|  |
| --- |
| Whatever Shall We Do? |
| Harnessing the Twitter API to observe fan loyalty of eliminated teams |
|  |

Qiuyi (Helen) Hong

Yanhong (Haley) Huang

Tom Meagher

Tyler Reese

2/10/2016

Table of Contents

[ABSTRACT 2](file:///E:\WPI\研一\DS501\Case%20study%201\Case%20Study%201%20Report%20New%20Data%20Version_1.docx#_Toc442751630)

[INTRODUCTION 2](#_Toc442751631)

[OBJECTIVE 1: Explore common thoughts or attitudes surrounding the Patriots 3](#_Toc442751632)

[OBJECTIVE 2: Determine Twitter users who are likely to be Patriots fans 5](#_Toc442751633)

[OBJECTIVE 3: Determine in the absence of the Patriots, which of the two remaining teams has the attention and interest of Patriots fans 6](#_Toc442751634)

[BROADER IMPACT 8](#_Toc442751635)

[DATA LIMITATIONS 9](#_Toc442751636)

[CONCLUSIONS 10](#_Toc442751637)

[APENDIX I: ADDITIONAL TABLES 11](#_Toc442751638)

DS 501: Introduction to Data Science

Worcester Polytechnic Institute

Spring, 2016

Instructor: Randy Paffenroth

Whatever Shall We Do?

Harnessing the Twitter API to observe fan loyalty of eliminated teams

Qiuyi (Helen) Hong, Yanhong (Haley) Huang, Tom Meagher, and Tyler Reese

**ABSTRACT−** The Super Bowl−the championship game of American football− is one of the most-watched events on U.S. television every year. Yet, the majority of viewers are fans of teams which are *not* in the Big Game. In this paper, we use data drawn from the Twitter streaming API to begin to explore the thoughts and motivation for watching the game amongst fans of a team which has been eliminated.

**INTRODUCTION−**  The 2015 NFL season could not have started much better for the New England Patriots. Coming off of a Super Bowl championship the year before, the perennial-favorite Patriots won their first 10 games. This left the legions of Patriots fans−including the four authors of this paper−eagerly awaiting a return-trip to the Super Bowl for the Patriots. This anticipation proved short-sighted, however. Following multiple player injuries, the Patriots faltered late in the season and eventually lost in the playoffs, one game shy of the championship. As Super Bowl 50 drew near, we found ourselves with mixed feelings. Without our team of choice, the Patriots, in contention we were unsure of how to participate in upcoming spectacle of the spectacle of the Big Game. To mollify our combined confusion and curiosity, we set out to sample the thoughts and Super-Bowl-related feelings others in our situation−namely, other Patriots fans. Thankfully, in this age of social media there is a widely accessible (and public) platform in which the Patriot faithful can express their opinions on any number of topics…Twitter.

Amongst social media platforms, Twitter offers the advantage that it progresses “at the speed of thought.” Given character limits, users must often distill their messages in order to express their foremost thoughts. Therefore we chose to harness the Twitter API in attempts to observe opinions amongst those who, like us, usually cheer for the Patriots. Our goal was the following three objectives[[1]](#footnote-1):

1. Determine if, as the Super Bowl approaches, there are common thoughts or attitudes surrounding the Patriots.
2. Determine Twitter users who are likely to be Patriots fans.
3. Determine in the absence of the Patriots, which of the two remaining teams has the attention and interest of Patriots fans.

We will consider each of the above separately in the report that follows. For each objective, we will first explain the data that was collected. Next we will describe our methods for analyzing the data, and ultimately present our findings in the data. As our main goal was to understand pre-Super Bowl sentiments surrounding the Patriots, all of our data was collected in the days *leading up to* the game.

**OBJECTIVE 1**: Explore common thoughts or attitudes surrounding the patriots.

**Data**: In order to consider the most *current* feelings surrounding the Patriots, the Twitter streaming API was used to sample tweets in real-time. Tweets which contained the key-word “Patriots” within the text body were stored and saved. A total of 2,500 tweets were collected (and can be found in patriots.json)

**Data Analysis:** we performed a variety of frequency-based analysis on this collection of tweets. To begin, we calculated the average word count in each tweet, and lexical diversity among all words contained in the collection of tweets. The results were as follows:

**Table 1.1: Average words and Lexical diversity**

|  |  |
| --- | --- |
| **Average words per tweet** | 14.55 |
| **Lexical Diversity** | 0.1906 |

We then determined the most commonly occurring words in the collection of tweets. We filtered-out “stop-words” to avoid simply collecting short syntactical words that are commonly used in English sentences. The top 30 remaining words were as follows:

**Table 1.2: Most Common Words**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Word** | **Count** |  | **Word** | **Count** |  | **Word** | **Count** |
| Patriots | 637 | Super | 132 | [MT](https://t.co/NOK6SgklmY) | 94 |
| @Patriots: | 372 | http://t.co/oSPeY3QMpH | 129 | Tom | 93 |
| patriots | 346 | Bowl | 122 | behind | 93 |
| #NFLHonors | 297 | Enlist | 121 | conservative | 92 |
| Gronk. | 285 | New | 118 | #TLOT | 91 |
| Deion | 285 | Join | 113 | unite | 91 |
| https://t.co/v762e2V5T | 283 | England | 108 | Cruz! | 90 |
| @Patriots | 234 | Time | 103 | win | 90 |
| @USFreedomArmy: | 177 | via | 95 | playing | 90 |
| #Patriots | 158 | NFL | 95 | @mericanrefugee: | 90 |

Next, we tabulated the most popular tweet entities−user mentions and hashtags−occurring in our collection. These were as follows:

**Table 1.3: Popular user mentions Table 1.4: Popular Hashtags**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Screen Name** | **Count** |  | **Hashtag** | **Count** |
| @Patriots | 629 | #NFLHonors | 298 |
| @USFreedomArmy | 177 | #Patriots | 183 |
| @mericanrefugee | 90 | #PJNET | 123 |
| @realOBF | 44 | #CruzCrew | 96 |
| @NFL | 31 | #TLOT | 91 |
| @PatriotsExtra | 31 | #SB49 | 68 |
| @HouSuperBowl | 31 | #PATRIOTS | 67 |
| @BethMinyard | 29 |  | #NFL | 57 |
| @Seahawks | 21 |  | #EsuranceSweepstakes | 55 |
| @feistyoldguy | 20 |  | #Superbowl50 | 53 |

Lastly, we began to search for the most popular tweet in the collection. Within the Twitter world, “popularity” can be judged by two common metrics- number of retweets, or number of favorites. As it turns out, *all* tweets in our collected had *both* zero retweets and zero favorites. This does not indicate a lack of popularity, but a reflection of our data collection methods. Using the Twitter streaming API, these tweets were collected basically *in real time*: they were collected essentially as they were submitted to Twitter. Thus at the time of collection, these Tweets had been available for only fractions of a second: not enough elapsed time for any Twitter user to retweet or favorite. Retweet and favorite counts are a reasonable metric to consider popularity of *historical* Twitter data, but seem less significant when using streaming data. [For completeness, a table of 10 “popular” tweets can be found in Appendix I].

**Results and Findings:** Overall, it seems that we retrieved a non-trivial collection of tweets involving the search term “Patriots.” Given all 2,500 tweets, the average word-count for the text body is over 14. This suggests that many of the tweets collected are not simply users submitting short exclamations or quips, but rather full sentences and (hopefully) complete thoughts. This collection has a rather low lexical diversity, however. A lexical diversity of 0.19 indicates that of all words occurring in all collected tweets, only about 20% of them are unique. This tends to suggest that many of the tweets collected have similar wording, and are perhaps presenting similar (or identical) ideas.

When considering the most commonly occurring (non-“stop”) words in our Tweets, it is clear that not all Twitter users are focused on the Patriots *football team*. One of the most commonly occurring words is “@USFreedomArmy” and a number of other popular words include “Enlist” “Join.” This appears to be a Twitter call-to-action, which is likely using the term *Patriots* in the dictionary-sense, not referring to a team mascot. On the other hand, there are many tweets which are referencing the Patriots football team, with “Super Bowl,” “NFL,” and “NFLHonors” occurring with relatively high frequency. There are also many references to 3 Patriots players, “Gronk,” “Deion,” and “Tom.” These trends indicate that, despite the Patriots being eliminated from the super bowl, there is still interest in *discussing* the Patriots. However, these words do not provide any hints of current attitudes towards the Patriots. Reflecting on this method of analysis, a lack of conclusion is not overly surprising. There are countless words which can be used to express a single emotion. Even if there was a consensus feeling of sadness among fans, the way each chooses to express this feeling (“sad,” “upset,” “disappointed,” “crushed,” “despair,” etc.) will serve to distill the appearance of these terms within a word-count. Thus while simply counting popular words is likely to recover some of the *subjects* being discussed (for example, the players mentioned above), it is less likely that a count of popular words will illustrate the attitudes or feelings towards those subjects.

The most popular Tweet entities again confirm that many of the tweets collected reference the Patriots football organization. Six out of ten of the most popular user mentions and hashtags are both football-related (for example, @NFL, #NFLHonors). As with common words, the popular tweet entities do not provide much insight as to current attitudes towards the Patriots. The football-centered nature of these entities, however, indicates that the Patriots are still a topic of conversation, despite their lack of participation in the Super Bowl. One trend worth noticing is the high occurrence of @seahawks and #SB49, both in reference to the *previous* Super Bowl (49) in which the Patriots *defeated* the Seahawks. Perhaps fans are reminiscing on a more successful season.

**OBJECTIVE 2**: Determine Twitter users who are likely to be Patriots fans.

**Data**: To determine users who are likely to be Patriots fans, it is reasonable to consider those users who “follow” accounts related to the Patriots. While a casual observer may follow the @Patriots primary Twitter account, fans are also likely to follow Patriots *players* on Twitter. Therefore we collected Twitter ID numbers of all friends and followers of Rob Gronkowski. A popular and publicly-colorful Patriots player, Gronkowski has a verified Twitter account with many followers (these can be found in gronk\_followers.json and gronk-friends.json).

**Data Analysis:** After accumulating the ID numbers for all friends and followers of Gronkowski, we then used the Twitter API to retrieve the screen names attached to each account. These names (chosen by the user) can be explored for patterns more easily than the auto-assigned ID numbers. As of our collection, @RobGronkowski had 384 friends and 1,263,239 followers. 10 examples of each (both user ID and screen number) are displayed below. [Note: all tables have been truncated to streamline the report. Full tables of 20 friends, followers, and mutual friends can be found in Appendix I.]

**Table 2.1: Example Friends Table 2.1: Example Followers**

**of @RobGronkowski of @RobGronkowski**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **User ID** | **Screen Name** |  | **User ID** | **Screen Name** |
| 20575752 | marcelluswiley | 4876598751 | newtonkn1 |
| 890891 | BleacherReport | 1025779262 | y\_yohn |
| 29925371132 | GronkPartyBus | 3021470789 | penelopecg24h |
| 966774301 | uninterrupted | 4876845639 | BarrieaultFund |
| 218748456 | Drubnation | 2153522761 | ohpatriotsgirl |
| 25367082 | samanthapeszek | 2879975514 | RayMcP3 |
| 3020277803 | ninko50 | 713746011 | Javiii\_Castro15 |
| 67381805 | StaffordBros | 4876856416 | ecosurfinc1 |
| 63253045 | MonsterEnergy | 3334787685 | poppy\_carlton |
| 123276343 | BarstoolBigCat | 27335788 | DivyaBahl |

In addition, we can consider those Twitter users which are mutual friends of Gronkowski: that is, those whose accounts are both *following* @RobGronkowski, and being followed *by* @RobGronkowski. Of Gronkowki’s 384 total Twitter friendships, 335 of those are mutual. 10 examples are given below.

**Table 2.3: Example mutual friends of @RobGronkowski**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **User ID** | **Screen Name** |  | **User ID** | **Screen Name** |
| 1059194370 | kobebryant | 84451338 | QuintonAaron |
| 191650646 | viccarucci | 26053643 | jimmykimmel |
| 314298886 | Simzy18 | 101852687 | ZIMMERWIZ |
| 17587207 | boburnham | 145745936 | RobinMeade |
| 20575752 | marcelluswiley | 22938645 | EricStangel |

**Results and Findings:** Summarizing, Rob Gronkowski (one of the Patriots players) has a total of 1,263,239 followers and 385 friends on Twitter. Of those, 335 are mutual. As can be seen even in the small sample tables above, many of Gronkowski’s mutual friends are famous individuals- other athletes, or entertainment personalities. This is not surprising, as Gronkowski is a top-level athlete with an outgoing personality. Gronkowski’s followers, on the other hand, seem to be “regular people” (at the very least, given a small sample none jump-out as belonging to celebrities). Thus if we want to isolate Twitter ID’s likely to belong to Patriots fans, many can likely be found by considering Gronkowski’s followers that exclude his mutual friends. This can easily be done using the set.difference() function in Python. Indeed, one of the accounts collected above has the user name @ohpatriotsgirl.

**OBJECTIVE 3**: Determine in the absence of the Patriots, which of the two remaining teams has the attention and interest of Patriots fans

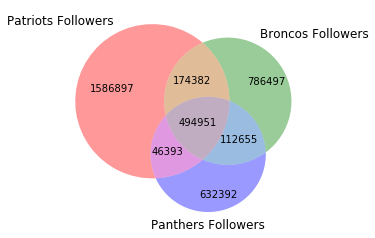
**Note:** The two teams competing in the Super Bowl are the Denver Broncos and the Carolina Panthers.

**Data**: We collected two additional sets of Twitter data to explore this question. First, we collected the Twitter ID numbers of all followers of the three football teams. We used the twitter API to store and save the ID numbers of all followers of the verified Twitter accounts of the Patriots (@Patriots) the Broncos (@Broncos) and the Panthers (@Panthers). These can be found, respectively in: Patriots\_Followers.json, Broncos\_Followers.json, and Panthers\_Followers.json.

Next we returned to the Twitter streaming API in order to survey current opinions of Patriots fans. The day before the Super Bowl, we filtered the twitter stream for tweets which contained either “Broncos” or “Panthers” in the text body. We restricted our search to only those Tweets created in a geo-zone of the Boston area, in attempts to isolate the feelings of Patriots fans. Beginning at 3:27PM, we sampled the twitter stream periodically, opening a collection window for 2.5 minutes every 10 minutes. This was repeated for 5 intervals, and a total of 3,200 tweets were collected. In addition, the *number* of Tweets of each type was recorded for each collection window.

**Data Analysis:** Our first data collection retrieved all Twitter followers of the Patriots, Broncos, and Panthers Twitter accounts. This allowed us to compute the number of Twitter users that follow more than one of the teams in question. In particular, we found the following overlaps in followers, which can be displayed in illustrative venn-diagram format.

**Figure 3.1: Common Twitter followers**



Our second data filtered the Twitter streaming API, restricted geographically to the Boston area, for tweets containing the search terms “Broncos” or “Panthers.” The search was conducted at periodic windows, and the number of each type of tweet recovered in ever collection window was recorded. The goal of this data-collection strategy was to analyze *popularity* of the given search terms. If one of the two terms were more popular in the Boston area, tweets containing that keyword would be submitted at a much *faster* rate. Therefore rather than calculating simple *volume* of tweets containing each term, we want to estimate the *speed* at which each search-term is being used. This can be facilitated through the real-time nature of the Twitter streaming API. By tabulating the number of tweets referring to “Broncos” or “Panthers” in each periodic collection window, we aim to estimate the *rate* at which each term is being used in and around Boston, and thus determine which team is the more popular conversation topic among Patriots fans. A summary of this data is as follows:

**Table 3.1: Periodic Tweet Collection**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Collection Window** | **Start Time** | **End Time** | **Tweets containing “Broncos”** | **Tweets containing “Panthers”** |
| 1 | 15:27:52 | 15:30:23 | 336 | 358 |
| 2 | 15:40:23 | 15:42:53 | 332 | 310 |
| 3 | 15:52:43 | 15:55:25 | 300 | 226 |
| 4 | 16:05:25 | 16:07:56 | 392 | 278 |
| 5 | 16:17:56 | 16:20:27 | 311 | 317 |

Computing statistics on this data we find the following summaries:

**Table 3.2: Summary of “Broncos” vs. “Panthers” Tweets**

|  |  |  |
| --- | --- | --- |
|  | **Tweets containing “Broncos”** | **Tweets containing “Panthers”** |
| **Total Number of Tweets** | 1,671 | 1,489 |
| **Average Tweets per 2.5 minute Window** | 334.2 | 297.8 |
| **Average Tweets per minute** | 133.68 | 119.12 |

**Figure 3.2: Cumulative distribution of Tweets**

**Results and Findings:** First we consider the mutual Twitter followers of the three football teams. As can be drawn from Figure 3.1, the Patriots have 2,302,623 Twitter followers. Of those, 29% follow the Broncos and 24% follow the Panthers. However, 8% follow the Broncos and *not* the Panthers, whereas only 2% follow the Panthers but not the Broncos. Therefore, a Twitter user who follows the Patriots on Twitter is more likely to follow the Broncos than the Panthers. What is more, given these statistics it is not unreasonable to conclude that a Patriots *fan* is more likely to be interested in the Broncos than the Panthers. While the percentage-difference in twitter followers seems marginal, only 5-6%, 6% of the Patriots 2.3 million Twitter followers is over 117,000 people. This is certainly a non-trivial difference.

One important note is that we are not claiming that Patriots fans are likely to be Broncos *fans.* Rather, the data suggest that a Patriots fan is more likely to be *interested* in the Denver Broncos than they are the Carolina Panthers. In the end, *interest* is at the heart of what we are trying to understand. If a Patriots fan is more interested in the Broncos, this will influence their motivation to participate in Super Bowl-related activities. Though they may watch the big game rooting for a Broncos’ loss, the Broncos are driving their interests nonetheless.

Our second set of periodic data, focused geographically on the Boston region, supports the notion that Patriots fans have more interest in the Denver Broncos. Indeed, the day before the Big Game, tweets containing the term “Broncos” were being written in the Boston area at a rate which was approximately 15 more tweets per minute than those containing “Panthers.” This corresponds to a 12.5% higher tweet-per minute ratio of texts pertaining to the Broncos. This higher rate can be visualized by considering the slopes of the lines in Figure 3.2. Over a cumulative collection window of 12.5 minutes, 1,671 tweets about the Broncos were authored, compared to 1,489 discussing the Panthers. This corresponds to 182 additional tweets, or about 12%. These tweets were collected from the Boston area on a Saturday afternoon, less than 48 hours before the super bowl. These results agree with the assertion that the Denver Broncos stimulate the interest of Patriots fans more so than the Carolina Panthers.

Considering the situation, this result is not overly surprising. The New England Patriots and Denver Broncos are division rivals, with the teams often facing each other multiple times in a season. In fact, it was the Broncos that defeated the Patriots to end their season. The Patriots and the Panthers, on the other hand, rarely meet during the regular season. Therefore Patriots fans having a mutual interest in the Denver Broncos is intuitive, and supported by our Twitter API data.

**BROADER IMPACT**

Our use of the Twitter API was primarily motivated by curiosity, confusion, and perhaps a bit of disappointment. While we usually cheer for the New England Patriots, after their elimination we were unsure how to proceed with the Super Bowl approaching. Therefore, as described above, we explored a number of facets of the Twitter API trying to understand the current attitude of other Patriots fans. Of particular interest was discerning if, among the two remaining teams, either seemed to be a favorite among New England supporters.

Moving beyond our own fan-induced emotions, understanding the fan loyalty of eliminated teams can prove extremely useful, especially for businesses. Take the current example, which considers opinions of Patriots fans before a Broncos-Panthers Super Bowl. There are millions of Patriots fans in the U.S. alone. Many of them will still be engaged leading up to the Super Bowl: throwing parties, listening to radio and television broadcasts, and reading newspaper articles. Understanding the interests of these Patriots fans stands to increase consumer participation. Consider, for example, a Boston sports radio-host. In the weeks leading up to the Big Game, many on-air segments will certainly be dedicated towards Super Bowl talk. Tailoring the broadcasts towards the preferences (or aversions) of the local fans stands to build, and maintain, an engaged audience. Local supermarkets will be stocking-up on party food to prepare for the many Super Bowl celebrations. Customizing the store décor or inventory, leaning even slightly towards the current Broncos-Panthers preference of shoppers who are usually Patriots fans, could certainly increase profits.

This example certainly extends beyond the realm of Patriots fans. As the Super Bowl approaches, there are 30 NFL teams which will not be playing on Sunday. Local businesses, be it entertainment or consumer-based, are accustomed to tailoring their products based on the home-town favorite. The Super Bowl, however, is on such a grand scale that it can often overshadow usual loyalties. Countless fans, whose teams are no longer in contention, still participate in Super Bowl festivities. Understanding the short-term interests of these fans can be very advantageous for local branches and businesses.

**DATA LIMITATIONS**

While sampling the Twitter API is a reasonable platform for surveying current public opinions, the data we collected was not without its limitations. First, only a fraction of the U.S. population have Twitter accounts. Indeed, many of the most dedicated sports fans are in the older generations of society, and are less likely to be Twitter users. Moreover, of those individuals that have Twitter accounts, many are infrequent participants: though they have opinions they do not choose to express them on the Twitter platform. Thus we recognize that the opinions presented via Twitter are not representative of the population as a whole. We do, however, believe that the Twitter API was the most appropriate method of collecting data. With the Super Bowl fast-approaching, these time constraints limited the useful measures of data gathering. Beyond experiments or surveys, an observation-based method, especially one with the volume of data that Twitter accumulates, seemed the most probable for collecting meaningful data given a short time window.

What is more, we recognize that Twitter is not ubiquitous in its knowledge, even of its own users! For example, there are likely many Patriots fans who have twitter accounts, but to not “follow the patriots” (some of the authors are included). Similarly, there are many users who follow the Patriots on Twitter, but would pledge their allegiance to another team. Therefore the number of Twitter followers is, at best, an approximation for the number of true fans, *even those within the Twitter universe.* Lastly, we realize that constraining a geo-search to the Boston area does not encompass all Patriots fans. There are certainly Patriots supporters living in every corner of the country. As sports-fandom is largely determined geographically, however, this presented itself as the most reasonable approach to sample Patriots fans on Twitter.

**CONCLUSIONS**

In this report, we used the Twitter API to examine the loyalty of fans of eliminated teams, specifically as it pertains to the Super Bowl. In particular, as the Super Bowl approached we sought to consider attitudes surrounding the New England Patriots (an eliminated team), as well as identify Twitter users who are likely to be Patriots fans. Moreover given the two remaining Super Bowl Teams, the Denver Broncos and the Carolina Panthers, we aimed to determine which was of greater interest to Patriots fans.

We used the Twitter streaming API to store in real-time a collection of tweets pertaining to the term “Patriots.” While some of the collected Tweets were referring to subjects other than the football team, by considering common tweet entities (user names and hashtags) we determined that many of the tweets collected were explicitly about football. By considering popular words, however, we were unable to determine any definitive attitudes or opinions surrounding the Patriots. While some of the common words allowed us to draw some inferences, we do not present these with certainty. We tried to determine which of the tweets was the most popular- and thus most likely contained opinions others agreed with. Standard Twitter measures of popularity are “retweets” and “favorites.” As the tweets were collected in real-time, however, neither retweets nor favorites had been accumulated. These metrics are appropriate for determining popularity of historic Twitter data.

In order to identify Twitter followers likely to be Patriots fans, we collected the Twitter ID numbers of one of the most famous players, Rob Gronkowski. We then used the Twitter API to retrieve the screen names attached to this account. Gronkowski had over a million followers but less than 400 friends, 335 of which were mutual. Those mutual friends seemed to be largely famous personalities, and thus the most likely place to identify Patriots fans is Gronkowski’s followers which are not mutual friends.

Lastly we tried to determine whether Patriots fans were more interested in the Broncos or the Panthers. After collecting all followers of the official Twitter accounts for each team, we determined that a Patriots follower was more likely to follow the Broncos, by a nontrivial margin. This suggests a mutual interest. Our most interesting data set was collected the day before the Super Bowl. Constraining a search of the Twitter streaming API to the Boston area, we periodically collected tweets which contained the words “Broncos” or “Panthers.” By counting the number of tweets collected in each window, this allowed us to estimate the *speed* at which Boston tweeters were discussing each team. We determined that tweets concerning the Broncos were being generated at a rate which was 15 tweets more per minute, or about 12.5%. This agrees with the notion that Patriots fans are more likely to be interested in the Denver Broncos than the Carolina Panthers.

**APENDIX I: ADDITIONAL TABLES**

**Table A.1: Top 10 most “Popular” Tweets**

|  |  |  |
| --- | --- | --- |
| **Retweet Count** | **Screen Name** | **Text** |
| 0 | vlewey | RT @vlewey: @jillarie85 <https://t.co/5CCdYV2F3t> |
| 0 | vitorsergio | RT @vitorsergio: E ainda levei uma sacaneada retroativa ao dizer que torço para o Patriots... |
| 0 | vaneessab3 | RT @vaneessab3: Me: I need to buy a Broncos Sara: ya I need to buy a patriots @SaraEchelberry |
| 0 | usosports1 | RT @usosports1: @Patriots RB @joeyiosefa back to community/spends time with local elementary kids. #PatriotNation #NFL #NFLPA https:/… |
| 0 | usosports1 | RT @usosports1: @Patriots RB @joeyiosefa back to community/spends time with local elementary kids. #PatriotNation #NFL #NFLPA https:/… |
| 0 | usosports1 | RT @usosports1: @Patriots RB @joeyiosefa back to community/spends time with local elementary kids. #PatriotNation #NFL #NFLPA https:/… |
| 0 | uhatremblay | RT @uhatremblay: @curtisbeast Yeah...everyone knows he's a fraud and incompetent with no integrity...unless he goes after Patriots. Then he… |
| 0 | tweet4upatriots | RT @tweet4upatriots: Whose watching the 8th REPUBLICAN DEBATE #PJNET #TCOT #CCOT #VETS #USMIL PATRIOTS #CONSERVATIVE PRAYERS 2016 https:/… |
| 0 | tweet4upatriots | RT @tweet4upatriots: VETERANS FIRST <https://t.co/Xx3vRwETp2> |
| 0 | tweet4upatriots | RT @tweet4upatriots: Support military spouses and veteran's spouses #C2GTHR #LNYHBT #PJNET #TCOT #VETS #USMIL #PATRIOTS #CONSERVATIVE https… |

**Table A.2: Full 20 Friends, Followers, and Mutual Followers of @RobGronkowski**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Friends** | |  | **Followers** | |  | **Mutual Friends** | |
| **User ID** | **Screen Name** | **User ID** | **Screen Name** | **User ID** | **Screen Name** |
| 20575752 | marcelluswiley | 4876598751 | newtonkn1 | 1059194370 | kobebryant |
| 890891 | BleacherReport | 1025779262 | y\_yohn | 191650646 | viccarucci |
| 29925371132 | GronkPartyBus | 3021470789 | penelopecg24h | 314298886 | Simzy18 |
| 966774301 | uninterrupted | 4876845639 | BarrieaultFund | 17587207 | boburnham |
| 218748456 | Drubnation | 2153522761 | ohpatriotsgirl | 20575752 | marcelluswiley |
| 25367082 | samanthapeszek | 2879975514 | RayMcP3 | 84451338 | QuintonAaron |
| 3020277803 | ninko50 | 713746011 | Javiii\_Castro15 | 26053643 | jimmykimmel |
| 67381805 | StaffordBros | 4876856416 | ecosurfinc1 | 101852687 | ZIMMERWIZ |
| 63253045 | MonsterEnergy | 3334787685 | poppy\_carlton | 145745936 | RobinMeade |
| 123276343 | BarstoolBigCat | 27335788 | DivyaBahl | 22938645 | EricStangel |
| 743044668 | opendorse | 887664163 | cerda011 | 142364694 | Shandrewpr |
| 343546941 | CatherinVaritek | 4876770340 | PaPiCee17 | 29653015 | MarcusSmith\_ |
| 2227768384 | goon356 | 1025779262 | y\_yohn | 128102424 | Chan95Jones |
| 26053643 | jimmykimmel | 3021470789 | penelopecg24h | 299253711 | GronkPartyBus |
| 229293125 | RontezMiles | 4876845639 | BarrieaultFund | 41293339 | ckreiswirthESPN |
| 34461255 | ImDJHollywood | 2153522761 | ohpatriotsgirl | 2966774301 | uninterrupted |
| 21111883 | ddlovato | 2879975514 | RayMcP3 | 61604894 | DWXXIII |
| 1683163405 | CaseyMuhtadi | 713746011 | Javiii\_Castro15 | 198735903 | GordieGronk |
| 829673054 | DannyAmendola | 4876856416 | ecosurfinc1 | 25880097 | GronkDreams87 |
| 30274144 | hollyrpeete | 3334787685 | poppy\_carlton | 207923746 | Timbaland |

1. Note the following breakdown: *Objective 1*: Problems 1 and 2 | *Objective 2*: Problem 3 | *Objective 3*: Problem 4. [↑](#footnote-ref-1)