 +0000
294   837482249356513284  2017-03-03 01:58:22 +0000
1323  706265994973601792  2016-03-05 23:51:49 +0000
1352  703774238772166656  2016-02-28 02:50:28 +0000
502   813081950185472002  2016-12-25 18:00:17 +0000

      text \
709  This is Hero. He was enjoying the car ride unt...
637  This is Moreton. He's the Good Boy Who Lived. ...
1221 This is Blitz. He screams. 10/10 (vid by @yeaa...
19   RT @dog_rates: This is Canela. She attempted s...
661  RT @dog_rates: This is Alfie. He's touching a ...
56   Here is a pupper approaching maximum borkdrive...
417  This is Paisley. She really wanted to be presi...
1801 10/10 I'd follow this dog into battle no quest...
1907 This pupper just wants a belly rub. This puppe...
912  Here's another picture without a dog in it. Id...
1426 This is Carter. He wakes up in the morning and...
669  RT @dog_rates: This is Leela. She's a Fetty Wo...
628  This is Mack. He's rather h*ckin sleepy. Excep...

```

933 "The dogtor is in hahahaha no but seriously I'...
 1526 This is Phred. He's an Albanian Flepperkush. T...
 2255 This is a rare Hungarian Pinot named Jessiga. ...
 294 This is Waffles. He's a ship captain in real l...
 1323 This is Kara. She's been trying to solve that ...
 1352 "YOU CAN'T HANDLE THE TRUTH" both 10/10 https:...
 502 This is Baron. He's officially festive as h*ck...

	expanded_urls	rating_numerator \
709	https://twitter.com/dog_rates/status/785170936...	11
637	https://twitter.com/dog_rates/status/793286476...	13
1221	https://vine.co/v/iDrOvVqq0A6	10
19	https://twitter.com/dog_rates/status/887473957...	13
661	https://twitter.com/dog_rates/status/763837565...	11
56	https://twitter.com/dog_rates/status/881536004...	14
417	https://twitter.com/dog_rates/status/822489057...	13
1801	https://twitter.com/dog_rates/status/676957860...	10
1907	https://twitter.com/dog_rates/status/674447403...	10
912	https://twitter.com/dog_rates/status/757596066...	4
1426	https://twitter.com/dog_rates/status/697881462...	10
669	https://twitter.com/dog_rates/status/762699858...	11
628	https://twitter.com/dog_rates/status/794926597...	12
933	https://twitter.com/dog_rates/status/753655901...	10
1526	https://twitter.com/dog_rates/status/690374419...	11
2255	https://twitter.com/dog_rates/status/667773195...	8
294	https://twitter.com/dog_rates/status/837482249...	13
1323	https://twitter.com/dog_rates/status/706265994...	11
1352	https://twitter.com/dog_rates/status/703774238...	10
502	https://twitter.com/dog_rates/status/813081950...	11

	rating_denominator	name	tweet_id \
709	10	Hero	6.852688e+17
637	10	Moreton	6.812615e+17
1221	10	Blitz	7.442348e+17
19	10	Canela	6.662731e+17
661	10	Alfie	6.824295e+17
56	10	a	6.670655e+17
417	10	Paisley	6.740249e+17
1801	10	None	8.319398e+17
1907	10	None	8.525534e+17
912	10	None	7.008476e+17
1426	10	Carter	7.725816e+17
669	10	Leela	6.830789e+17
628	10	Mack	6.808896e+17
933	10	None	7.033564e+17
1526	10	Phred	7.887659e+17
2255	10	a	NaN
294	10	Waffles	6.713559e+17

1323	10	Kara	7.566518e+17
1352	10	None	7.599238e+17
502	10	Baron	6.758707e+17

	jpg_url	img_num	...	\
709	https://pbs.twimg.com/media/CYKQSOxUQAE0ptC.jpg	1.0	...	
637	https://pbs.twimg.com/media/CXRTw_5WMAAUDVp.jpg	1.0	...	
1221	https://pbs.twimg.com/ext_tw_video_thumb/74423...	1.0	...	
19	https://pbs.twimg.com/media/CT8T1mtUwAA3aqm.jpg	1.0	...	
661	https://pbs.twimg.com/media/CXh5_dDWQAIBU-J.jpg	1.0	...	
56	https://pbs.twimg.com/media/CUHkkJpXIAA2w3n.jpg	1.0	...	
417	https://pbs.twimg.com/media/CVqeEKLW4AA1wXH.jpg	1.0	...	
1801	https://pbs.twimg.com/media/C4ukOEWWQAAaZm1.jpg	1.0	...	
1907	https://pbs.twimg.com/media/C9Tg1bPW0AkAMDI.jpg	1.0	...	
912	https://pbs.twimg.com/media/CbnpI_1XIAAiRAz.jpg	1.0	...	
1426	https://pbs.twimg.com/media/CrjCOJAWAAAjz6n.jpg	3.0	...	
669	https://pbs.twimg.com/media/CXrIntsUsAEkv0d.jpg	1.0	...	
628	https://pbs.twimg.com/media/CXMBhXfWEAA4mMI.jpg	1.0	...	
933	https://pbs.twimg.com/media/CcLS6QKUcAAUuPa.jpg	1.0	...	
1526	https://pbs.twimg.com/media/CvJCabcWgAIoUxW.jpg	1.0	...	
2255	NaN	NaN	...	
294	https://pbs.twimg.com/media/CVEilyCUwAETbJ-.jpg	1.0	...	
1323	https://pbs.twimg.com/media/CoAqWPTW8AAiJlZ.jpg	1.0	...	
1352	https://pbs.twimg.com/media/CovKqSYVIAAUbUW.jpg	1.0	...	
502	https://pbs.twimg.com/media/CWEs1b-WEAEhq82.jpg	1.0	...	

	p2	p2_conf	p2_dog	p3	p3_conf	\
709	Norwegian_elkhound	0.000547	True	bull_mastiff	0.000235	
637	miniature_poodle	0.095429	True	Maltese_dog	0.065738	
1221	ice_bear	0.044681	False	whippet	0.018442	
19	toy_terrier	0.111884	True	basenji	0.111152	
661	Italian_greyhound	0.314091	True	Mexican_hairless	0.037773	
56	doormat	0.103259	False	space_heater	0.042568	
417	Pekinese	0.339835	True	Persian_cat	0.006448	
1801	marmot	0.091234	False	grey_fox	0.090644	
1907	Brabancon_griffon	0.139028	True	Rottweiler	0.125940	
912	redbone	0.153005	True	whippet	0.135199	
1426	Border_collie	0.128352	True	Saint_Bernard	0.059476	
669	Eskimo_dog	0.094044	True	wallaby	0.085237	
628	collie	0.078331	True	Pomeranian	0.020407	
933	collie	0.097364	True	English_springer	0.003037	
1526	golden_retriever	0.272734	True	jigsaw_puzzle	0.041476	
2255	NaN	NaN	NaN	NaN	NaN	
294	toy_poodle	0.165585	True	Irish_terrier	0.056094	
1323	kelpie	0.282301	True	Cardigan	0.112601	
1352	seat_belt	0.109168	False	pug	0.102466	
502	Welsh_springer_spaniel	0.184193	True	beagle	0.182241	

	p3_dog	tweet_id	favorite_count	retweet_count	dog_type
709	True	7.819552e+17	10691.0	3174.0	NaN
637	True	7.917749e+17	43209.0	21018.0	NaN
1221	True	7.113067e+17	3086.0	686.0	NaN
19	True	8.880784e+17	19377.0	2932.0	NaN
661	True	7.887659e+17	26238.0	9786.0	NaN
56	False	8.812684e+17	20714.0	4531.0	pupper
417	False	8.204467e+17	0.0	2416.0	NaN
1801	False	6.762197e+17	70355.0	28003.0	NaN
1907	True	6.739569e+17	1776.0	853.0	pupper
912	True	7.530270e+17	3705.0	886.0	NaN
1426	True	6.954464e+17	4148.0	1682.0	NaN
669	False	7.877176e+17	9830.0	2623.0	NaN
628	True	7.931204e+17	12170.0	3729.0	NaN
933	True	7.511329e+17	4787.0	1199.0	NaN
1526	False	6.888982e+17	1953.0	721.0	NaN
2255	NaN	6.671921e+17	338.0	87.0	NaN
294	True	8.353091e+17	0.0	19419.0	NaN
1323	True	7.040548e+17	2733.0	850.0	NaN
1352	True	7.012147e+17	11426.0	4708.0	NaN
502	True	8.099208e+17	14971.0	3730.0	NaN

[20 rows x 23 columns]

2.1.4 Change data types of tweet_id, Name, and timestamp

```
In [88]: df2['tweet_id'] = df2['tweet_id'].astype(str)
```

```
In [89]: df2['timestamp'] = pd.to_datetime(df2['timestamp'], format = "%Y-%m-%d ")
```

```
In [90]: df2['name'] = df2['name'].astype(str)
```

2.1.5 Noticed some invalid dog names in name column

```
In [91]: df2['name'].value_counts()
```

```
Out[91]: None      745
a              55
Charlie        12
Cooper         11
Lucy           11
...
Dex            1
Ace            1
Tayzie         1
Grizzzie       1
Christoper     1
Name: name, Length: 957, dtype: int64
```

```
In [96]: df2['name'].sample(10)
```

```
Out[96]: 751      None
         1422     Lily
         1893     None
         408     Crawford
        2046    Alejandro
         131     None
         538     None
        2247     None
         168     None
         708      Doc
        Name: name, dtype: object
```

```
In [98]: df2['name'] = df2['name'].str.replace('^[a-z]+', 'None');
```

```
/var/folders/8g/xnwb819n62n3vzd_bphz159w0000gn/T/ipykernel_4215/3157652721.py:1: FutureWarning:
  df2['name'] = df2['name'].str.replace('^[a-z]+', 'None');
```

```
In [100]: df2.name.sample(20)
```

```
Out[100]: 1307    Finnegus
          801      None
          1755     Tug
          1182     Sadie
          330     Gidget
          978      Bo
          2324     None
          2145     None
          1236     Kane
          1663     None
          708      Doc
          198     Einstein
          873     Bruce
           63     Romeo
          1885     None
          1583     None
          590     Jeffrey
          170     None
          1303     Keurig
          1843     None
        Name: name, dtype: object
```

```
In [104]: df2.name.value_counts()
```

```
Out[104]: None      854
          Charlie    12
          Lucy      11
```

```

Cooper      11
Oliver      11
...
Devón       1
Gert        1
Dex         1
Ace         1
Christoper  1
Name: name, Length: 932, dtype: int64

```

2.1.6 Feature Engineering

```

In [105]: df2['rating_numerator'] = df2['rating_numerator'].astype(float)
          df2['rating_denominator'] = df2['rating_denominator'].astype(float)

```

```

In [106]: df2['rating'] = df2['rating_numerator']/df2['rating_denominator']

```

```

In [107]: df2.info()

```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2356 entries, 0 to 2355
Data columns (total 24 columns):
#   Column                Non-Null Count  Dtype
---  -
0   tweet_id              2356 non-null   object
1   timestamp              2356 non-null   datetime64[ns, UTC]
2   text                  2356 non-null   object
3   expanded_urls          2297 non-null   object
4   rating_numerator       2356 non-null   float64
5   rating_denominator     2356 non-null   float64
6   name                  2356 non-null   object
7   tweet_id              2356 non-null   object
8   jpg_url               2075 non-null   object
9   img_num               2075 non-null   float64
10  p1                    2075 non-null   object
11  p1_conf               2075 non-null   float64
12  p1_dog                2075 non-null   object
13  p2                    2075 non-null   object
14  p2_conf               2075 non-null   float64
15  p2_dog                2075 non-null   object
16  p3                    2075 non-null   object
17  p3_conf               2075 non-null   float64
18  p3_dog                2075 non-null   object
19  tweet_id              2356 non-null   object
20  favorite_count         2327 non-null   float64
21  retweet_count          2327 non-null   float64
22  dog_type               399 non-null    object
23  rating                 2356 non-null   float64
dtypes: datetime64[ns, UTC](1), float64(9), object(14)

```

memory usage: 441.9+ KB

```
In [111]: df2.rating.head()
```

```
Out[111]: 0    1.3  
         1    1.3  
         2    1.2  
         3    1.3  
         4    1.2  
         Name: rating, dtype: float64
```

3 Storing Data

```
In [212]: df2.to_csv("twitter_archive_master.csv")
```

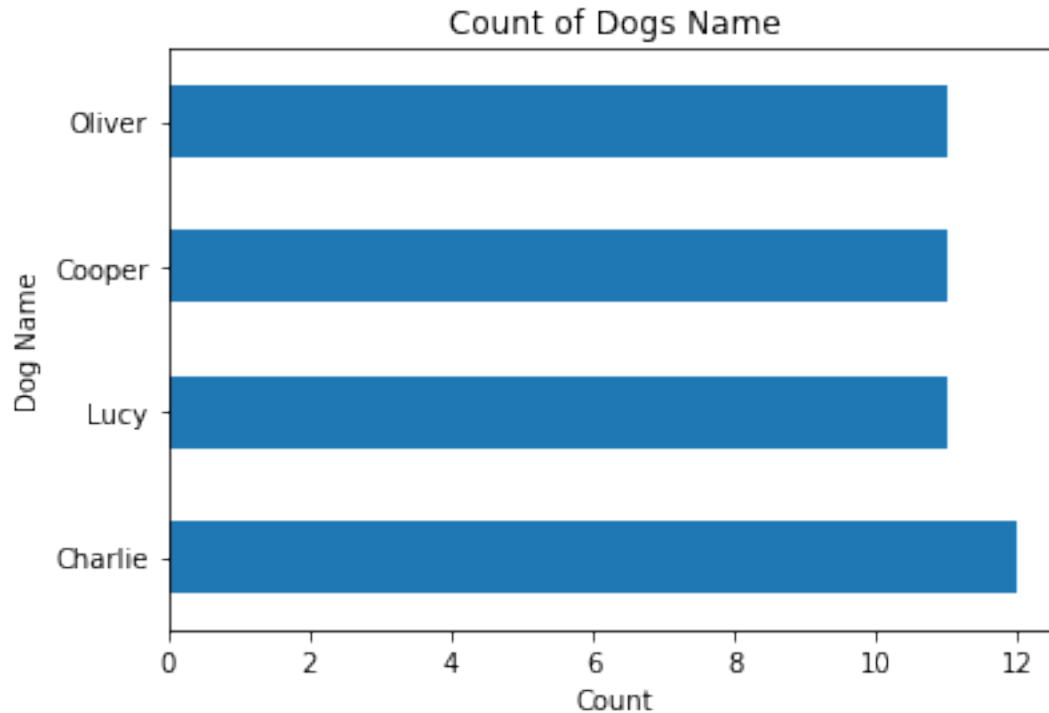
4 Visualization and Analyzing

This part provide an analysis to draw valuable conclusion

4.0.1 define

1. visualize the comparison of retweets count and favorite count
2. visualize the most popular dog name
3. visualize the total number of tweets over time
4. Visualize the count of dog types in the dataset

```
In [191]: import seaborn as sns  
         #Plotting most 5 popular dog names  
         df2['name'].value_counts()[1:5].plot(kind='barh')  
         plt.xlabel("Count")  
         plt.ylabel("Dog Name")  
         plt.title("Count of Dogs Name");
```

```
In [139]: df2.retweet_count.head()
```

```
Out[139]: 0    7092.0
          1    5345.0
          2    3517.0
          3    7295.0
          4    7833.0
          Name: retweet_count, dtype: float64
```

```
In [140]: df2.favorite_count.head()
```

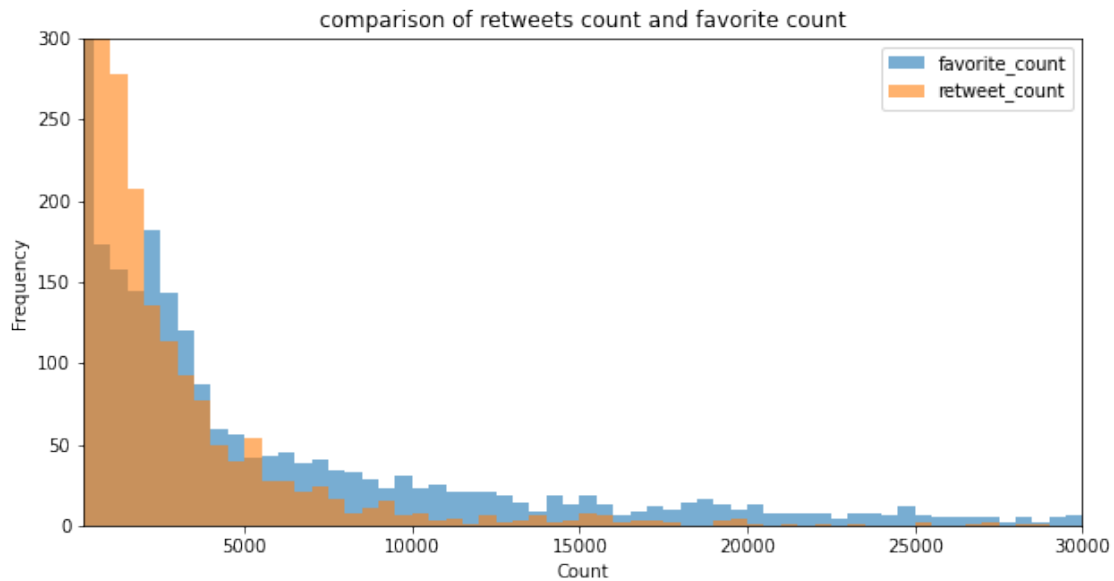
```
Out[140]: 0    34189.0
          1    29642.0
          2    22322.0
          3    37358.0
          4    35706.0
          Name: favorite_count, dtype: float64
```

```
In [192]: plt.figure(figsize = [10,5])
          binss = np.arange(df2['favorite_count'].min() , df2['favorite_count'].max() + 500, 500)
          binsss = np.arange(df2['retweet_count'].min() , df2['retweet_count'].max() + 500, 500)
          plt.hist(df2['favorite_count'], bins=binss, alpha=0.6, label='favorite_count')
          plt.hist(df2['retweet_count'], bins=binsss, alpha=0.6, label='retweet_count')
          plt.xlim(200,30000)
```

```

plt.ylim(0,300)
plt.legend(loc='upper right')
plt.title('comparison of retweets count and favorite count')
plt.xlabel("Count")
plt.ylabel("Frequency")
plt.show()

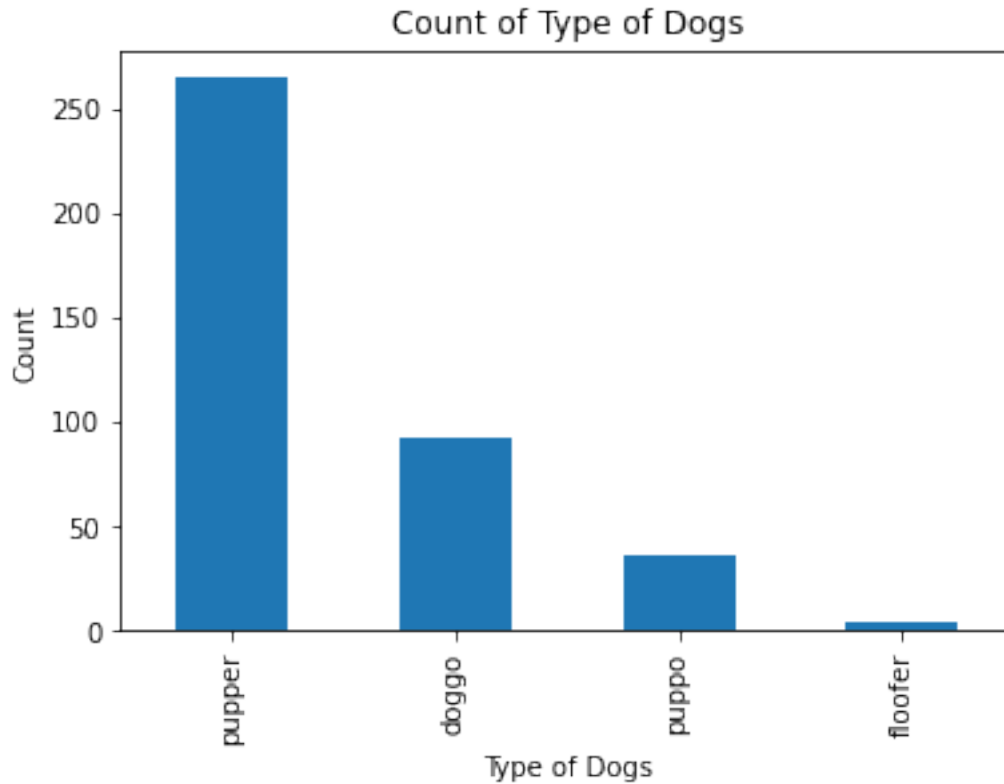
```



```

In [188]: #Plotting most 5 popular dog names
df2['dog_type'].value_counts()[:5].plot(kind='bar')
plt.xlabel("Type of Dogs")
plt.ylabel("Count")
plt.title("Count of Type of Dogs");

```

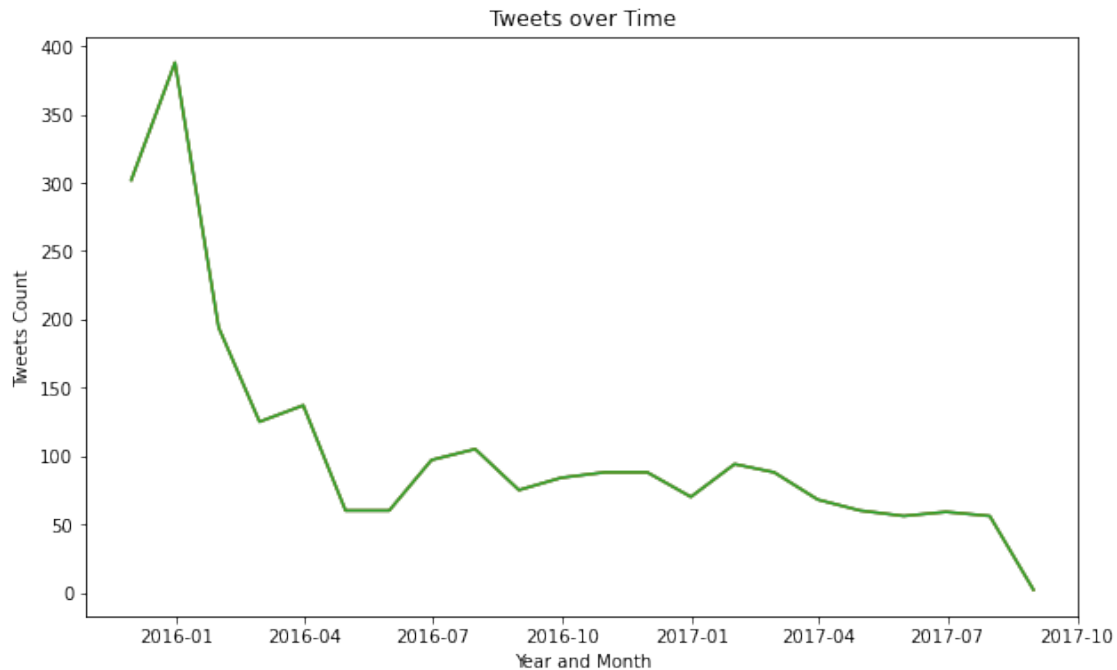


```
In [207]: mask= df2.groupby(pd.Grouper(key = 'timestamp', freq = "M")).count().reset_index()
mask = mask[['timestamp', 'tweet_id']]
mask.head()
```

```
Out[207]:
```

	timestamp	tweet_id	tweet_id	tweet_id
0	2015-11-30 00:00:00+00:00	302	302	302
1	2015-12-31 00:00:00+00:00	388	388	388
2	2016-01-31 00:00:00+00:00	194	194	194
3	2016-02-29 00:00:00+00:00	125	125	125
4	2016-03-31 00:00:00+00:00	137	137	137

```
In [211]: plt.figure(figsize=(10, 6));
plt.plot(mask.timestamp, mask.tweet_id);
plt.xlabel('Year and Month')
plt.ylabel('Tweets Count')
plt.title('Tweets over Time');
```



5 Conclusion

- found that the most popular dog names are Charlie, Lucy, Cooper and Oliver
- People tend to retweet more than liking tweets
- The most popular dog type is Pupper
- Over time tweets decreased sharply, with spikes in activity during the early of 2016(Jan), 2016(Mar), and generally decreasing from there.

6 Resources

- <https://seaborn.pydata.org/generated/seaborn.barplot.html>
- <https://stackoverflow.com/questions/6871201/plot-two-histograms-on-single-chart-with-matplotlib>
- <http://net-informations.com/ds/pd/comb.html>