wrangle_act

December 16, 2018

0.1 Introduction

Real-world data can be disorderly and unclean, making analyses difficult. In this project, I have collected tweet data and details for the twitter archive of the user @dog_rates, also known as WeRateDogs. WeRateDogs rates dogs with some humorous content about them. The ratings are out of 10, but these fun dogs all manage to score above 10. Since the twitter data consists primarily of tweets, additional data including favorite/retweet count data, and image predictions to identify dog breeds, were collected by querying Twitter's API and from alternate sources.

```
In [325]: import pandas as pd
          import tweepy
          import numpy as np
          import matplotlib.pyplot as plt
          import requests
          import os
          import json
```

0.2 Gathering

Sources: The data were collected from three sources. The basic tweet texts from 2015 to 2017, along with the information gleaned from it including the dog's name, stage and ratings were downloaded from the Udacity server as a csv file and saved as twitter-archive-enhanced.csv, and loaded into a dataframe using Pandas. Additional data were obtained by querying Twitter's API using the Tweepy library after creating a developer account, using the associated secure keys. The tweet_id indicated json files were downloaded and stored in a text file tweet_json.txt, and parsed to extract the favorite and retweet counts into a dataframe. Image_based breed predictions for the dogs, openly available from a url was downloaded as a tsv (image-predictions.tsv) and loaded into a third dtaframe.

```
In [326]: # Load the twitter archive downloaded from the Udacity server, into a dataframe
          df_archive = pd.read_csv('twitter-archive-enhanced.csv')
```

```
In [327]: # Download the image-predictions file from the url below
          url = "https://d17h27t6h515a5.cloudfront.net/topher/2017/August/599fd2ad_image-predi
          file_name = url.split('/')[-1]
          if not os.path.exists(file_name):
              response = requests.get(url).content
              with open (file_name, mode = 'wb') as file:
```

```
            file.write(response)
    # Load the tsv file into a dataframe
    df_impreds = pd.read_csv('image-predictions.tsv', sep = '\t')
```

In [328]:
```
    # Connect to the Twitter API using the Tweepy library (after setting up a developer
    consumer_key = ''
    consumer_secret = ''
    access_token = ''
    access_secret = ''

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

    api = tweepy.API(auth)
```

In [329]:
```
    # Collect additional information (retweet count, favorite count) from the Twitter API
    file_name = 'tweet_json.txt'
    if not os.path.exists(file_name):
        tweet_list = []
        # get tweet data for each tweet id
        for count, tweet_id in enumerate(df_archive.tweet_id):
            # Catch exceptions
            try:
                tweet = api.get_status(id = tweet_id, tweet_mode='extended')
                tweet_list.append({
                    "tweet_id": tweet_id,
                    "retweet_count": tweet.retweet_count,
                    "favorite_count": tweet.favorite_count,
                })
            except:
                print('{} Tweet id not found'.format(tweet_id))

     # save tweet details into a text file
        with open(file_name, 'w') as outfile:
            json.dump(tweet_list, outfile)
```

In [330]:
```
    # Create the dataframe from the text file
    with open('tweet_json.txt') as handle:
        json_file = json.load(handle)
    df_addl = pd.DataFrame(json_file)
```

0.3 Assessment

In [331]:
```
    # Preliminary analyses
    df_archive.head(100)
```

Out[331]:

	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
10	890006608113172480	NaN	NaN
11	889880896479866881	NaN	NaN
12	889665388333682689	NaN	NaN
13	889638837579907072	NaN	NaN
14	889531135344209921	NaN	NaN
15	889278841981685760	NaN	NaN
16	888917238123831296	NaN	NaN
17	888804989199671297	NaN	NaN
18	888554962724278272	NaN	NaN
19	888202515573088257	NaN	NaN
20	888078434458587136	NaN	NaN
21	887705289381826560	NaN	NaN
22	887517139158093824	NaN	NaN
23	887473957103951883	NaN	NaN
24	887343217045368832	NaN	NaN
25	887101392804085760	NaN	NaN
26	886983233522544640	NaN	NaN
27	886736880519319552	NaN	NaN
28	886680336477933568	NaN	NaN
29	886366144734445568	NaN	NaN
..	...	...	...
70	879008229531029506	NaN	NaN
71	878776093423087618	NaN	NaN
72	878604707211726852	NaN	NaN
73	878404777348136964	NaN	NaN
74	878316110768087041	NaN	NaN
75	878281511006478336	NaN	NaN
76	878057613040115712	NaN	NaN
77	877736472329191424	NaN	NaN
78	877611172832227328	NaN	NaN
79	877556246731214848	NaN	NaN
80	877316821321428993	NaN	NaN
81	877201837425926144	NaN	NaN
82	876838120628539392	NaN	NaN
83	876537666061221889	NaN	NaN
84	876484053909872640	NaN	NaN
85	876120275196170240	NaN	NaN
86	875747767867523072	NaN	NaN
87	875144289856114688	NaN	NaN
88	875097192612077568	NaN	NaN

```
89  875021211251597312                  NaN                  NaN
90  874680097055178752                  NaN                  NaN
91  874434818259525634                  NaN                  NaN
92  874296783580663808                  NaN                  NaN
93  874057562936811520                  NaN                  NaN
94  874012996292530176                  NaN                  NaN
95  873697596434513921                  NaN                  NaN
96  873580283840344065                  NaN                  NaN
97  873337748698140672                  NaN                  NaN
98  873213775632977920                  NaN                  NaN
99  872967104147763200                  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
10  2017-07-26 00:31:25 +0000
11  2017-07-25 16:11:53 +0000
12  2017-07-25 01:55:32 +0000
13  2017-07-25 00:10:02 +0000
14  2017-07-24 17:02:04 +0000
15  2017-07-24 00:19:32 +0000
16  2017-07-23 00:22:39 +0000
17  2017-07-22 16:56:37 +0000
18  2017-07-22 00:23:06 +0000
19  2017-07-21 01:02:36 +0000
20  2017-07-20 16:49:33 +0000
21  2017-07-19 16:06:48 +0000
22  2017-07-19 03:39:09 +0000
23  2017-07-19 00:47:34 +0000
24  2017-07-18 16:08:03 +0000
25  2017-07-18 00:07:08 +0000
26  2017-07-17 16:17:36 +0000
27  2017-07-16 23:58:41 +0000
28  2017-07-16 20:14:00 +0000
29  2017-07-15 23:25:31 +0000
..                        ...
70  2017-06-25 16:07:47 +0000
71  2017-06-25 00:45:22 +0000
72  2017-06-24 13:24:20 +0000
73  2017-06-24 00:09:53 +0000
```

```
74  2017-06-23 18:17:33 +0000
75  2017-06-23 16:00:04 +0000
76  2017-06-23 01:10:23 +0000
77  2017-06-22 03:54:17 +0000
78  2017-06-21 19:36:23 +0000
79  2017-06-21 15:58:08 +0000
80  2017-06-21 00:06:44 +0000
81  2017-06-20 16:29:50 +0000
82  2017-06-19 16:24:33 +0000
83  2017-06-18 20:30:39 +0000
84  2017-06-18 16:57:37 +0000
85  2017-06-17 16:52:05 +0000
86  2017-06-16 16:11:53 +0000
87  2017-06-15 00:13:52 +0000
88  2017-06-14 21:06:43 +0000
89  2017-06-14 16:04:48 +0000
90  2017-06-13 17:29:20 +0000
91  2017-06-13 01:14:41 +0000
92  2017-06-12 16:06:11 +0000
93  2017-06-12 00:15:36 +0000
94  2017-06-11 21:18:31 +0000
95  2017-06-11 00:25:14 +0000
96  2017-06-10 16:39:04 +0000
97  2017-06-10 00:35:19 +0000
98  2017-06-09 16:22:42 +0000
99  2017-06-09 00:02:31 +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...
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18  <a href="http://twitter.com/download/iphone" r...
19  <a href="http://twitter.com/download/iphone" r...
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20  <a href="http://twitter.com/download/iphone" r...
21  <a href="http://twitter.com/download/iphone" r...
22  <a href="http://twitter.com/download/iphone" r...
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29  <a href="http://twitter.com/download/iphone" r...
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72  <a href="http://twitter.com/download/iphone" r...
73  <a href="http://twitter.com/download/iphone" r...
74  <a href="http://twitter.com/download/iphone" r...
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76  <a href="http://twitter.com/download/iphone" r...
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87  <a href="http://twitter.com/download/iphone" r...
88  <a href="http://twitter.com/download/iphone" r...
89  <a href="http://twitter.com/download/iphone" r...
90  <a href="http://twitter.com/download/iphone" r...
91  <a href="http://twitter.com/download/iphone" r...
92  <a href="http://twitter.com/download/iphone" r...
93  <a href="http://twitter.com/download/iphone" r...
94  <a href="http://twitter.com/download/iphone" r...
95  <a href="http://twitter.com/download/iphone" r...
96  <a href="http://twitter.com/download/iphone" r...
97  <a href="http://twitter.com/download/iphone" r...
98  <a href="http://twitter.com/download/iphone" r...
99  <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
10	This is Koda. He is a South Australian decksha...	NaN
11	This is Bruno. He is a service shark. Only get...	NaN
12	Here's a puppo that seems to be on the fence a...	NaN
13	This is Ted. He does his best. Sometimes that'...	NaN
14	This is Stuart. He's sporting his favorite fan...	NaN
15	This is Oliver. You're witnessing one of his m...	NaN
16	This is Jim. He found a fren. Taught him how t...	NaN
17	This is Zeke. He has a new stick. Very proud o...	NaN
18	This is Ralphus. He's powering up. Attempting ...	NaN
19	RT @dog_rates: This is Canela. She attempted s...	8.874740e+17
20	This is Gerald. He was just told he didn't get...	NaN
21	This is Jeffrey. He has a monopoly on the pool...	NaN
22	I've yet to rate a Venezuelan Hover Wiener. Th...	NaN
23	This is Canela. She attempted some fancy porch...	NaN
24	You may not have known you needed to see this ...	NaN
25	This... is a Jubilant Antarctic House Bear. We...	NaN
26	This is Maya. She's very shy. Rarely leaves he...	NaN
27	This is Mingus. He's a wonderful father to his...	NaN
28	This is Derek. He's late for a dog meeting. 13...	NaN
29	This is Roscoe. Another pupper fallen victim t...	NaN
..	...	...
70	This is Beau. That is Beau's balloon. He takes...	NaN
71	This is Snoopy. He's a proud #PrideMonthPuppo...	NaN
72	Martha is stunning how h*ckin dare you. 13/10 ...	NaN
73	RT @dog_rates: Meet Shadow. In an attempt to r...	8.782815e+17
74	RT @dog_rates: Meet Terrance. He's being yelle...	6.690004e+17
75	Meet Shadow. In an attempt to reach maximum zo...	NaN
76	This is Emmy. She was adopted today. Massive r...	NaN
77	This is Aja. She was just told she's a good do...	NaN
78	RT @rachel2195: @dog_rates the boyfriend and h...	8.768508e+17
79	This is Penny. She's both pupset and fired pup...	NaN
80	Meet Dante. At first he wasn't a fan of his ne...	NaN
81	This is Nelly. He graduated with his dogtorate...	NaN
82	This is Ginger. She's having a ruff Monday. To...	NaN
83	I can say with the pupmost confidence that the...	NaN
84	This is Benedict. He wants to thank you for th...	NaN
85	Meet Venti, a seemingly caffeinated puppoccino...	NaN
86	This is Goose. He's a womanizer. Cheeky as h*c...	NaN
87	Meet Nugget and Hank. Nugget took Hank's bone...	NaN
88	You'll get your package when that precious man...	NaN
89	Guys please stop sending pictures without any ...	NaN
90	Meet Cash. He hath acquired a stick. A very go...	NaN
91	RT @dog_rates: This is Coco. At first I though...	8.663350e+17

```
92  This is Jed. He may be the fanciest pupper in ...                  NaN
93  I can't believe this keeps happening. This, is...                  NaN
94  This is Sebastian. He can't see all the colors...                  NaN
95  RT @dog_rates: This is Walter. He won't start ...         8.688804e+17
96  We usually don't rate Deck-bound Saskatoon Bla...                  NaN
97  RT @dog_rates: This is Sierra. She's one preci...         8.732138e+17
98  This is Sierra. She's one precious pupper. Abs...                  NaN
99  Here's a very large dog. He has a date later. ...                  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
10                       NaN                         NaN
11                       NaN                         NaN
12                       NaN                         NaN
13                       NaN                         NaN
14                       NaN                         NaN
15                       NaN                         NaN
16                       NaN                         NaN
17                       NaN                         NaN
18                       NaN                         NaN
19              4.196984e+09  2017-07-19 00:47:34 +0000
20                       NaN                         NaN
21                       NaN                         NaN
22                       NaN                         NaN
23                       NaN                         NaN
24                       NaN                         NaN
25                       NaN                         NaN
26                       NaN                         NaN
27                       NaN                         NaN
28                       NaN                         NaN
29                       NaN                         NaN
..                       ...                         ...
70                       NaN                         NaN
71                       NaN                         NaN
72                       NaN                         NaN
73              4.196984e+09  2017-06-23 16:00:04 +0000
74              4.196984e+09  2015-11-24 03:51:38 +0000
75                       NaN                         NaN
76                       NaN                         NaN
```

```
77                      NaN                          NaN
78             5.128045e+08  2017-06-19 17:14:49 +0000
79                      NaN                          NaN
80                      NaN                          NaN
81                      NaN                          NaN
82                      NaN                          NaN
83                      NaN                          NaN
84                      NaN                          NaN
85                      NaN                          NaN
86                      NaN                          NaN
87                      NaN                          NaN
88                      NaN                          NaN
89                      NaN                          NaN
90                      NaN                          NaN
91             4.196984e+09  2017-05-21 16:48:45 +0000
92                      NaN                          NaN
93                      NaN                          NaN
94                      NaN                          NaN
95             4.196984e+09  2017-05-28 17:23:24 +0000
96                      NaN                          NaN
97             4.196984e+09  2017-06-09 16:22:42 +0000
98                      NaN                          NaN
99                      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
10  https://twitter.com/dog_rates/status/890006608...                13
11  https://twitter.com/dog_rates/status/889880896...                13
12  https://twitter.com/dog_rates/status/889665388...                13
13  https://twitter.com/dog_rates/status/889638837...                12
14  https://twitter.com/dog_rates/status/889531135...                13
15  https://twitter.com/dog_rates/status/889278841...                13
16  https://twitter.com/dog_rates/status/888917238...                12
17  https://twitter.com/dog_rates/status/888804989...                13
18  https://twitter.com/dog_rates/status/888554962...                13
19  https://twitter.com/dog_rates/status/887473957...                13
20  https://twitter.com/dog_rates/status/888078434...                12
21  https://twitter.com/dog_rates/status/887705289...                13
22  https://twitter.com/dog_rates/status/887517139...                14
```

```
23  https://twitter.com/dog_rates/status/887473957...                13
24  https://twitter.com/dog_rates/status/887343217...                13
25  https://twitter.com/dog_rates/status/887101392...                12
26  https://twitter.com/dog_rates/status/886983233...                13
27  https://www.gofundme.com/mingusneedsus,https:/...                13
28  https://twitter.com/dog_rates/status/886680336...                13
29  https://twitter.com/dog_rates/status/886366144...                12
..                                                 ...               ...
70  https://twitter.com/dog_rates/status/879008229...                13
71  https://twitter.com/dog_rates/status/878776093...                13
72  https://twitter.com/bbcworld/status/8785998685...                13
73  https://www.gofundme.com/3yd6y1c,https://twitt...                13
74  https://twitter.com/dog_rates/status/669000397...                11
75  https://www.gofundme.com/3yd6y1c,https://twitt...                13
76  https://twitter.com/dog_rates/status/878057613...                14
77  https://twitter.com/dog_rates/status/877736472...                13
78  https://twitter.com/rachel2195/status/87685077...                14
79  https://twitter.com/dog_rates/status/877556246...                12
80  https://twitter.com/dog_rates/status/877316821...                13
81  https://twitter.com/dog_rates/status/877201837...                12
82  https://twitter.com/dog_rates/status/876838120...                12
83  https://twitter.com/mpstowerham/status/8761629...                14
84  https://twitter.com/dog_rates/status/876484053...                13
85  https://twitter.com/dog_rates/status/876120275...                13
86  https://twitter.com/dog_rates/status/875747767...                13
87  https://twitter.com/dog_rates/status/875144289...                13
88  https://twitter.com/drboondoc/status/874413398...                13
89  https://twitter.com/dog_rates/status/875021211...                12
90  https://twitter.com/dog_rates/status/874680097...                12
91  https://twitter.com/dog_rates/status/866334964...                12
92  https://twitter.com/dog_rates/status/874296783...                13
93  https://twitter.com/dog_rates/status/874057562...                12
94  https://twitter.com/dog_rates/status/874012996...                13
95  https://twitter.com/dog_rates/status/868880397...                14
96  https://twitter.com/dog_rates/status/873580283...                13
97  https://www.gofundme.com/help-my-baby-sierra-g...                12
98  https://www.gofundme.com/help-my-baby-sierra-g...                12
99  https://twitter.com/dog_rates/status/872967104...                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
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
10	10	Koda	None	None	None	None
11	10	Bruno	None	None	None	None
12	10	None	None	None	None	puppo
13	10	Ted	None	None	None	None
14	10	Stuart	None	None	None	puppo
15	10	Oliver	None	None	None	None
16	10	Jim	None	None	None	None
17	10	Zeke	None	None	None	None
18	10	Ralphus	None	None	None	None
19	10	Canela	None	None	None	None
20	10	Gerald	None	None	None	None
21	10	Jeffrey	None	None	None	None
22	10	such	None	None	None	None
23	10	Canela	None	None	None	None
24	10	None	None	None	None	None
25	10	None	None	None	None	None
26	10	Maya	None	None	None	None
27	10	Mingus	None	None	None	None
28	10	Derek	None	None	None	None
29	10	Roscoe	None	None	pupper	None
..	...	...	...	...	...	...
70	10	Beau	None	None	None	None
71	10	Snoopy	None	None	None	puppo
72	10	None	None	None	None	None
73	10	Shadow	None	None	None	None
74	10	Terrance	None	None	None	None
75	10	Shadow	None	None	None	None
76	10	Emmy	None	None	None	None
77	10	Aja	None	None	None	None
78	10	None	None	None	pupper	None
79	10	Penny	None	None	None	None
80	10	Dante	None	None	None	None
81	10	Nelly	None	None	None	None
82	10	Ginger	None	None	pupper	None
83	10	None	None	None	None	None
84	10	Benedict	None	None	None	None
85	10	Venti	None	None	None	None
86	10	Goose	None	None	None	None
87	10	Nugget	None	None	None	None
88	10	None	None	None	None	None
89	10	None	None	None	None	None
90	10	Cash	None	None	None	None
91	10	Coco	None	None	None	None
92	10	Jed	None	None	pupper	None
93	10	None	None	None	None	None
94	10	Sebastian	None	None	None	puppo

```
95                  10     Walter   None    None    None   None
96                  10       None   None    None    None   None
97                  10     Sierra   None    None  pupper   None
98                  10     Sierra   None    None  pupper   None
99                  10       None  doggo    None    None   None

[100 rows x 17 columns]
```

```
In [332]: df_archive.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
```

```
In [333]: df_archive.doggo.nunique(), df_archive.floofer.nunique(), df_archive.pupper.nunique()
```

```
Out[333]: (2, 2, 2, 2)
```

```
In [334]: df_archive.expanded_urls[900]
```

```
Out[334]: 'https://twitter.com/dog_rates/status/758740312047005698/photo/1'
```

```
In [335]: df_archive.nunique()
```

```
Out[335]: 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 [336]: df_impreds.head()
```

Out[336]:

	tweet_id	jpg_url	img_num	p1	p1_conf	p1_dog	p2	p2_conf	p2_dog	p3	p3_conf	p3_dog
0	666020888022790149	https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg	1	Welsh_springer_spaniel	0.465074	True	collie	0.156665	True	Shetland_sheepdog	0.061428	True
1	666029285002620928	https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg	1	redbone	0.506826	True	miniature_pinscher	0.074192	True	Rhodesian_ridgeback	0.072010	True
2	666033412701032449	https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg	1	German_shepherd	0.596461	True	malinois	0.138584	True	bloodhound	0.116197	True
3	666044226329800704	https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg	1	Rhodesian_ridgeback	0.408143	True	redbone	0.360687	True	miniature_pinscher	0.222752	True
4	666049248165822465	https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg	1	miniature_pinscher	0.560311	True	Rottweiler	0.243682	True	Doberman	0.154629	True

```
In [337]: df_impreds.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 [338]: df_addl.head()
```

```
Out[338]:    favorite_count  retweet_count            tweet_id
          0           38149           8345  892420643555336193
          1           32717           6170  892177421306343426
          2           24637           4082  891815181378084864
          3           41491           8481  891689557279858688
          4           39658           9184  891327558926688256
```

```
In [339]: df_addl.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 887 entries, 0 to 886
Data columns (total 3 columns):
favorite_count    887 non-null int64
retweet_count     887 non-null int64
tweet_id          887 non-null int64
dtypes: int64(3)
memory usage: 20.9 KB
```

```
In [340]: # Are any rows duplicated?
          df_archive.duplicated().sum()
```

```
Out[340]: 0
```

```
In [341]: df_impreds.duplicated().sum()
```

```
Out[341]: 0
```

```
In [342]: df_addl.duplicated().sum()
```

```
Out[342]: 0
```

0.4 Cleaning

Upon assessment using the Pandas and Numpy fucntions, the following data tidiness and quality issues were identified. The prospective solutions are noted alongside.

Tidiness:

1. Type of dogs split into 4 columns in df_archive; melt to one
2. jpg_url and img_num columns in df_impreds are not necessary for the planned analyses; remove these columns
3. df_addl should be part of df_archive; merge to the archive
4. Add df_impreds also to the df_archive for easier analyses

Quality:

1. in_reply_to_status_id and in_reply_to_user_id columns are reply tweets; remove rows
2. retweeted_status_id, retweeted_user_id and retweeted_time_stamps columns represent retweets; remove rows
3. Timestamp as string; change to datetime format
4. Source column has 4 unique values which represent the actual sources, lost in the html format; Pick out the source from the html link
5. expanded_urls column doesn't make sense; remove
6. Rating denominator should be 10 for all; change to 10
7. Rating numerator has low and high values; begin at 11, cap at 15
8. Datatype of tweet_id is int; change to string
9. Dog_types has some mixed types of dogs; consolidate to 'mixed_types'

```
In [343]: # Copy the dataframes
          df_archive_clean = df_archive.copy()
          df_impreds_clean = df_impreds.copy()
          df_addl_clean = df_addl.copy()
```

0.4.1 Tidiness

Define: Type of dogs split into 4 columns in df_archive; melt to one

```
In [344]: # Code
          df_archive_clean.replace('None', '', inplace = True)
          df_archive_clean['dog_type'] = df_archive_clean[['doggo', 'floofer', 'pupper', 'puppo
          df_archive_clean = df_archive_clean.drop(['doggo', 'floofer', 'pupper', 'puppo'], ax
          df_archive_clean.replace('', np.nan, inplace = True)
```

```
In [345]: # Test
          df_archive_clean.dog_type.value_counts()
```

```
Out[345]: pupper          245
          doggo            83
          puppo            29
          doggopupper      12
          floofer           9
          doggofloofer      1
          doggopuppo        1
          Name: dog_type, dtype: int64
```

Define: jpg_url and img_num in df_impreds are not necessary for the planned analyses; remove these columns

```
In [346]: # Code
          df_impreds_clean = df_impreds_clean.drop(['jpg_url', 'img_num'], axis = 1)
```

```
In [347]: # Test
          df_impreds_clean.head(1)
```

Out[347]:

	tweet_id	p1	p1_conf	p1_dog	p2	p2_conf	p2_dog	p3	p3_conf	p3_dog
0	666020888022790149	Welsh_springer_spaniel	0.465074	True	collie	0.156665	True	Shetland_sheepdog	0.061428	True

Define: df_addl should be part of archive; merge to the archive

```
In [348]: # Code: Merge the additional data (favorite and retweet counts) to the archive dataf
          df_archive_clean = df_archive_clean.merge(df_addl_clean, on = 'tweet_id', how = 'left
```

```
In [349]: # Test
          df_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2356 entries, 0 to 2355
Data columns (total 16 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                        1611 non-null object
dog_type                    380 non-null object
favorite_count              887 non-null float64
retweet_count               887 non-null float64
dtypes: float64(6), int64(3), object(7)
memory usage: 312.9+ KB
```

```
In [350]: # Test that the null and real values in the favorite_count add up to the total numbe
          df_archive_clean['favorite_count'].isnull().sum() + df_addl.shape[0]
```

```
Out[350]: 2356
```

In [351]:
```
# Test
df_archive_clean.head(100)
```

Out[351]:

	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	
10	890006608113172480	NaN	NaN	
11	889880896479866881	NaN	NaN	
12	889665388333682689	NaN	NaN	
13	889638837579907072	NaN	NaN	
14	889531135344209921	NaN	NaN	
15	889278841981685760	NaN	NaN	
16	888917238123831296	NaN	NaN	
17	888804989199671297	NaN	NaN	
18	888554962724278272	NaN	NaN	
19	888202515573088257	NaN	NaN	
20	888078434458587136	NaN	NaN	
21	887705289381826560	NaN	NaN	
22	887517139158093824	NaN	NaN	
23	887473957103951883	NaN	NaN	
24	887343217045368832	NaN	NaN	
25	887101392804085760	NaN	NaN	
26	886983233522544640	NaN	NaN	
27	886736880519319552	NaN	NaN	
28	886680336477933568	NaN	NaN	
29	886366144734445568	NaN	NaN	
..	...	...	...	
70	879008229531029506	NaN	NaN	
71	878776093423087618	NaN	NaN	
72	878604707211726852	NaN	NaN	
73	878404777348136964	NaN	NaN	
74	878316110768087041	NaN	NaN	
75	878281511006478336	NaN	NaN	
76	878057613040115712	NaN	NaN	
77	877736472329191424	NaN	NaN	
78	877611172832227328	NaN	NaN	
79	877556246731214848	NaN	NaN	
80	877316821321428993	NaN	NaN	
81	877201837425926144	NaN	NaN	
82	876838120628539392	NaN	NaN	

83	876537666061221889	NaN	NaN
84	876484053909872640	NaN	NaN
85	876120275196170240	NaN	NaN
86	875747767867523072	NaN	NaN
87	875144289856114688	NaN	NaN
88	875097192612077568	NaN	NaN
89	875021211251597312	NaN	NaN
90	874680097055178752	NaN	NaN
91	874434818259525634	NaN	NaN
92	874296783580663808	NaN	NaN
93	874057562936811520	NaN	NaN
94	874012996292530176	NaN	NaN
95	873697596434513921	NaN	NaN
96	873580283840344065	NaN	NaN
97	873337748698140672	NaN	NaN
98	873213775632977920	NaN	NaN
99	872967104147763200	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
10	2017-07-26 00:31:25 +0000
11	2017-07-25 16:11:53 +0000
12	2017-07-25 01:55:32 +0000
13	2017-07-25 00:10:02 +0000
14	2017-07-24 17:02:04 +0000
15	2017-07-24 00:19:32 +0000
16	2017-07-23 00:22:39 +0000
17	2017-07-22 16:56:37 +0000
18	2017-07-22 00:23:06 +0000
19	2017-07-21 01:02:36 +0000
20	2017-07-20 16:49:33 +0000
21	2017-07-19 16:06:48 +0000
22	2017-07-19 03:39:09 +0000
23	2017-07-19 00:47:34 +0000
24	2017-07-18 16:08:03 +0000
25	2017-07-18 00:07:08 +0000
26	2017-07-17 16:17:36 +0000
27	2017-07-16 23:58:41 +0000
28	2017-07-16 20:14:00 +0000

```
29  2017-07-15 23:25:31 +0000
..                        ...
70  2017-06-25 16:07:47 +0000
71  2017-06-25 00:45:22 +0000
72  2017-06-24 13:24:20 +0000
73  2017-06-24 00:09:53 +0000
74  2017-06-23 18:17:33 +0000
75  2017-06-23 16:00:04 +0000
76  2017-06-23 01:10:23 +0000
77  2017-06-22 03:54:17 +0000
78  2017-06-21 19:36:23 +0000
79  2017-06-21 15:58:08 +0000
80  2017-06-21 00:06:44 +0000
81  2017-06-20 16:29:50 +0000
82  2017-06-19 16:24:33 +0000
83  2017-06-18 20:30:39 +0000
84  2017-06-18 16:57:37 +0000
85  2017-06-17 16:52:05 +0000
86  2017-06-16 16:11:53 +0000
87  2017-06-15 00:13:52 +0000
88  2017-06-14 21:06:43 +0000
89  2017-06-14 16:04:48 +0000
90  2017-06-13 17:29:20 +0000
91  2017-06-13 01:14:41 +0000
92  2017-06-12 16:06:11 +0000
93  2017-06-12 00:15:36 +0000
94  2017-06-11 21:18:31 +0000
95  2017-06-11 00:25:14 +0000
96  2017-06-10 16:39:04 +0000
97  2017-06-10 00:35:19 +0000
98  2017-06-09 16:22:42 +0000
99  2017-06-09 00:02:31 +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...
10  <a href="http://twitter.com/download/iphone" r...
11  <a href="http://twitter.com/download/iphone" r...
12  <a href="http://twitter.com/download/iphone" r...
13  <a href="http://twitter.com/download/iphone" r...
```

```
14  <a href="http://twitter.com/download/iphone" r...
15  <a href="http://twitter.com/download/iphone" r...
16  <a href="http://twitter.com/download/iphone" r...
17  <a href="http://twitter.com/download/iphone" r...
18  <a href="http://twitter.com/download/iphone" r...
19  <a href="http://twitter.com/download/iphone" r...
20  <a href="http://twitter.com/download/iphone" r...
21  <a href="http://twitter.com/download/iphone" r...
22  <a href="http://twitter.com/download/iphone" r...
23  <a href="http://twitter.com/download/iphone" r...
24  <a href="http://twitter.com/download/iphone" r...
25  <a href="http://twitter.com/download/iphone" r...
26  <a href="http://twitter.com/download/iphone" r...
27  <a href="http://twitter.com/download/iphone" r...
28  <a href="http://twitter.com/download/iphone" r...
29  <a href="http://twitter.com/download/iphone" r...
..                                                 ...
70  <a href="http://twitter.com/download/iphone" r...
71  <a href="http://twitter.com/download/iphone" r...
72  <a href="http://twitter.com/download/iphone" r...
73  <a href="http://twitter.com/download/iphone" r...
74  <a href="http://twitter.com/download/iphone" r...
75  <a href="http://twitter.com/download/iphone" r...
76  <a href="http://twitter.com/download/iphone" r...
77  <a href="http://twitter.com/download/iphone" r...
78  <a href="http://twitter.com/download/iphone" r...
79  <a href="http://twitter.com/download/iphone" r...
80  <a href="http://twitter.com/download/iphone" r...
81  <a href="http://twitter.com/download/iphone" r...
82  <a href="http://twitter.com/download/iphone" r...
83  <a href="http://twitter.com/download/iphone" r...
84  <a href="http://twitter.com/download/iphone" r...
85  <a href="http://twitter.com/download/iphone" r...
86  <a href="http://twitter.com/download/iphone" r...
87  <a href="http://twitter.com/download/iphone" r...
88  <a href="http://twitter.com/download/iphone" r...
89  <a href="http://twitter.com/download/iphone" r...
90  <a href="http://twitter.com/download/iphone" r...
91  <a href="http://twitter.com/download/iphone" r...
92  <a href="http://twitter.com/download/iphone" r...
93  <a href="http://twitter.com/download/iphone" r...
94  <a href="http://twitter.com/download/iphone" r...
95  <a href="http://twitter.com/download/iphone" r...
96  <a href="http://twitter.com/download/iphone" r...
97  <a href="http://twitter.com/download/iphone" r...
98  <a href="http://twitter.com/download/iphone" r...
99  <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	
10	This is Koda. He is a South Australian decksha...	NaN	
11	This is Bruno. He is a service shark. Only get...	NaN	
12	Here's a puppo that seems to be on the fence a...	NaN	
13	This is Ted. He does his best. Sometimes that'...	NaN	
14	This is Stuart. He's sporting his favorite fan...	NaN	
15	This is Oliver. You're witnessing one of his m...	NaN	
16	This is Jim. He found a fren. Taught him how t...	NaN	
17	This is Zeke. He has a new stick. Very proud o...	NaN	
18	This is Ralphus. He's powering up. Attempting ...	NaN	
19	RT @dog_rates: This is Canela. She attempted s...	8.874740e+17	
20	This is Gerald. He was just told he didn't get...	NaN	
21	This is Jeffrey. He has a monopoly on the pool...	NaN	
22	I've yet to rate a Venezuelan Hover Wiener. Th...	NaN	
23	This is Canela. She attempted some fancy porch...	NaN	
24	You may not have known you needed to see this ...	NaN	
25	This... is a Jubilant Antarctic House Bear. We...	NaN	
26	This is Maya. She's very shy. Rarely leaves he...	NaN	
27	This is Mingus. He's a wonderful father to his...	NaN	
28	This is Derek. He's late for a dog meeting. 13...	NaN	
29	This is Roscoe. Another pupper fallen victim t...	NaN	
..	...	...	
70	This is Beau. That is Beau's balloon. He takes...	NaN	
71	This is Snoopy. He's a proud #PrideMonthPuppo...	NaN	
72	Martha is stunning how h*ckin dare you. 13/10 ...	NaN	
73	RT @dog_rates: Meet Shadow. In an attempt to r...	8.782815e+17	
74	RT @dog_rates: Meet Terrance. He's being yelle...	6.690004e+17	
75	Meet Shadow. In an attempt to reach maximum zo...	NaN	
76	This is Emmy. She was adopted today. Massive r...	NaN	
77	This is Aja. She was just told she's a good do...	NaN	
78	RT @rachel2195: @dog_rates the boyfriend and h...	8.768508e+17	
79	This is Penny. She's both pupset and fired pup...	NaN	
80	Meet Dante. At first he wasn't a fan of his ne...	NaN	
81	This is Nelly. He graduated with his dogtorate...	NaN	
82	This is Ginger. She's having a ruff Monday. To...	NaN	
83	I can say with the pupmost confidence that the...	NaN	
84	This is Benedict. He wants to thank you for th...	NaN	
85	Meet Venti, a seemingly caffeinated puppoccino...	NaN	

```
86  This is Goose. He's a womanizer. Cheeky as h*c...                  NaN
87  Meet Nugget and Hank. Nugget took Hank's bone...                   NaN
88  You'll get your package when that precious man...                  NaN
89  Guys please stop sending pictures without any ...                  NaN
90  Meet Cash. He hath acquired a stick. A very go...                  NaN
91  RT @dog_rates: This is Coco. At first I though...         8.663350e+17
92  This is Jed. He may be the fanciest pupper in ...                  NaN
93  I can't believe this keeps happening. This, is...                  NaN
94  This is Sebastian. He can't see all the colors...                  NaN
95  RT @dog_rates: This is Walter. He won't start ...         8.688804e+17
96  We usually don't rate Deck-bound Saskatoon Bla...                  NaN
97  RT @dog_rates: This is Sierra. She's one preci...         8.732138e+17
98  This is Sierra. She's one precious pupper. Abs...                  NaN
99  Here's a very large dog. He has a date later. ...                  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
10                       NaN                         NaN
11                       NaN                         NaN
12                       NaN                         NaN
13                       NaN                         NaN
14                       NaN                         NaN
15                       NaN                         NaN
16                       NaN                         NaN
17                       NaN                         NaN
18                       NaN                         NaN
19              4.196984e+09  2017-07-19 00:47:34 +0000
20                       NaN                         NaN
21                       NaN                         NaN
22                       NaN                         NaN
23                       NaN                         NaN
24                       NaN                         NaN
25                       NaN                         NaN
26                       NaN                         NaN
27                       NaN                         NaN
28                       NaN                         NaN
29                       NaN                         NaN
..                       ...                         ...
70                       NaN                         NaN
```

```
71                      NaN                         NaN
72                      NaN                         NaN
73             4.196984e+09  2017-06-23 16:00:04 +0000
74             4.196984e+09  2015-11-24 03:51:38 +0000
75                      NaN                         NaN
76                      NaN                         NaN
77                      NaN                         NaN
78             5.128045e+08  2017-06-19 17:14:49 +0000
79                      NaN                         NaN
80                      NaN                         NaN
81                      NaN                         NaN
82                      NaN                         NaN
83                      NaN                         NaN
84                      NaN                         NaN
85                      NaN                         NaN
86                      NaN                         NaN
87                      NaN                         NaN
88                      NaN                         NaN
89                      NaN                         NaN
90                      NaN                         NaN
91             4.196984e+09  2017-05-21 16:48:45 +0000
92                      NaN                         NaN
93                      NaN                         NaN
94                      NaN                         NaN
95             4.196984e+09  2017-05-28 17:23:24 +0000
96                      NaN                         NaN
97             4.196984e+09  2017-06-09 16:22:42 +0000
98                      NaN                         NaN
99                      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
10  https://twitter.com/dog_rates/status/890006608...                13
11  https://twitter.com/dog_rates/status/889880896...                13
12  https://twitter.com/dog_rates/status/889665388...                13
13  https://twitter.com/dog_rates/status/889638837...                12
14  https://twitter.com/dog_rates/status/889531135...                13
15  https://twitter.com/dog_rates/status/889278841...                13
16  https://twitter.com/dog_rates/status/888917238...                12
```

```
17  https://twitter.com/dog_rates/status/888804989...                13
18  https://twitter.com/dog_rates/status/888554962...                13
19  https://twitter.com/dog_rates/status/887473957...                13
20  https://twitter.com/dog_rates/status/888078434...                12
21  https://twitter.com/dog_rates/status/887705289...                13
22  https://twitter.com/dog_rates/status/887517139...                14
23  https://twitter.com/dog_rates/status/887473957...                13
24  https://twitter.com/dog_rates/status/887343217...                13
25  https://twitter.com/dog_rates/status/887101392...                12
26  https://twitter.com/dog_rates/status/886983233...                13
27  https://www.gofundme.com/mingusneedsus,https:/...                13
28  https://twitter.com/dog_rates/status/886680336...                13
29  https://twitter.com/dog_rates/status/886366144...                12
..                                                ...               ...
70  https://twitter.com/dog_rates/status/879008229...                13
71  https://twitter.com/dog_rates/status/878776093...                13
72  https://twitter.com/bbcworld/status/8785998685...                13
73  https://www.gofundme.com/3yd6y1c,https://twitt...                13
74  https://twitter.com/dog_rates/status/669000397...                11
75  https://www.gofundme.com/3yd6y1c,https://twitt...                13
76  https://twitter.com/dog_rates/status/878057613...                14
77  https://twitter.com/dog_rates/status/877736472...                13
78  https://twitter.com/rachel2195/status/87685077...                14
79  https://twitter.com/dog_rates/status/877556246...                12
80  https://twitter.com/dog_rates/status/877316821...                13
81  https://twitter.com/dog_rates/status/877201837...                12
82  https://twitter.com/dog_rates/status/876838120...                12
83  https://twitter.com/mpstowerham/status/8761629...                14
84  https://twitter.com/dog_rates/status/876484053...                13
85  https://twitter.com/dog_rates/status/876120275...                13
86  https://twitter.com/dog_rates/status/875747767...                13
87  https://twitter.com/dog_rates/status/875144289...                13
88  https://twitter.com/drboondoc/status/874413398...                13
89  https://twitter.com/dog_rates/status/875021211...                12
90  https://twitter.com/dog_rates/status/874680097...                12
91  https://twitter.com/dog_rates/status/866334964...                12
92  https://twitter.com/dog_rates/status/874296783...                13
93  https://twitter.com/dog_rates/status/874057562...                12
94  https://twitter.com/dog_rates/status/874012996...                13
95  https://twitter.com/dog_rates/status/868880397...                14
96  https://twitter.com/dog_rates/status/873580283...                13
97  https://www.gofundme.com/help-my-baby-sierra-g...                12
98  https://www.gofundme.com/help-my-baby-sierra-g...                12
99  https://twitter.com/dog_rates/status/872967104...                12

    rating_denominator       name dog_type  favorite_count  retweet_count
0                   10    Phineas      NaN         38149.0         8345.0
1                   10      Tilly      NaN         32717.0         6170.0
```

2	10	Archie	NaN	24637.0	4082.0
3	10	Darla	NaN	41491.0	8481.0
4	10	Franklin	NaN	39658.0	9184.0
5	10	NaN	NaN	19912.0	3055.0
6	10	Jax	NaN	11642.0	2028.0
7	10	NaN	NaN	64369.0	18526.0
8	10	Zoey	NaN	27359.0	4196.0
9	10	Cassie	doggo	31398.0	7250.0
10	10	Koda	NaN	30182.0	7202.0
11	10	Bruno	NaN	27345.0	4885.0
12	10	NaN	puppo	47340.0	9872.0
13	10	Ted	NaN	26714.0	4462.0
14	10	Stuart	puppo	14867.0	2206.0
15	10	Oliver	NaN	24849.0	5279.0
16	10	Jim	NaN	28627.0	4410.0
17	10	Zeke	NaN	25141.0	4217.0
18	10	Ralphus	NaN	19517.0	3489.0
19	10	Canela	NaN	NaN	NaN
20	10	Gerald	NaN	21415.0	3431.0
21	10	Jeffrey	NaN	29684.0	5289.0
22	10	such	NaN	45557.0	11465.0
23	10	Canela	NaN	67968.0	17845.0
24	10	NaN	NaN	33141.0	10219.0
25	10	NaN	NaN	30092.0	5858.0
26	10	Maya	NaN	34601.0	7632.0
27	10	Mingus	NaN	11860.0	3222.0
28	10	Derek	NaN	22085.0	4383.0
29	10	Roscoe	pupper	20856.0	3141.0
..	...	...	...	...	...
70	10	Beau	NaN	18695.0	2657.0
71	10	Snoopy	puppo	19123.0	4072.0
72	10	NaN	NaN	29810.0	7095.0
73	10	Shadow	NaN	0.0	1270.0
74	10	Terrance	NaN	0.0	6560.0
75	10	Shadow	NaN	7632.0	1270.0
76	10	Emmy	NaN	41419.0	6721.0
77	10	Aja	NaN	78539.0	18817.0
78	10	NaN	pupper	0.0	80.0
79	10	Penny	NaN	22398.0	3756.0
80	10	Dante	NaN	26986.0	5102.0
81	10	Nelly	NaN	26741.0	5513.0
82	10	Ginger	pupper	20394.0	3299.0
83	10	NaN	NaN	23178.0	4572.0
84	10	Benedict	NaN	18497.0	2367.0
85	10	Venti	NaN	27527.0	4633.0
86	10	Goose	NaN	24848.0	4239.0
87	10	Nugget	NaN	21615.0	4868.0
88	10	NaN	NaN	27050.0	5978.0

```
89                  10        NaN      NaN         25119.0         4666.0
90                  10       Cash      NaN         27459.0         4596.0
91                  10       Coco      NaN             0.0        14575.0
92                  10        Jed   pupper         25720.0         4068.0
93                  10        NaN      NaN         22355.0         3918.0
94                  10  Sebastian    puppo         34149.0        10309.0
95                  10     Walter      NaN             NaN            NaN
96                  10        NaN      NaN         23893.0         3910.0
97                  10     Sierra   pupper             0.0         1572.0
98                  10     Sierra   pupper          7146.0         1572.0
99                  10        NaN    doggo         27036.0         5364.0

[100 rows x 16 columns]
```

Define: For ease of analysis, add the df_impreds also to the archive

```
In [352]: # Code
          df_archive_clean = df_archive_clean.merge(df_impreds_clean, on = 'tweet_id', how = '
```

```
In [353]: df_archive_clean.head(1)
```

Out[353]:

```
             tweet_id  in_reply_to_status_id  in_reply_to_user_id  \
0  892420643555336193                    NaN                  NaN

                    timestamp  \
0  2017-08-01 16:23:56 +0000

                                              source  \
0  <a href="http://twitter.com/download/iphone" r...

                                                text  retweeted_status_id  \
0  This is Phineas. He's a mystical boy. Only eve...                  NaN

   retweeted_status_user_id retweeted_status_timestamp  \
0                       NaN                        NaN

                                        expanded_urls  ...    retweet_count  \
0  https://twitter.com/dog_rates/status/892420643...  ...           8345.0

       p1   p1_conf p1_dog     p2   p2_conf p2_dog      p3  p3_conf p3_dog
0  orange  0.097049  False  bagel  0.085851  False  banana  0.07611  False

[1 rows x 25 columns]
```

0.4.2 Quality

Define: in_reply_to_status_id and in_reply_to_user_id columns are reply tweets; remove rows

```
In [354]: # Code
          df_archive_clean = df_archive_clean.drop(['in_reply_to_status_id', 'in_reply_to_user_
```

```
In [355]: # Test to check if the attributes are absent
          df_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2356 entries, 0 to 2355
Data columns (total 23 columns):
tweet_id                      2356 non-null int64
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                          1611 non-null object
dog_type                      380 non-null object
favorite_count                887 non-null float64
retweet_count                 887 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
dtypes: float64(7), int64(3), object(13)
memory usage: 441.8+ KB
```

Define: retweeted_status_id, retweeted_user_id and retweeted_time_stamps columns represent retweets; remove rows

```
In [356]: # Code
          df_archive_clean = df_archive_clean.drop(['retweeted_status_id', 'retweeted_status_us
```

```
In [357]: # Test to check if the columns are deleted
          df_archive_clean.head(1)
```

```
Out[357]:             tweet_id                  timestamp  \
          0  892420643555336193  2017-08-01 16:23:56 +0000

                                                 source  \
          0  <a href="http://twitter.com/download/iphone" r...

                                                   text  \
```

```
0  This is Phineas. He's a mystical boy. Only eve...

                                          expanded_urls  rating_numerator  \
0  https://twitter.com/dog_rates/status/892420643...                13

   rating_denominator     name dog_type  favorite_count  retweet_count  \
0                  10  Phineas      NaN         38149.0         8345.0

       p1   p1_conf p1_dog     p2   p2_conf p2_dog      p3  p3_conf p3_dog
0  orange  0.097049  False  bagel  0.085851  False  banana  0.07611  False
```

Define: Timestamp as string; change to datetime format

```
In [358]: # Code
          df_archive_clean['timestamp'] = pd.to_datetime(df_archive_clean['timestamp'])

In [359]: # Test
          df_archive_clean.timestamp.head()

Out[359]: 0   2017-08-01 16:23:56
          1   2017-08-01 00:17:27
          2   2017-07-31 00:18:03
          3   2017-07-30 15:58:51
          4   2017-07-29 16:00:24
          Name: timestamp, dtype: datetime64[ns]
```

Define: Source column has 4 unique values which represent the actual sources, lost in the html format; Pick out the source from the html link

```
In [360]: # Code
          df_archive_clean.source = df_archive_clean.source.apply(lambda x: x.split('>')[-2]).s

In [361]: # Test
          df_archive_clean.source.head()

Out[361]: 0    Twitter for iPhone
          1    Twitter for iPhone
          2    Twitter for iPhone
          3    Twitter for iPhone
          4    Twitter for iPhone
          Name: source, dtype: object

In [362]: df_archive_clean.source.unique()

Out[362]: array(['Twitter for iPhone', 'Twitter Web Client', 'Vine - Make a Scene',
                 'TweetDeck'], dtype=object)
```

Define: expanded_urls column doesn't make sense; remove

```
In [363]: # Code
          df_archive_clean = df_archive_clean.drop('expanded_urls', axis = 1)
```

```
In [364]: # Test
          df_archive_clean.head(1)
```

```
Out[364]:             tweet_id           timestamp              source  \
          0  892420643555336193 2017-08-01 16:23:56  Twitter for iPhone

                                                  text  rating_numerator  \
          0  This is Phineas. He's a mystical boy. Only eve...                13

             rating_denominator     name dog_type  favorite_count  retweet_count  \
          0                  10  Phineas      NaN         38149.0         8345.0

                 p1   p1_conf p1_dog     p2   p2_conf p2_dog      p3  p3_conf p3_dog
          0  orange  0.097049  False  bagel  0.085851  False  banana  0.07611  False
```

Define: Rating denominator should be 10 for all; change to 10

```
In [365]: # Code
          #(df_archive_clean.loc[:, 'rating_denominator'] != 10).sum()
          df_archive_clean.loc[df_archive_clean.loc[:, 'rating_denominator'] != 10, 'rating_de
```

```
In [366]: # Test
          df_archive_clean.rating_denominator.unique()
```

```
Out[366]: array([10])
```

Define: Rating numerator has high and 0 values; set minimum at 11, maximum at 15

```
In [367]: # Code
          df_archive_clean.loc[df_archive_clean.loc[:, 'rating_numerator'] >= 15, 'rating_nume
          df_archive_clean.loc[df_archive_clean.loc[:, 'rating_numerator'] < 10, 'rating_numera
```

```
In [368]: # Test
          df_archive_clean.rating_numerator.unique()
```

```
Out[368]: array([13, 12, 14, 11, 15, 10])
```

Define: Datatype of tweet_id is int; change to string

```
In [369]: # Code
          df_archive_clean.tweet_id = df_archive_clean.tweet_id.astype('str')
```

```
In [370]: # Test
          df_archive_clean.tweet_id.dtype
```

```
Out[370]: dtype('O')
```

Define: Dog_types has some mixed types of dogs; consolidate to 'mixed_types'

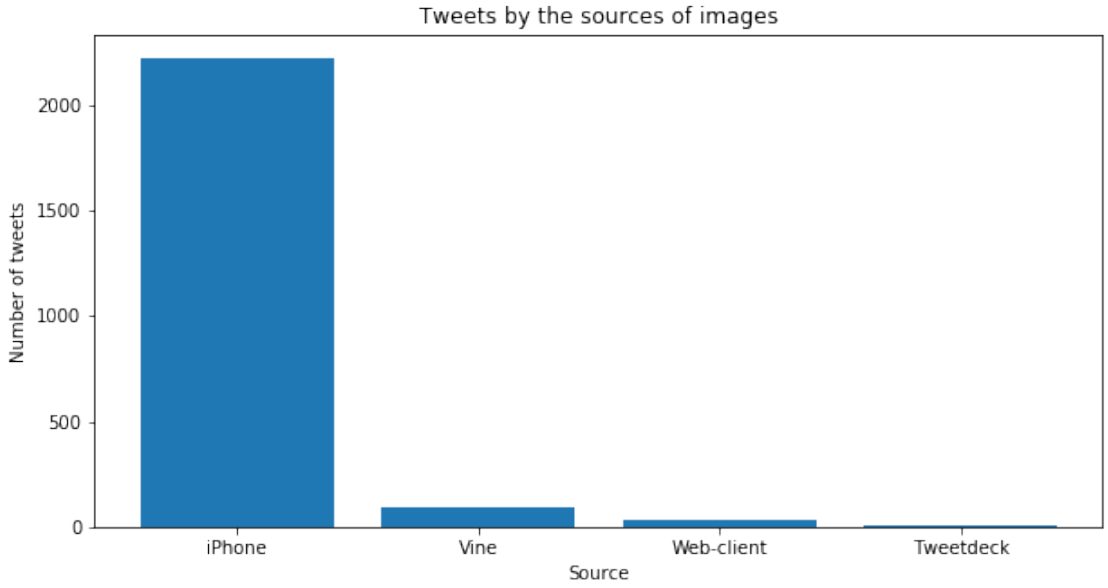
```
In [371]: # Code
          df_archive_clean.loc[(df_archive_clean.loc[: ,'dog_type'] == 'doggopuppo'), 'dog_type
          df_archive_clean.loc[(df_archive_clean.loc[:, 'dog_type'] == 'doggofloofer'), 'dog_ty
          df_archive_clean.loc[(df_archive_clean.loc[:, 'dog_type'] == 'doggopupper'), 'dog_typ

In [372]: # Test
          df_archive_clean.dog_type.unique()

Out[372]: array([nan, 'doggo', 'puppo', 'pupper', 'floofer', 'mixed_type'],
                dtype=object)

In [373]: df_archive_clean.info()

<class 'pandas.core.frame.DataFrame'>
Int64Index: 2356 entries, 0 to 2355
Data columns (total 19 columns):
tweet_id              2356 non-null object
timestamp             2356 non-null datetime64[ns]
source                2356 non-null object
text                  2356 non-null object
rating_numerator      2356 non-null int64
rating_denominator    2356 non-null int64
name                  1611 non-null object
dog_type              380 non-null object
favorite_count        887 non-null float64
retweet_count         887 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
dtypes: datetime64[ns](1), float64(5), int64(2), object(11)
memory usage: 368.1+ KB


In [374]: df_archive_clean.to_csv('twitter_archive_master.csv', index = False)
```

0.5 Data Analyses

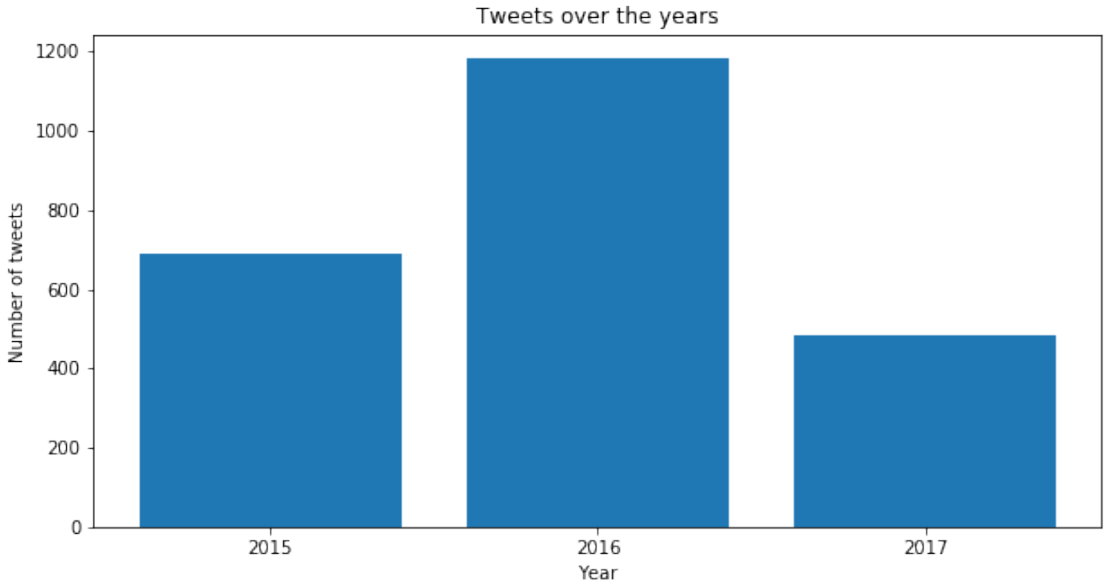
```
In [375]: # How many rows and columns finally?
          df_archive_clean.shape

Out[375]: (2356, 19)

In [376]: # Data types
          df_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2356 entries, 0 to 2355
Data columns (total 19 columns):
tweet_id              2356 non-null object
timestamp             2356 non-null datetime64[ns]
source                2356 non-null object
text                  2356 non-null object
rating_numerator      2356 non-null int64
rating_denominator    2356 non-null int64
name                  1611 non-null object
dog_type              380 non-null object
favorite_count        887 non-null float64
retweet_count         887 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
dtypes: datetime64[ns](1), float64(5), int64(2), object(11)
memory usage: 368.1+ KB
```

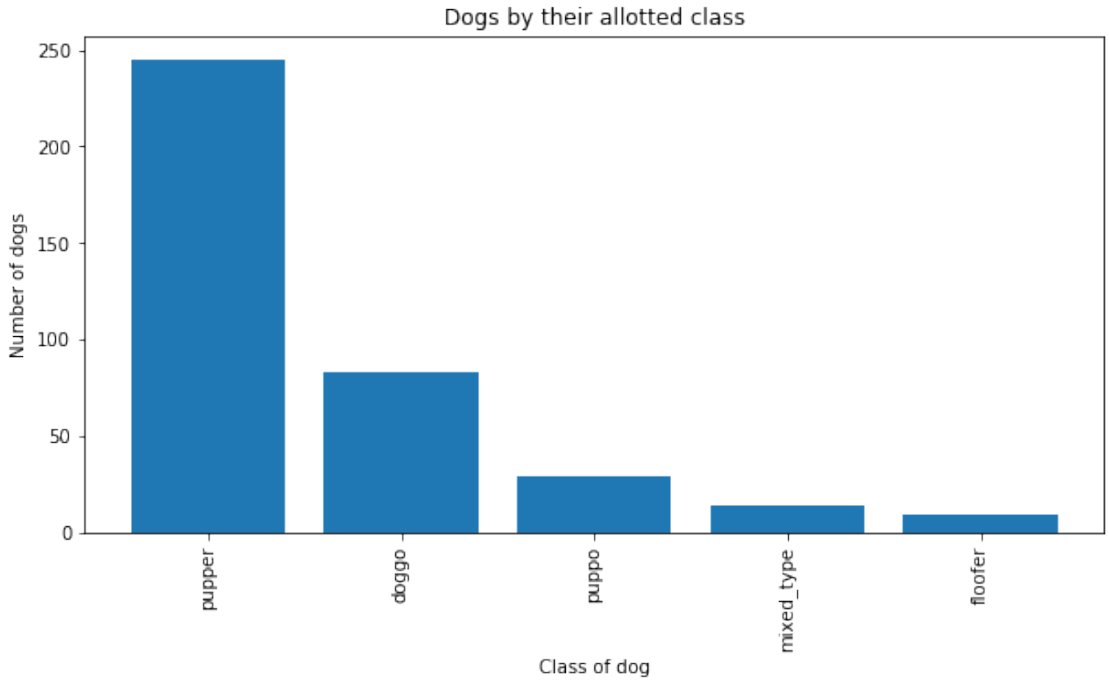
```
In [377]: # Which source was used most for the images?
          df_archive_clean.source.value_counts()

Out[377]: Twitter for iPhone     2221
          Vine - Make a Scene      91
          Twitter Web Client       33
          TweetDeck                11
          Name: source, dtype: int64

In [378]: x = ['iPhone', 'Vine', 'Web-client', 'Tweetdeck']
          y = df_archive_clean.source.value_counts()
          f, ax = plt.subplots(figsize=(10,5))
          plt.bar(x, y)
          plt.xlabel('Source')
          plt.ylabel('Number of tweets')
          plt.title('Tweets by the sources of images')
          plt.show();
```




```
In [379]: # How many tweets were there every year?
          df_archive_clean['tweet_id'].groupby([df_archive_clean['timestamp'].dt.year]).count()

Out[379]: timestamp
          2015     690
          2016    1183
          2017     483
          Name: tweet_id, dtype: int64

In [380]: x = ['2015', '2016', '2017']
          y = df_archive_clean['tweet_id'].groupby([df_archive_clean['timestamp'].dt.year]).cou

In [381]: f, ax = plt.subplots(figsize=(10,5))
          plt.bar(x, y)
          plt.xlabel('Year')
          plt.ylabel('Number of tweets')
          plt.title('Tweets over the years')
          plt.show();
```



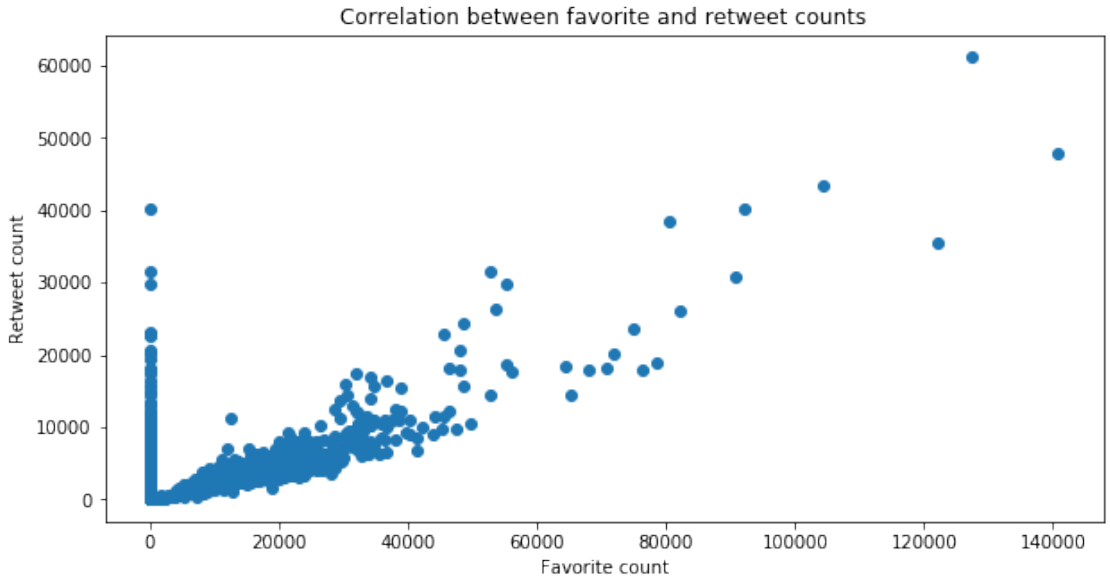

```
In [382]: # Among the dog classes, which was the most frequent?
          df_archive_clean.dog_type.value_counts()

Out[382]: pupper        245
          doggo          83
          puppo          29
          mixed_type     14
          floofer         9
          Name: dog_type, dtype: int64

In [383]: x = ['pupper', 'doggo', 'puppo','mixed_type', 'floofer']
          y = df_archive_clean.dog_type.value_counts()
          f, ax = plt.subplots(figsize=(10,5))
          plt.bar(x, y)
          plt.xlabel('Class of dog')
          plt.ylabel('Number of dogs')
          plt.title('Dogs by their allotted class')
          plt.xticks(rotation='vertical')
          plt.show();
```



In [384]:
```
# What were the highest favorite and retweet counts? Which dogs won those?
df_archive_clean['favorite_count'].max(), df_archive_clean['retweet_count'].max()
```

Out[384]: (140764.0, 61150.0)

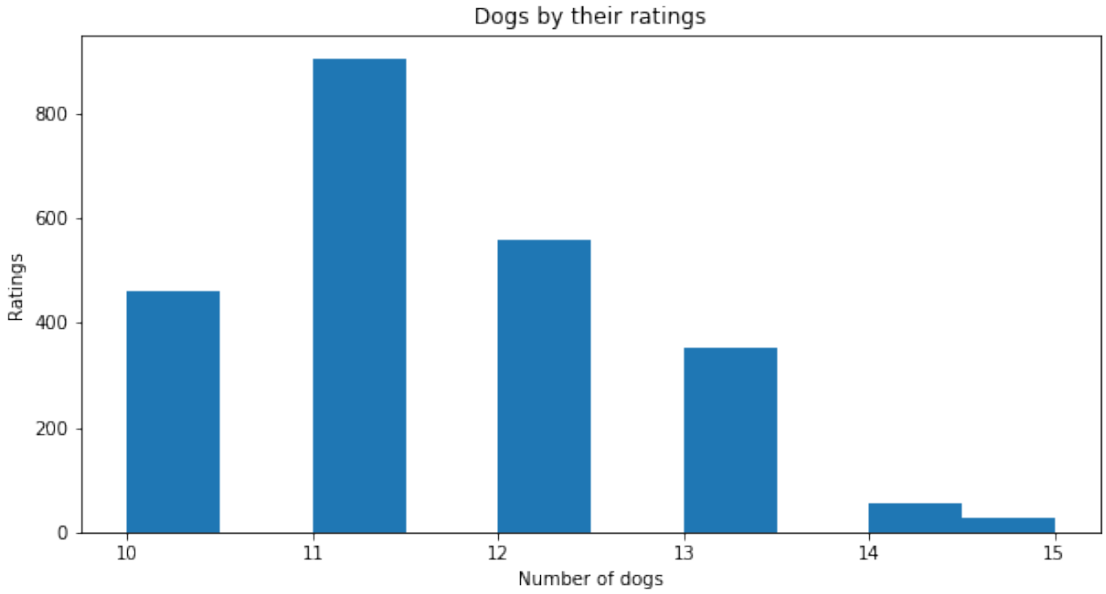
In [385]:
```
# Correlation between favorite and retweet counts
f, ax = plt.subplots(figsize=(10,5))
plt.scatter(df_archive_clean['favorite_count'], df_archive_clean['retweet_count'])
plt.xlabel('Favorite count')
plt.ylabel('Retweet count')
plt.title('Correlation between favorite and retweet counts')
plt.show();
```




```
In [386]: df_archive_clean[df_archive_clean['favorite_count'] == (df_archive_clean['favorite_co

Out[386]:              tweet_id           timestamp              source  \
          413  822872901745569793 2017-01-21 18:26:02  Twitter for iPhone

                                                    text  rating_numerator  \
          413  Here's a super supportive puppo participating ...                13

               rating_denominator name dog_type  favorite_count  retweet_count  \
          413                  10  NaN    puppo        140764.0        47855.0

                              p1   p1_conf p1_dog                 p2   p2_conf p2_dog  \
          413  Lakeland_terrier  0.196015   True  Labrador_retriever  0.160329   True

                           p3   p3_conf p3_dog
          413  Irish_terrier  0.069126   True

In [387]: df_archive_clean[df_archive_clean['favorite_count'] == (df_archive_clean['favorite_co

Out[387]: 413    Here's a super supportive puppo participating ...
          Name: text, dtype: object

In [388]: df_archive_clean[df_archive_clean['retweet_count'] == (df_archive_clean['retweet_cou

Out[388]:              tweet_id           timestamp              source  \
          534  807106840509214720 2016-12-09 06:17:20  Twitter for iPhone

                                                    text  rating_numerator  \
```

```
534  This is Stephan. He just wants to help. 13/10 ...                13

     rating_denominator     name dog_type  favorite_count  retweet_count  \
534                  10  Stephan      NaN        127370.0        61150.0

            p1  p1_conf p1_dog          p2   p2_conf p2_dog           p3  \
534  Chihuahua  0.50537   True  Pomeranian  0.120358   True  toy_terrier

      p3_conf p3_dog
534  0.077008   True
```

In [389]:
```
# How did the dog scores vary by the ratings
f, ax = plt.subplots(figsize=(10,5))
plt.hist(df_archive_clean['rating_numerator'])
plt.xlabel('Number of dogs')
plt.ylabel('Ratings')
plt.title('Dogs by their ratings')
plt.show();
```

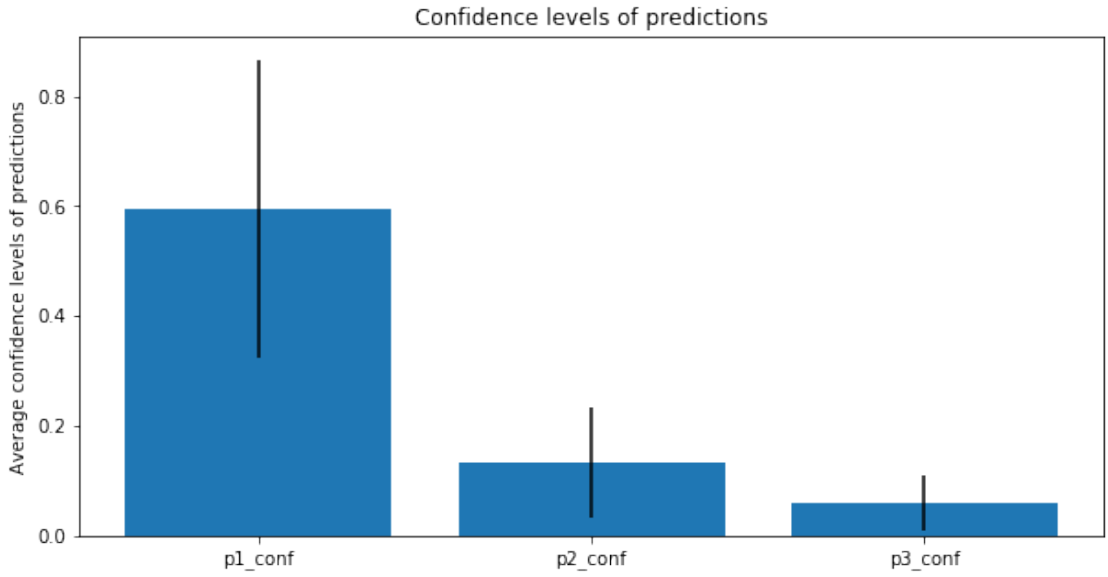


In [390]:
```
p1_conf = df_archive_clean['p1_conf'].mean()
p2_conf = df_archive_clean['p2_conf'].mean()
p3_conf = df_archive_clean['p3_conf'].mean()
p1_err = df_archive_clean['p1_conf'].std()
p2_err = df_archive_clean['p2_conf'].std()
p3_err = df_archive_clean['p3_conf'].std()
```

In [391]:
```
# How variable were the three top predictions in their confidence levels?
x = ['p1_conf', 'p2_conf', 'p3_conf']
```

```
y = [p1_conf, p2_conf, p3_conf]
z = [p1_err, p2_err, p3_err]
```

In [392]:
```
f, ax = plt.subplots(figsize=(10,5))
plt.bar(x, y, yerr=z)
#plt.xlabel('Predictions')
plt.ylabel('Average confidence levels of predictions')
plt.title('Confidence levels of predictions')
plt.show();
```



0.6 Conclusions

After merging the three dataframes and fixing the cleanliness issues, it was seen that there were 2356 instances and 19 attributes. These were the tweet_id, timestamp, source, text, rating_numerator, rating_denominator, name, dog_type, favorite_count, retweet_count and the 9 image prediction details columns. Of the 4 sources used to render the images, iPhone, Vine, Web_client and Tweetdeck, iPhone was found to be the most frequent, with 2221 source listings. There were 690, 1183 and 483 tweets for the years 2015, 2016 and 2017 respectively. The maximum number of tweets during 2016 is expected since the tweets were collected from November 2015 to August 2017. From the information contained in the texts, the dogs were classified into dog stages, ranging from pupper to doggo to floofer, and alternative intermediate or composite stages. The pupper was seen to be the most frequent stage among the classifiable dogs (from the tweet texts) of the categories encountered viz. 'pupper', 'doggo', 'puppo', 'floofer' and 'mixed_type'. The highest favorite count was 140764, for an unnamed puppo, apparently a super supportive one participating in the Women's march in Toronto. The highest retweet count was 61150, for Stephan, a helpful dog predicted to be a Chihuhua with 50% confidence level. A scatter plot analysis showed that there was a strong correlation between the favorite and retweet counts for the dogs. The dogs received ratings between 11 and 15. The most frequent ratings were in the range

of 11-12, numbering aroung 900. The average confidence levels for dog predictions based on their images were 60% for their first prediction, and lower for the subsequent two breed predictions.