Project: Wrangling and Analyze Data

Data Gathering

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

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

In [1]:

```
# import modules
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import shutil
import json
import tweepy
from tweepy import OAuthHandler
from timeit import default_timer as timer
from warnings import filterwarnings
import re
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns

filterwarnings('ignore')
```

In [2]:

```python
# load twitter archived dataset
twitter_archive = pd.read_csv('twitter-archive-enhanced.csv')
twitter_archive.head()
```

Out[2]:

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	timestamp	source	text	retweet
0	892420643555336193	NaN	NaN	2017-08-01 16:23:56 +0000	<a href="http://twitter.com/download/iphone" r...	This is Phineas. He's a mystical boy. Only eve...	
1	892177421306343426	NaN	NaN	2017-08-01 00:17:27 +0000	<a href="http://twitter.com/download/iphone" r...	This is Tilly. She's just checking pup on you....	
2	891815181378084864	NaN	NaN	2017-07-31 00:18:03 +0000	<a href="http://twitter.com/download/iphone" r...	This is Archie. He is a rare Norwegian Pouncin...	
3	891689557279858688	NaN	NaN	2017-07-30 15:58:51 +0000	<a href="http://twitter.com/download/iphone" r...	This is Darla. She commenced a snooze mid meal...	
4	891327558926688256	NaN	NaN	2017-07-29 16:00:24 +0000	<a href="http://twitter.com/download/iphone" r...	This is Franklin. He would like you to stop ca...	

In [3]:

```
twitter_archive.sample(10)
```

Out[3]:

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	timestamp	source	
1050	743210557239623680	NaN	NaN	2016-06-15 22:36:19 +0000	<a href="http://twitter.com/download/iphone" r...	Meet Kay underground legend. P
643	793195938047070209	NaN	NaN	2016-10-31 21:00:23 +0000	<a href="http://twitter.com/download/iphone" r...	Say hello to Lily. pupset that her c
1208	715704790270025728	NaN	NaN	2016-04-01 00:58:13 +0000	<a href="http://vine.co" rel="nofollow">Vine -...	This is Bentley. He kisses back. 11/
1769	678380236862578688	NaN	NaN	2015-12-20 01:03:46 +0000	<a href="http://twitter.com/download/iphone" r...	This is Crump underestimat sno
2310	666786068205871104	NaN	NaN	2015-11-18 01:12:41 +0000	<a href="http://twitter.com/download/iphone" r...	Unfamiliar wi breed. Ears poi
632	793962221541933056	NaN	NaN	2016-11-02 23:45:19 +0000	<a href="http://twitter.com/download/iphone" r...	This is Maximu face is stuck like t
1685	681654059175129088	NaN	NaN	2015-12-29 01:52:46 +0000	<a href="http://twitter.com/download/iphone" r...	This is Toffee. happy pupper. Ap
388	826598365270007810	NaN	NaN	2017-02-01 01:09:42 +0000	<a href="http://twitter.com/download/iphone" r...	This is Pawnd... Pawnd. He's su
1659	683098815881154561	NaN	NaN	2016-01-02 01:33:43 +0000	<a href="http://twitter.com/download/iphone" r...	aahhhhkslaldhwnx 12/10 for be sn
1550	689154315265683456	NaN	NaN	2016-01-18 18:36:07 +0000	<a href="http://twitter.com/download/iphone" r...	We normally don birds but I feel ba

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

In [4]:

```python
import requests
r = requests.get('https://d17h27t6h515a5.cloudfront.net/topher/2017/August/599fd2ad_image-predictions/image-predictions.tsv')
```

In [5]:

```python
# save image prediction data
if r.status_code == 200:
    with open('image_predictions.tsv', 'wb') as f:
        r.raw.decode_content = True
        shutil.copyfileobj(r.raw, f)
```

In [6]:

```python
image_prediction = pd.read_csv('image-predictions.tsv', sep='\t')
image_prediction.head()
```

Out[6]:

	tweet_id	jpg_url	img_num	p1	p1_conf	p1_dog	
0	666020888022790149	https://pbs.twimg.com/media/CT4udn0WwAA0aMy.jpg	1	Welsh_springer_spaniel	0.465074	True	
1	666029285002620928	https://pbs.twimg.com/media/CT42GRgUYAA5iDo.jpg	1	redbone	0.506826	True	miniature_p
2	666033412701032449	https://pbs.twimg.com/media/CT4521TWwAEvMyu.jpg	1	German_shepherd	0.596461	True	ı
3	666044226329800704	https://pbs.twimg.com/media/CT5Dr8HUEAA-lEu.jpg	1	Rhodesian_ridgeback	0.408143	True	ı
4	666049248165822465	https://pbs.twimg.com/media/CT5IQmsXIAAKY4A.jpg	1	miniature_pinscher	0.560311	True	Rc

In [7]:

```
image_prediction.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
```

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

In [8]:

```
# Setup tweepy api
consumer_key = 'None'
consumer_secret = 'None'
access_token = 'None'
access_secret = 'None'

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

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

In [ ]:

```
# Extract tweets with Api
count = 0
fails_dict = {}
start = timer()
with open('tweet_json.txt', 'w') as f:
    for tweet_id in tweet_ids:
        count += 1
        print(str(count) + ": " + str(tweet_id))
        try:
            tweet = api.get_status(id=tweet_id, tweet_mode = 'extended')
            print('Success')
            json.dump(tweet._json, f)
            f.write('\n')
        except tweepy.TweepyException as e:
            print('Fail')
            fails_dict[tweet_id] = e
            pass

end = timer()
print(end - start)
print(fails_dict)
```

In [ ]:

```
# Save tweet details in json format to a list of dictionaries
# read data line by line
with open('tweet_json.txt') as file:

    status = []
    for line in file:
        status.append(json.loads(line))
```

In [9]:

```
tweets = pd.read_csv('tweets.csv')
tweets.head()
```

Out[9]:

	tweet_id	retweet_count	favorite_count
0	892420643555336193	7009	33812
1	892177421306343426	5301	29329
2	891815181378084864	3481	22048
3	891689557279858688	7217	36899
4	891327558926688256	7760	35310

In [10]:

```
tweets.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2327 entries, 0 to 2326
Data columns (total 3 columns):
tweet_id          2327 non-null int64
retweet_count     2327 non-null int64
favorite_count    2327 non-null int64
dtypes: int64(3)
memory usage: 54.6 KB
```

Assessing Data

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

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

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

Assessing `twitter_archive_enhanced` dataset

In [11]:

```
twitter_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
```

- `retweet_status_id` is float and not an int
- `timestamp` and `retweeted_status_timestamp` is object instead of datetime
- missing data in (`in_reply_to_status_id,in_reply_to_user_id`) and `[retweet_status_id - expanding_urls]`)
- Duplicate tweets as retweet
- Nulls represented as None in name, doggo, floofer, pupper amd puppo
- tweets not related to dog ratings
- retweet_status_user_id is float and not an int

In [12]:

```
#twitter_archive[~twitter_archive.retweeted_status_id.isna()]['retweeted_status_id']
twitter_archive[twitter_archive.tweet_id == 888202515573088257]
```

Out[12]:

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	timestamp	source	text	retwe
19	888202515573088257	NaN	NaN	2017-07-21 01:02:36 +0000	<a href="http://twitter.com/download/iphone" r...	RT @dog_rates: This is Canela. She attempted s...	

Here we view a sample retweet. We can see that the data in the `text` column begins with **RT** . Also the `retweeted_status_id` has a value

In [13]:

```
twitter_archive.describe()
```

Out[13]:

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

- minimum `rating_denominator` and `rating_numerator` is 0
- maximum `rating_denominator` and `rating_numerator` is 170 and 1776 respectively
- 75% of ratings value 1.2 or below

In [14]:
```
twitter_archive[twitter_archive['rating_denominator'] == twitter_archive.rating_denominator.min()]
```

Out[14]:

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	timestamp	source	text	retv
313	835246439529840640	8.352460e+17	26259576.0	2017-02-24 21:54:03 +0000	<a href="http://twitter.com/download/iphone" r...	@jonnysun @Lin_Manuel ok jomny I know you're e...	

- One record has a rating denominator of 0

In [15]:
```
twitter_archive[twitter_archive['rating_numerator'] == twitter_archive.rating_numerator.min()]
```

Out[15]:

	tweet_id	in_reply_to_status_id	in_reply_to_user_id	timestamp	source	text	retwe
315	835152434251116546	NaN	NaN	2017-02-24 15:40:31 +0000	<a href="http://twitter.com/download/iphone" r...	When you're so blinded by your systematic plag...	
1016	746906459439529985	7.468859e+17	4.196984e+09	2016-06-26 03:22:31 +0000	<a href="http://twitter.com/download/iphone" r...	PUPDATE: can't see any. Even if I could, I cou...	

- Two records have a rating numerator or 0

Assessing the `tweets` dataset

In [16]:

```
tweets.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2327 entries, 0 to 2326
Data columns (total 3 columns):
tweet_id          2327 non-null int64
retweet_count     2327 non-null int64
favorite_count    2327 non-null int64
dtypes: int64(3)
memory usage: 54.6 KB
```

- There are 2327 records for all the columns in the tweets dataset
- All records are of integer data types

In [17]:

```
tweets.describe().T
```

Out[17]:

	count	mean	std	min	25%	50%	75%	max
tweet_id	2327.0	7.417930e+17	6.820795e+16	6.660209e+17	6.781394e+17	7.178418e+17	7.986547e+17	8.924206e+17
retweet_count	2327.0	2.471014e+03	4.184799e+03	1.000000e+00	4.945000e+02	1.148000e+03	2.860500e+03	7.073300e+04
favorite_count	2327.0	7.053779e+03	1.096152e+04	0.000000e+00	1.225000e+03	3.051000e+03	8.603500e+03	1.448750e+05

- mean retweet_count is 2471 with the median of 1148. This indicates a heavily positively skewed data.
- mean favorite_count is 7053 with median of 3051. This also indicates a positively skewed data
- minimum favorite and retweet counts are 0 and 1 respectively
- maximum favorite and retweet counts are 144875 and 70733 respectively

In [18]:

```
tweets.duplicated().sum()
```

Out[18]:

```
0
```

In [19]:

```
tweets.tweet_id.nunique()
```

Out[19]:

```
2327
```

- There are no duplicated rows in the data set

In [20]:

```
tweets.sample(10)
```

Out[20]:

	tweet_id	retweet_count	favorite_count
1223	710997087345876993	1267	4223
1297	706166467411222528	1459	4742
1366	700002074055016451	1206	3038
2101	670093938074779648	277	911
385	824297048279236611	3569	14232
1844	675145476954566656	783	1918
1696	680085611152338944	8156	11762
1578	685667379192414208	511	2186
1828	675517828909424640	407	1151
2197	668274247790391296	198	721

- Sample of 10 records in the tweets dataset.

Assessing the `image_prediction` dataset

In [21]:
```
image_prediction.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
```

- There are 2075 observations in the data set. The data has four distinct data types (int, float, bool and object)

In [22]:
```
image_prediction.describe()
```

Out[22]:

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

- The mean first prediction confidence is ~0.59.
- 25% of the time, the algorithm predicts with a confidence of over 0.84

In [23]:
```
image_prediction.tweet_id.duplicated().sum()
```
Out[23]:
```
0
```

In [24]:
```
image_prediction.tweet_id.nunique()
```
Out[24]:
```
2075
```

In [25]:
```
image_prediction.sample(10)
```
Out[25]:

	tweet_id	jpg_url	img_num	p1	p1_conf	p1_dog	
1742	822647212903690241	https://pbs.twimg.com/media/C2oRbOuWEAAbVSI.jpg	1	Samoyed	0.416769	True	
673	683357973142474752	https://pbs.twimg.com/media/CXvGbWeWMAcRbyJ.jpg	1	Pembroke	0.406509	True	
1732	821149554670182400	https://pbs.twimg.com/ext_tw_video_thumb/82114...	1	German_shepherd	0.515933	True	
1748	823581115634085888	https://pbs.twimg.com/media/C23ypm6VQAAO31I.jpg	1	dingo	0.280949	False	(
2040	885167619883638784	https://pbs.twimg.com/media/DEi_N9qXYAAgEEw.jpg	4	malamute	0.812482	True	
1071	716439118184652801	https://pbs.twimg.com/media/CfFNk7cWAAA-hND.jpg	1	Siberian_husky	0.396495	True	
1482	781163403222056960	https://pbs.twimg.com/media/Ctc_-BTWEAAQpZh.jpg	1	Shetland_sheepdog	0.973841	True	
1502	784517518371221505	https://pbs.twimg.com/media/CuMqhGrXYAQwRqU.jpg	2	malamute	0.757764	True	
150	668641109086707712	https://pbs.twimg.com/media/CUd9ivxWUAAuXSQ.jpg	1	vacuum	0.432594	False	
1170	736225175608430592	https://pbs.twimg.com/media/CjeY5DKXEAA3WkD.jpg	1	Labrador_retriever	0.399217	True	West_High

- There are no duplicated rows in the data set
- All records are unique

Quality issues

`twitter_archive_enhanced` dataset

1. `retweet_status_id` and `retweet_status_user_id` is float and not an int
2. `timestamp` is object instead of datetime
3. missing data in (`in_reply_to_status_id,in_reply_to_user_id`)
4. Duplicate tweets as retweet
5. Invalid Dog Names
6. incorrect rating denominators
7. incorrect rating numerators with decimal values incorrectly extracted

`image_prediction` dataset

1. Some dog names in the prediction columns P1, P2 and P3 are not capitalised

Tidiness issues

1. dog stages represented as separate columns
2. The **`tweets`** table should be a part of the **`twitter_archive_enhanced`** table

Cleaning Data

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

Note: Make a copy of the original data before cleaning. Cleaning includes merging individual pieces of data according to the rules of tidy data (https://cran.r-project.org/web/packages/tidyr/vignettes/tidy-data.html). The result should be a high-quality and tidy master pandas DataFrame (or DataFrames, if appropriate).

In [26]:

```
# Make copies of original pieces of data

twitter_archive_clean = twitter_archive.copy()
tweets_clean = tweets.copy()
image_prediction_clean = image_prediction.copy()
```

Cleaning

Quality Issues

Issue #1

Define:

Convert retweet_status_id and retweet_status_user_id from float to string.

Code

In [27]:

```
twitter_archive_clean.retweeted_status_id = twitter_archive_clean.retweeted_status_id.astype(str)
twitter_archive_clean.retweeted_status_user_id = twitter_archive_clean.retweeted_status_user_id.astype(str)
```

Test

```
In [28]: twitter_archive_clean.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           2356 non-null object
retweeted_status_user_id      2356 non-null object
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(2), int64(3), object(12)
memory usage: 313.0+ KB
```

`retweet_status_id` and `retweet_status_user_id` now have **object** as the datatype

Issue #2

Define:

Convert the data type of `timestamp` from object to datetime

Code

In [29]:
```
twitter_archive_clean.timestamp = pd.to_datetime(twitter_archive_clean.timestamp)
```

Test

In [30]:
```
twitter_archive_clean.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 datetime64[ns]
source                        2356 non-null object
text                          2356 non-null object
retweeted_status_id           2356 non-null object
retweeted_status_user_id      2356 non-null object
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: datetime64[ns](1), float64(2), int64(3), object(11)
memory usage: 313.0+ KB
```

`timestamp` column is now of **datetime** data type

Issue #3

Define:

drop the in_reply_to_status_id and in_reply_to_user_id columns

Code

In [31]:
```
twitter_archive_clean.drop(['in_reply_to_status_id','in_reply_to_user_id'], axis=1, inplace=True)
```

Test

In [32]:
```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2356 entries, 0 to 2355
Data columns (total 15 columns):
tweet_id                      2356 non-null int64
timestamp                     2356 non-null datetime64[ns]
source                        2356 non-null object
text                          2356 non-null object
retweeted_status_id           2356 non-null object
retweeted_status_user_id      2356 non-null object
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: datetime64[ns](1), int64(3), object(11)
memory usage: 276.2+ KB
```

`in_reply_to_status_id` and `in_reply_to_user_id` columns are no more in the dataset

Issue #4

Define :

Create a dataframe of retweets and drop all rows where retweet_status_id is present.

Code

In [33]:

```
# create a data frame of retweets
retweets = twitter_archive_clean[~twitter_archive_clean.retweeted_status_timestamp.isna()]
```

In [34]:

```
retweets.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 181 entries, 19 to 2260
Data columns (total 15 columns):
tweet_id                      181 non-null int64
timestamp                     181 non-null datetime64[ns]
source                        181 non-null object
text                          181 non-null object
retweeted_status_id           181 non-null object
retweeted_status_user_id      181 non-null object
retweeted_status_timestamp    181 non-null object
expanded_urls                 180 non-null object
rating_numerator              181 non-null int64
rating_denominator            181 non-null int64
name                          181 non-null object
doggo                         181 non-null object
floofer                       181 non-null object
pupper                        181 non-null object
puppo                         181 non-null object
dtypes: datetime64[ns](1), int64(3), object(11)
memory usage: 22.6+ KB
```

In [35]:

```
# delete retweets from the twitter_archive_clean dataset
twitter_archive_clean.drop(retweets.index, axis=0, inplace=True)
```

In [36]:

```
# drop all retweet related columns since there are no records for them
twitter_archive_clean.drop(['retweeted_status_id','retweeted_status_user_id','retweeted_status_timestamp'], axis=1, inplace=True)
```

Test

In [37]:

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 12 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null int64
rating_denominator    2175 non-null int64
name                  2175 non-null object
doggo                 2175 non-null object
floofer               2175 non-null object
pupper                2175 non-null object
puppo                 2175 non-null object
dtypes: datetime64[ns](1), int64(3), object(8)
memory usage: 220.9+ KB
```

- There are no records for retweets in the dataset. The data have only unique tweets now
- All retweet related columns have been removed.

Issue #5

Define:

- Isolate all rows that have invalid dog names.
- Check if we can further extract some of the names
- Update list of dog names
- Clean up the dog names to only contain valid names

Code

In [38]:
```
mask = twitter_archive_clean.name.str.contains('^[a-z]', regex=True)
twitter_archive_clean[mask][['text', 'name']].head()
```

Out[38]:

	text	name
22	I've yet to rate a Venezuelan Hover Wiener. Th...	such
56	Here is a pupper approaching maximum borkdrive...	a
169	We only rate dogs. This is quite clearly a smo...	quite
193	Guys, we only rate dogs. This is quite clearly...	quite
335	There's going to be a dog terminal at JFK Airp...	not

- There are 104 observations.
- There are some names that were not extracted properly from the text. We will try and extract some more names

In [39]:
```
dog_names_clean = twitter_archive_clean[mask][['text', 'name']]
```

In [40]:

```
# Create a list
# we will use the list to store the extracted dog_names from our execption list
dg_name = []
for dog_name in dog_names_clean['text']:
    try:
        name = re.search('(?<=named)(.\w+)', dog_name)
        if name:
            name = name.group(1)
        else:
            name = re.search('(?<=name is)(.\w+)', dog_name)
            name = name.group(1)

    except:
        pass
    dg_name.append(name)
```

In [41]:

```
dog_name_fix = pd.Series(dg_name,dog_names_clean.index)
```

In [42]:

```
twitter_archive_clean['names_fixed'] = dog_name_fix
```

In [43]:

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 13 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null int64
rating_denominator    2175 non-null int64
name                  2175 non-null object
doggo                 2175 non-null object
floofer               2175 non-null object
pupper                2175 non-null object
puppo                 2175 non-null object
names_fixed           22 non-null object
dtypes: datetime64[ns](1), int64(3), object(9)
memory usage: 237.9+ KB
```

- There are 22 new dog names that we have been able to fetch

In [44]:

```
# UPDATE THE DOG NAMES
twitter_archive_clean.names_fixed.fillna(twitter_archive_clean.name,inplace=True)
```

Test

In [45]:

```
mask = twitter_archive_clean.names_fixed.str.contains('^[a-z]', regex=True)
twitter_archive_clean[mask]['names_fixed'].value_counts()
```

Out[45]:

```
a               35
the              8
an               5
very             4
one              4
just             3
quite            3
not              2
actually         2
getting          2
mad              1
old              1
life             1
infuriating      1
officially       1
all              1
such             1
unacceptable     1
his              1
by               1
light            1
space            1
this             1
incredibly       1
Name: names_fixed, dtype: int64
```

- The number of wrong dog names have reduce

In [46]:

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 13 columns):
tweet_id                 2175 non-null int64
timestamp                2175 non-null datetime64[ns]
source                   2175 non-null object
text                     2175 non-null object
expanded_urls            2117 non-null object
rating_numerator         2175 non-null int64
rating_denominator       2175 non-null int64
name                     2175 non-null object
doggo                    2175 non-null object
floofer                  2175 non-null object
pupper                   2175 non-null object
puppo                    2175 non-null object
names_fixed              2175 non-null object
dtypes: datetime64[ns](1), int64(3), object(9)
memory usage: 237.9+ KB
```

In [47]:

```
# remove leading spaces from names_fixed
twitter_archive_clean.names_fixed = twitter_archive_clean.names_fixed.str.replace(' ', '')
```

In [48]:

```
twitter_archive_clean[twitter_archive_clean.name == 'Zoey']['name'].value_counts()
```

Out[48]:

```
Zoey    3
Name: name, dtype: int64
```

In [49]:

```
twitter_archive_clean[twitter_archive_clean.names_fixed == 'Zoey']['names_fixed'].value_counts()
```

Out[49]:

```
Zoey    4
Name: names_fixed, dtype: int64
```

- names_fixed column we can confirm has more names than the original names column. We will proceed to replace the names column with the names_fixed column

In [50]:
```
# drop old column name
twitter_archive_clean.drop('name',axis=1, inplace=True)
```

In [51]:
```
# Rename column name
twitter_archive_clean.rename(columns={'names_fixed':'name'}, inplace=True)
```

In [52]:
```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 12 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null int64
rating_denominator    2175 non-null int64
doggo                 2175 non-null object
floofer               2175 non-null object
pupper                2175 non-null object
puppo                 2175 non-null object
name                  2175 non-null object
dtypes: datetime64[ns](1), int64(3), object(8)
memory usage: 220.9+ KB
```

Issue #6

Define:

- Update incorrect ratings numerator and denominators

Code

In [53]:

```
#create a dataframe of all denominators greater than 10
denom_to_fix = twitter_archive_clean[twitter_archive_clean.rating_denominator != 10][['text','rating_denomina
tor']]
```

In [54]:

```
# Extract denominator from tweet text
rating_denom = []

for text in denom_to_fix['text']:
    split_text = text.split('https')
    word = split_text[0]

    rating_denom.append(re.search('(\d+)(?!.*\d)',word).group(1))
```

In [55]:

```
# Convert ratings_denom to pandas series and append to denom_to_fix
rating_denom = pd.Series(rating_denom,denom_to_fix.index)
```

In [56]:

```
# convert datatypes from string and int to float
rating_denom = rating_denom.astype(float)
twitter_archive_clean.rating_denominator = twitter_archive_clean.rating_denominator.astype(float)
```

In [57]:

```
# add rating_denominator to twitter_archive_clean dataframe
twitter_archive_clean['rating_denom'] = rating_denom
```

In [58]:

```
# Update rating denom with values from rating_denominator
twitter_archive_clean['rating_denom'] = twitter_archive_clean.rating_denom.fillna(twitter_archive_clean.ratin
g_denominator)
```

Test

In [59]:

```
twitter_archive_clean[twitter_archive_clean.rating_denom != twitter_archive_clean.rating_denominator]
```

Out[59]:

	tweet_id	timestamp	source	text	expanded_urls
313	835246439529840640	2017-02-24 21:54:03	<a href="http://twitter.com/download/iphone" r...	@jonnysun @Lin_Manuel ok jomny I know you're e...	NaN
1068	740373189193256964	2016-06-08 02:41:38	<a href="http://twitter.com/download/iphone" r...	After so many requests, this is Bretagne. She ...	https://twitter.com/dog_rates/status/740373189...
1165	722974582966214656	2016-04-21 02:25:47	<a href="http://twitter.com/download/iphone" r...	Happy 4/20 from the squad! 13/10 for all https...	https://twitter.com/dog_rates/status/722974582...
1202	716439118184652801	2016-04-03 01:36:11	<a href="http://twitter.com/download/iphone" r...	This is Bluebert. He just saw that both #Final...	https://twitter.com/dog_rates/status/716439118...
1662	682962037429899265	2016-01-01 16:30:13	<a href="http://twitter.com/download/iphone" r...	This is Darrel. He just robbed a 7/11 and is i...	https://twitter.com/dog_rates/status/682962037...
2335	666287406224695296	2015-11-16 16:11:11	<a href="http://twitter.com/download/iphone" r...	This is an Albanian 3 1/2 legged Episcopalian...	https://twitter.com/dog_rates/status/666287406...

In [60]:

```
twitter_archive_clean.drop('rating_denominator', axis=1, inplace=True)
```

In [61]:

```
twitter_archive_clean.rename(columns={'rating_denom':'rating_denominator'}, inplace=True)
```

```
In [62]: twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 12 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null int64
doggo                 2175 non-null object
floofer               2175 non-null object
pupper                2175 non-null object
puppo                 2175 non-null object
name                  2175 non-null object
rating_denominator    2175 non-null float64
dtypes: datetime64[ns](1), float64(1), int64(2), object(8)
memory usage: 220.9+ KB
```

- All incorrect `rating_denominator` issues have been resolved

Issue #7

Define:

- capture ratings from text column in the dataset
- extract numerator values from text
- update numerator values in the dataset
- convert data type for rating_numerator to float

Code

In [63]:

```
# Extract ratings info from text
ratings = twitter_archive_clean.text.str.extract('((?:\d+\.)?\d+)\/(\d+)', expand=True)
```

In [64]:

```
ratings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 2 columns):
0    2175 non-null object
1    2175 non-null object
dtypes: object(2)
memory usage: 51.0+ KB
```

In [65]:

```
#update rating numerator values in dataset
twitter_archive_clean.rating_numerator = ratings[0]
```

In [66]:

```
# convert rating_numerator to float
twitter_archive_clean.rating_numerator = twitter_archive_clean.rating_numerator.astype(float)
```

Test

```
In [67]: twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 12 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null float64
doggo                 2175 non-null object
floofer               2175 non-null object
pupper                2175 non-null object
puppo                 2175 non-null object
name                  2175 non-null object
rating_denominator    2175 non-null float64
dtypes: datetime64[ns](1), float64(2), int64(1), object(8)
memory usage: 220.9+ KB
```

```
In [68]: twitter_archive_clean.rating_numerator.unique()
```

```
Out[68]: array([  1.30000000e+01,   1.20000000e+01,   1.40000000e+01,
                  1.35000000e+01,   1.70000000e+01,   1.10000000e+01,
                  1.00000000e+01,   4.20000000e+02,   6.66000000e+02,
                  6.00000000e+00,   1.82000000e+02,   1.50000000e+01,
                  9.60000000e+02,   0.00000000e+00,   7.00000000e+00,
                  8.40000000e+01,   2.40000000e+01,   9.75000000e+00,
                  5.00000000e+00,   1.12700000e+01,   3.00000000e+00,
                  8.00000000e+00,   9.00000000e+00,   4.00000000e+00,
                  1.65000000e+02,   1.77600000e+03,   2.04000000e+02,
                  5.00000000e+01,   9.90000000e+01,   8.00000000e+01,
                  4.50000000e+01,   6.00000000e+01,   4.40000000e+01,
                  1.00000000e+00,   1.43000000e+02,   1.21000000e+02,
                  2.00000000e+01,   9.50000000e+00,   1.12600000e+01,
                  2.00000000e+00,   1.44000000e+02,   8.80000000e+01])
```

- rating_numerator datatype is now float

Issue #8

Define:

- Capitalise first letter in dog names in the prediction columns P1, P2 and P3

Code

```
In [69]: image_prediction_clean.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 [70]:

```
# confirm names not capitalised in the column
capital_check = image_prediction_clean.p1.str.contains('^[a-z]', regex=True)
image_prediction_clean[capital_check]['p1'].head()
```

Out[70]:

```
1              redbone
4    miniature_pinscher
6           box_turtle
7                 chow
8        shopping_cart
Name: p1, dtype: object
```

In [71]:

```
image_prediction_clean.p1 = image_prediction_clean.p1.str.title()
image_prediction_clean.p2 = image_prediction_clean.p2.str.title()
image_prediction_clean.p3 = image_prediction_clean.p3.str.title()
```

Test

In [72]:

```
capital_check = image_prediction_clean.p1.str.contains('^[a-z]', regex=True)
image_prediction_clean[capital_check]['p1'].head()
```

Out[72]:

```
Series([], Name: p1, dtype: object)
```

In [73]:

```
capital_check = image_prediction_clean.p2.str.contains('^[a-z]', regex=True)
image_prediction_clean[capital_check]['p2'].head()
```

Out[73]:

```
Series([], Name: p2, dtype: object)
```

In [74]:

```
capital_check = image_prediction_clean.p3.str.contains('^[a-z]', regex=True)
image_prediction_clean[capital_check]['p3'].head()
```

Out[74]:

```
Series([], Name: p3, dtype: object)
```

- P1, P2 and P3 columns all have first letters capitalised

Tidiness

Issue #1

Define:

- create a dog_stage column
- Merge all dog stage columns together
- drop individual `doggo, puppo, floofer, pupper` columns

Code

In [75]:

```
# extract the various dog_stage columns
doggo = twitter_archive_clean[twitter_archive_clean.doggo == 'doggo']['doggo']
floofer = twitter_archive_clean[twitter_archive_clean.floofer == 'floofer']['floofer']
pupper = twitter_archive_clean[twitter_archive_clean.pupper == 'pupper']['pupper']
puppo = twitter_archive_clean[twitter_archive_clean.puppo == 'puppo']['puppo']
```

In [76]:

```
# merge all dog_stage into one column
dog_stage = doggo.append(floofer)
dog_stage = dog_stage.append(pupper)
dog_stage = dog_stage.append(puppo)
```

In [77]:

```
dg_index, dg_value = list(dog_stage.index), list(dog_stage.values)
```

In [78]:

```
# create an empty dog_stage column
twitter_archive_clean['dog_stage'] = None
```

In [79]:

```
# populate dog_stage column
for i in range(len(dg_value)):
    twitter_archive_clean.dog_stage.loc[dg_index[i]] = dg_value[i]
```

In [80]:

```
# drop doggo, puppo, floofer and pupper columns. This has already been merged as dog_stage
twitter_archive_clean.drop(['doggo', 'puppo', 'floofer', 'pupper'], axis=1, inplace=True)
```

Test

In [81]:

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

Out[81]:

```
pupper     234
doggo       75
puppo       25
floofer     10
Name: dog_stage, dtype: int64
```

In [82]:

```
twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2355
Data columns (total 9 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null float64
name                  2175 non-null object
rating_denominator    2175 non-null float64
dog_stage             344 non-null object
dtypes: datetime64[ns](1), float64(2), int64(1), object(5)
memory usage: 249.9+ KB
```

- dog_stage column has been added to the data set.
- the individual dog_stages (pupper, floofer, doggo, puppo) have been merged into one column

In [ ]:

```

```

Issue #2

Define:

Add tweets table to twitter_archive_enhanced table

Code

```
In [83]: twitter_archive_clean = twitter_archive_clean.merge(tweets_clean, how='left', on='tweet_id')
```

```
In [ ]: 
```

Test

```
In [84]: #confirm that the merge is successful
         twitter_archive_clean.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2175 entries, 0 to 2174
Data columns (total 11 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null datetime64[ns]
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null float64
name                  2175 non-null object
rating_denominator    2175 non-null float64
dog_stage             344 non-null object
retweet_count         2167 non-null float64
favorite_count        2167 non-null float64
dtypes: datetime64[ns](1), float64(4), int64(1), object(5)
memory usage: 203.9+ KB
```

- Retweets and Favorite Counts have been added to the twitter_archive dataset

Storing Data

Two datasets are to be saved.

1. The twitter archived enhanced master dataset
2. The image_prediction_data set

```
In [85]: twitter_archive_clean.to_csv('twitter_archive_master.csv', index=False)
         image_prediction_clean.to_csv('image_prediction.csv', index=False)
```

Analyzing and Visualizing Data

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

Analyzing Twitter Archived Master Dataset

In [86]:

```
# read data and view first few rows
df = pd.read_csv('twitter_archive_master.csv')
df.head()
```

Out[86]:

	tweet_id	timestamp	source	text	expanded_urls	rating_
0	892420643555336193	2017-08-01 16:23:56	<a href="http://twitter.com/download/iphone" r...	This is Phineas. He's a mystical boy. Only eve...	https://twitter.com/dog_rates/status/892420643...	
1	892177421306343426	2017-08-01 00:17:27	<a href="http://twitter.com/download/iphone" r...	This is Tilly. She's just checking pup on you....	https://twitter.com/dog_rates/status/892177421...	
2	891815181378084864	2017-07-31 00:18:03	<a href="http://twitter.com/download/iphone" r...	This is Archie. He is a rare Norwegian Pouncin...	https://twitter.com/dog_rates/status/891815181...	
3	891689557279858688	2017-07-30 15:58:51	<a href="http://twitter.com/download/iphone" r...	This is Darla. She commenced a snooze mid meal...	https://twitter.com/dog_rates/status/891689557...	
4	891327558926688256	2017-07-29 16:00:24	<a href="http://twitter.com/download/iphone" r...	This is Franklin. He would like you to stop ca...	https://twitter.com/dog_rates/status/891327558...	

In [ ]:

In [87]:

```
# sample 10 records from the dataset
df.sample(10)
```

Out[87]:

	tweet_id	timestamp	source	text	expanded_urls
933	733482008106668032	2016-05-20 02:18:32	<a href="http://twitter.com/download/iphone" r...	"Ello this is dog how may I assist" ...10/10 h...	https://twitter.com/dog_rates/status/733482008...
614	778383385161035776	2016-09-21 00:00:35	<a href="http://twitter.com/download/iphone" r...	This is Nala. She's a future Dogue model. Won'...	https://twitter.com/dog_rates/status/778383385...
2156	666268910803644416	2015-11-16 14:57:41	<a href="http://twitter.com/download/iphone" r...	Very concerned about fellow dog trapped in com...	https://twitter.com/dog_rates/status/666268910...
508	793962221541933056	2016-11-02 23:45:19	<a href="http://twitter.com/download/iphone" r...	This is Maximus. His face is stuck like that. ...	https://twitter.com/dog_rates/status/793962221...
362	820749716845686786	2017-01-15 21:49:15	<a href="http://twitter.com/download/iphone" r...	Meet Sunny. He can take down a polar bear in o...	https://twitter.com/dog_rates/status/820749716...
325	826848821049180160	2017-02-01 17:44:55	<a href="http://twitter.com/download/iphone" r...	This is Cupid. He was found in the trash. Now ...	https://twitter.com/dog_rates/status/826848821...
187	850333567704068097	2017-04-07 13:04:55	<a href="http://twitter.com/download/iphone" r...	@markhoppus MARK THAT DOG HAS SEEN AND EXPERIE...	NaN
921	735991953473572864	2016-05-27 00:32:10	<a href="http://twitter.com/download/iphone" r...	This is Maxaroni. He's curly af. Also rather f...	https://twitter.com/dog_rates/status/735991953...
1392	687704180304273409	2016-01-14 18:33:48	<a href="http://twitter.com/download/iphone" r...	Say hello to Blakely. He thinks that's a hat. ...	https://twitter.com/dog_rates/status/687704180...

	tweet_id	timestamp	source	text	expanded_urls
775	752173152931807232	2016-07-10 16:10:29	<a href="http://twitter.com/download/iphone" r...	This is Brody. He's a lifeguard. Always prepar...	https://twitter.com/dog_rates/status/752173152...

```
In [88]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2175 entries, 0 to 2174
Data columns (total 11 columns):
tweet_id              2175 non-null int64
timestamp             2175 non-null object
source                2175 non-null object
text                  2175 non-null object
expanded_urls         2117 non-null object
rating_numerator      2175 non-null float64
name                  2175 non-null object
rating_denominator    2175 non-null float64
dog_stage             344 non-null object
retweet_count         2167 non-null float64
favorite_count        2167 non-null float64
dtypes: float64(4), int64(1), object(6)
memory usage: 187.0+ KB
```

- There are 2175 observations in the dataset.
- We only have 2167 records for retweets and favorites

In [89]:
```
df.describe()
```

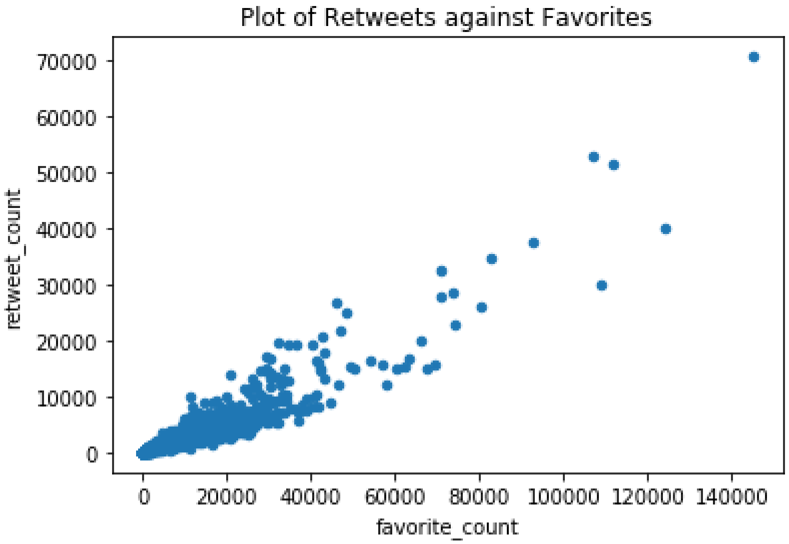
Out[89]:

	tweet_id	rating_numerator	rating_denominator	retweet_count	favorite_count
count	2.175000e+03	2175.000000	2175.000000	2167.000000	2167.000000
mean	7.371205e+17	13.177140	10.477241	2236.188740	7574.592986
std	6.748668e+16	47.705088	6.958764	3983.510947	11184.086552
min	6.660209e+17	0.000000	7.000000	1.000000	45.000000
25%	6.768432e+17	10.000000	10.000000	477.000000	1602.500000
50%	7.098528e+17	11.000000	10.000000	1058.000000	3409.000000
75%	7.894226e+17	12.000000	10.000000	2550.500000	9393.500000
max	8.924206e+17	1776.000000	170.000000	70733.000000	144875.000000

- Mean rating_denominator is ~10 with mean rating_numerator ~13.17
- 75% of the rating denominator have a value of 10 whereas that of rating numerator is at most 12

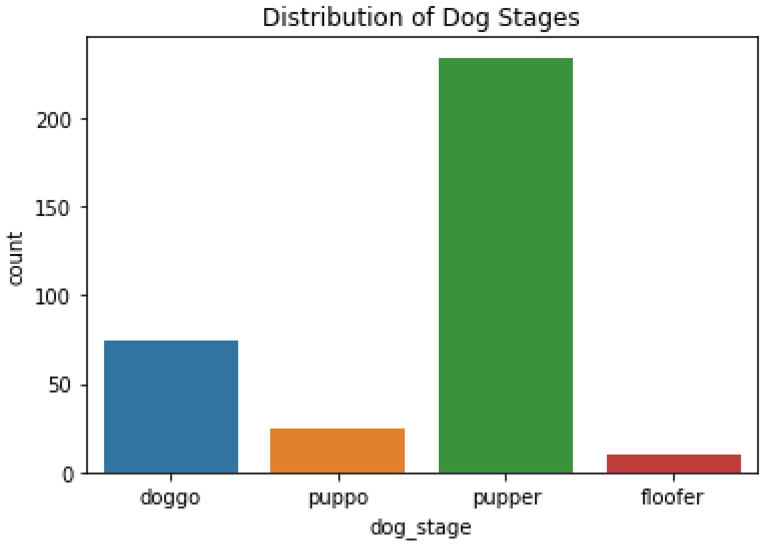
In [90]:

```
df.plot(x='favorite_count', y='retweet_count', kind='scatter')
plt.title('Plot of Retweets against Favorites')
plt.show()
```



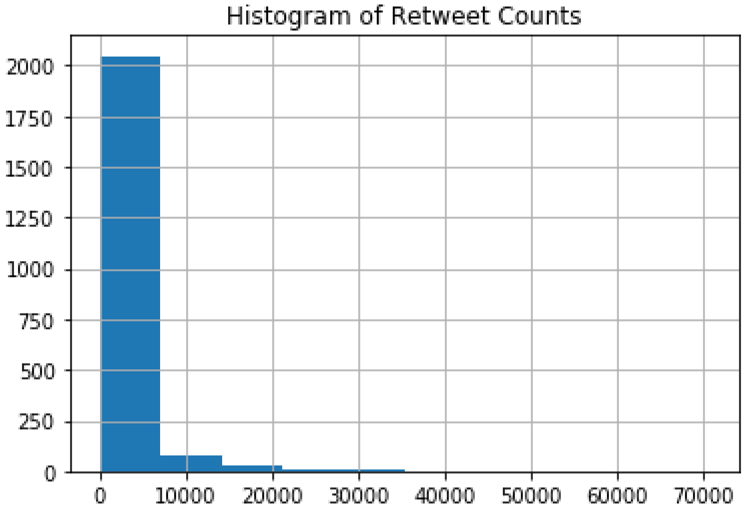
In [91]:

```
sns.countplot(data = df, x='dog_stage')
plt.title('Distribution of Dog Stages');
```



- Pupper is the most popular dog_stage

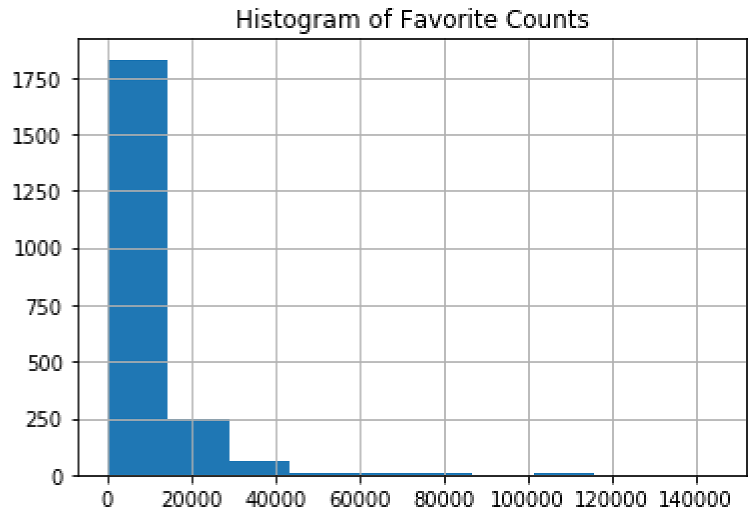
In [92]:
```
df.retweet_count.hist()
plt.title('Histogram of Retweet Counts');
```



- The histogram of retweet counts is positively skewed.

In [93]:

```
df.favorite_count.hist();
plt.title('Histogram of Favorite Counts');
```



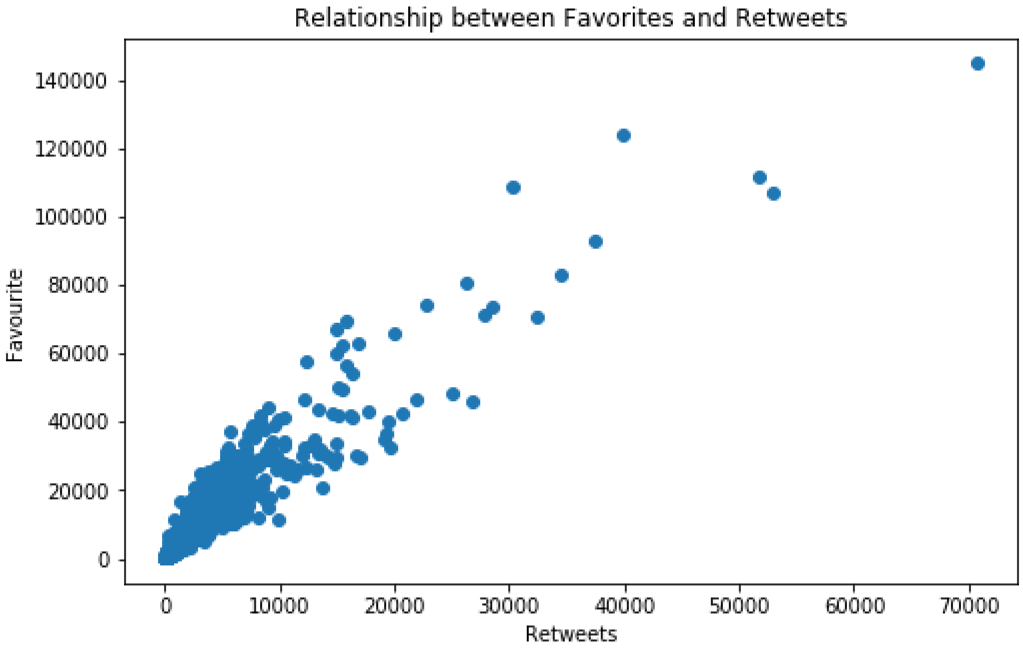
Insights:

1. Most popular dog_stage is `Pupper`
2. There is a positive correlation between favorites and retweets. If a tweet is retweeted, there is a high change that it will be favorited as well
3. Favorite and Retweet counts are heavily skewed to the right. This mean that only a small portion of tweets are highly retweeted or fovorited

Visualization

In [94]:

```
plt.figure(figsize=(8,5))
plt.scatter(x = df.retweet_count, y = df.favorite_count)
plt.xlabel('Retweets')
plt.ylabel('Favourite')
plt.title('Relationship between Favorites and Retweets')
plt.show()
```



In [ ]:

```
```