Purpose

The goal of this post is to source and analyze Twitter posts and followers for a given Twitter account (“handle”) using R. We will identify tweets with the most likes and retweets, as well as posting trends over time. We will also map the geographic distribution of Twitter followers by leveraging Google Maps API attributes.

The example Twitter handle will be the English language account of BVB Dortmund (“BVB”), a football team in Germany’s top professional league, the Bundesliga. We are using BVB’s English Twitter account instead of the club’s primary German language Twitter account because this blog post is written in English.

1. Setup

First, we need to obtain and authorize a free Twitter Developer account (instructions here).

Second step is to install and load the R rtweet package by Michael Kearney.

We will extract Twitter data multiple times so I have created two variables to avoid duplication and inconsistencies. The “twitter_user” variable stores the Twitter handle. The “sample” variable specifies the number of extracted records as some Twitter accounts have large volumes of followers and tweets.

```
library (rtweet)
library (tidyverse)

twitter_user <- "@blackyellow"
```

2. Analyze tweets

Source tweets

Now we will extract our first set of Twitter data.

The get_timeline function contains 90 fields for each tweet. The BVB account posts frequently so we will limit to the last 500 tweets.

```
tweets_raw <- get_timeline (twitter_user, n = 500)
```

Transform Tweets

Many fields are not needed for this exercise so we can cull the dataset. I have also renamed several fields for brevity and more standard Twitter notation (i.e. likes instead of favorites).

We are focusing on original tweets so have filtered out retweets.

I have extracted year from the creation date to enable summarizing tweet volume by year. Also, I have truncated the Tweet text field from 280 to 60 characters so more cleanly fits in a formatted table.

```
library (lubridate)

tweets <- tweets_raw %>%
   filter (is_retweet == FALSE) %>%
   rename (
      likes = favorite_count,
      retweets = retweet_count,
      created = created_at
      ) %>%
   mutate (
      text = str_sub(text,1,60),
      created = as.Date(created),
      year = year(created)
      ) %>%
   rename(date = created) %>%
   select (text, date, year, likes, retweets)
```

Visualize most liked tweets

We will sort by most liked tweets over time and rank via the dplyr row_to_column formula.

The GT package by Richard Iannone formats tables in a easy-to-read manner. The core gt::gt function adds lines between rows. Many other table formatting enhancements are available but out of scope for this blog.

The tweet with the most likes was BVB’s tribute to football legend Diego Maradona, who recently passed away.

```
library (gt)

tweets %>%
    arrange (-likes, -retweets) %>%
    head (10) %>%
    rowid_to_column("rank") %>%
    select (-year) %>%
    relocate (rank) %>%
    gt ()
```

rank	text	date	likes	retweets
1	Rest In Peace, Diego Armando Maradona 🙏 https://t.co/JB0DiVE	2020-11-25	39014	2541
2	Your 2020 Golden Boy Award Winner: ⭐ ERRRRRLIIINNNGG HAAAA	2020-11-21	25891	1462
3	“Only two?” 😂 https://t.co/OHcaIkNGnt	2020-11-24	23054	1004
4	He is not real.	2020-11-21	21004	1010
5	Just another day in the office 🎮 https://t.co/yE1IpiC6gc	2020-11-26	19328	359
6	He's the Golden Boy for a reason	2020-11-21	16180	788
7	The Goalden Boy 🥅⚽ https://t.co/XgIiDyKcC2	2020-11-22	13386	354
8	Hakuna Matata - Marco Reus 🤙 https://t.co/PITGdBLrhg	2020-11-28	12865	1520
9	Are you excited for the international break to end? Yes	2020-11-18	12741	494
10	Sweet Sixteen, Youssoufa Moukoko 🥳🎂 https://t.co/UaGEFhV0hC	2020-11-20	11921	385

Visualize most retweeted tweets

Next we will re-sort and re-rank by retweets, again using the GT package to cleanly format.

A tweet celebrating player striker Giovanni Reyna signing a contract extension produced the most retweets. The tribute to Argentine football legend Diego Maradona (most liked tweet) was #2 when ranking by retweets.

```
tweets %>%
   arrange (-retweets, -likes) %>%
   head (10) %>%
   rowid_to_column("rank") %>%
   select (rank, text, date, retweets, likes) %>%
   gt ()
```

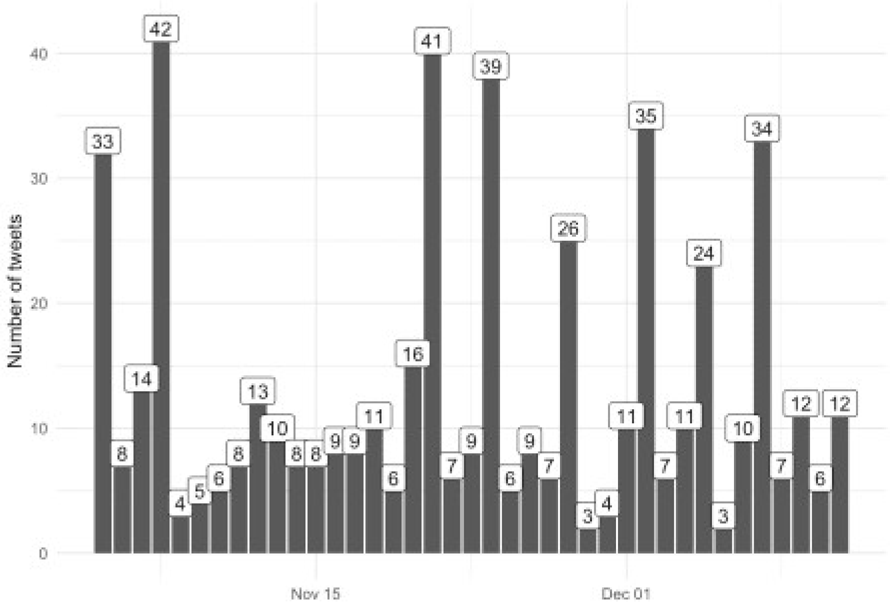
rank	text	date	retweets	likes
1	🚨 #REYNA2025 GIVEAWAY 🚨 To celebrate Gio’s contract extensi	2020-11-21	4926	3327
2	Rest In Peace, Diego Armando Maradona 🙏 https://t.co/JB0DiVE	2020-11-25	2541	39014
3	Hakuna Matata - Marco Reus 🤙 https://t.co/PlTGdBLrhg	2020-11-28	1520	12865
4	Your 2020 Golden Boy Award Winner: ⭐ ERRRRRRLIIINNNGG HAAAA	2020-11-21	1462	25891
5	He is not real.	2020-11-21	1010	21004
6	“Only two?” 😂 https://t.co/OHcalkNGnt	2020-11-24	1004	23054
7	63 | HAATTRICK!!! THIS MAN IS NOT HUMAN!!! #BSCBVB 1-3 htt	2020-11-21	844	10091
8	He's the Golden Boy for a reason	2020-11-21	788	16180
9	Just had to make sure 🤖 https://t.co/xScWp4Taw1	2020-11-21	749	7233
10	The last time we faced Frankfurt...💛🏟️ https://t.co/hlg7Z18Dl	2020-12-04	597	11384

Visualize number of tweets trends

Another area of interest is how tweet activity has evolved over time. Using dplyr we can easily summarize by number of tweets by day.

The volume of tweets was smallest during the international break in early to mid November. BVB does not play games during international breaks because the players are away representing their respective national football teams.

```
tweets %>%
   group_by (date) %>%
   count () %>%
   ggplot (aes (x = date, y = n)) +
      geom_col () +
      geom_label (aes(label = n)) +
      theme_minimal() +
      labs (x="", y = "Number of tweets")
```



3. Analyze Twitter followers

Source followers

Learning about followers for a Twitter handle is also frequently useful.

Two rtweet package functions are helpful here. First, get_followers returns a vector of Twitter user_ids of followers. The lookup_users function then extracts user attributes such as screen name, physical location (if supplied in profile) and number of followers.

The BVB account enjoys 583,000 followers so we will limit to 500 users for this blog entry. This is not a representative sample and is provided for illustrating R's visualization capabilities.

We will also add a row ID ranking each follower by largest number of followers via dplyr's rowid_to_column function.

```
 library(skimr)

followers <- twitter_user %>%
    get_followers() %>%
    head (500) %>%
    pull (user_id) %>%
    lookup_users () %>%
    select (screen_name, name, location, followers_count) %>%
    arrange (-followers_count) %>%
    rowid_to_column("rank")

 skim (followers)
```

Table 1: Data summary

Name	followers
Number of rows	500
Number of columns	5

Column type frequency:

character	3
numeric	2
Group variables	None

Variable type: character

skim_variable	n_missing	complete_rate	min	max	empty	n_unique	whitespace
screen_name	0	1	5	15	0	500	0
name	0	1	0	46	1	500	0
location	0	1	0	30	339	151	0

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
rank	0	1	250.50	144.48	1	125.75	250.5	375.25	500	▇▇▇▇▇
followers_count	0	1	212.32	1636.84	0	1.00	8.0	46.25	30252	▇▁▁▁▁

Top followers

We will first list the 10 largest followers by respective number of followers.

The follower from the sample with the most followers is winnie.

```
   followers %>%
      head (10) %>%
      select (rank, name, location, followers_count) %>%
      gt () %>%
         fmt_number (columns = vars(followers_count), use_seps = T,
decimals = 0)
```

rank	name	location	followers_count
1	Spence Checketts	Salt Lake City, Utah	30,252
2	شوقي		16,916
3	James Fielden	London	9,751
4	11.01🥂🎈	Pretoria, South Africa	3,386
5	feyyaz	Sanliurfa, Turkey	2,802
6	Biyan Rizaldy	Indonesia	2,800
7	Ashwin Appiah	Seattle, WA	2,592
8	TheGreekMamba 🇬🇷🇨🇦	Toronto, Ontario	2,358
9	Likes&Retweets	Nigeria	2,009
10	Dj Irakoze	Kampala, Uganda	1,951

Obtain follower geographic attributes

Another interesting item to research on followers is geographic distribution.

The provided location in Twitter profile is a good starting point. However, locations are neither standardized by level of detail (city, country) nor spelling. Standardization is necessary to group in table or map.

We will standardize at the highest level of detail, which is country, via the Google Maps API and accessed via the ggmaps package. If this is the first time you have accessed the Google Maps API, you will need to complete a one-time step of obtaining a free Google maps API key (instructions here).

```
library (ggmap)

register_google(key = Sys.getenv("GOOGLE_MAPS_API"))

followers_geo <- followers %>%
   mutate_geocode (location, output = "more") %>%
   mutate (
      country = word (address, -1, -1, sep = ","),
      country = str_to_upper (country),
      country = str_trim(country),
      country = ifelse(is.na(country), "NOT LISTED", country)
      ) %>%
   select (rank:followers_count, country, address, lon, lat)

followers_geo
```

```
## # A tibble: 500 x 9
##      rank screen_name name  location followers_count country address
lon
##
##  1     1 spencechec… Spen… "Salt L…           30252 USA     salt l…
-112.
##  2     2 shawkiii14  16916                 ""  شوقي NOT LI…       NA
##  3     3 James_Fiel… Jame… "London"            9751 UK      london…
-0.128
##  4     4 MalomaPale… 11.0… "Pretor…            3386 SOUTH … pretor…
28.2
##  5     5 feyyyaz     feyy… "Sanliu…            2802 TURKEY  şanlıu…
38.8
##  6     6 biyanrizal… Biya… "Indone…            2800 INDONE… indone…
114.
##  7     7 ashwinappi… Ashw… "Seattl…            2592 USA     seattl…
-122.
##  8     8 TheGreekMa… TheG… "Toront…            2358 CANADA  toront…
-79.4
##  9     9 folamisegun Like… "Nigeri…            2009 NIGERIA nigeria
8.68
## 10    10 DeejayIrak… Dj I… "Kampal…            1951 UGANDA  kampal…
32.6
## # … with 490 more rows, and 1 more variable: lat
```

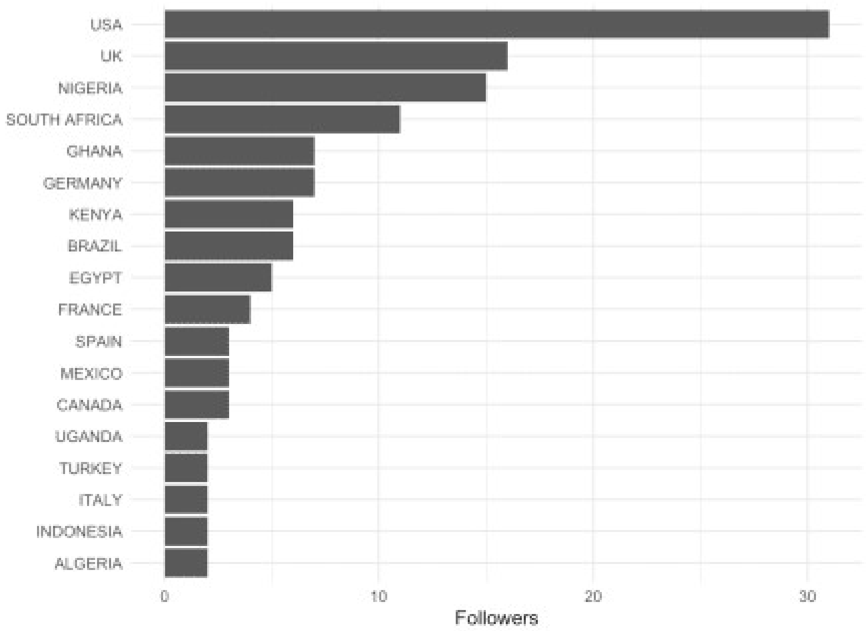
Visualize followers by country

We will first identify the top follower countries and summarize in a GT table.

The largest countries of followers in the sample are US, UK and Nigeria. The wider population for BVB followers of the English language account may be significantly different as the first 500 accounts are pulled, which is not a representative sample. Additionally, many followers of BVB's tweets follow sister accounts in different languages, such as the primary German language Twitter handle.

```
   followers_agg <- followers_geo %>%
      count (country) %>%
      filter (country != "NOT LISTED", n > 1) %>%
      arrange (-n)

   ggplot (followers_agg, aes (x = reorder(country, n), y = n)) +
      geom_col () +
      coord_flip () +
      theme_minimal() +
      labs (x="", y = "Followers")
```



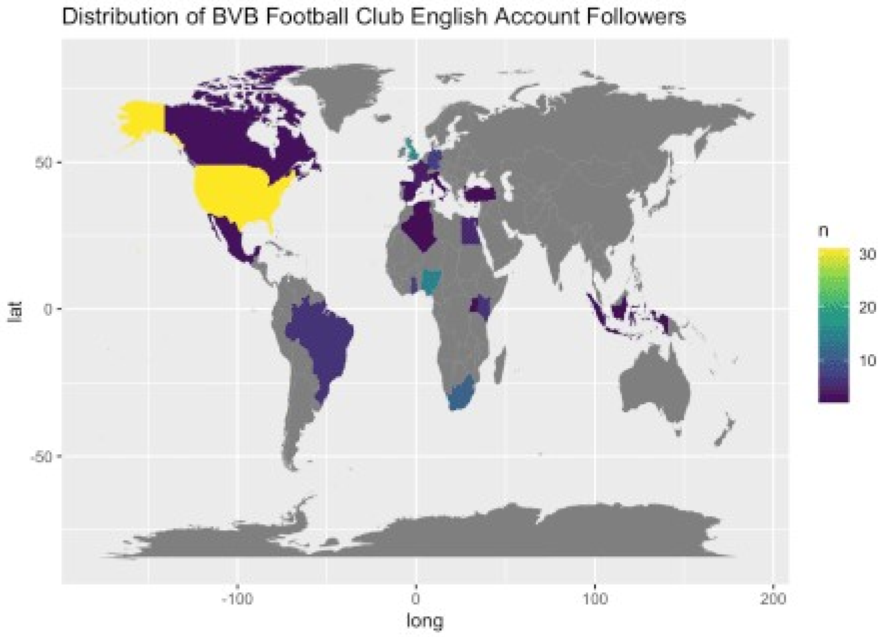
Visualize followers on a map

Next we will convert to a map to enable viewing the location of all users along with countries with most users.

```
   library (maps)

   world <- map_data ("world") %>%
      mutate (region = str_to_upper (region)) %>%
      left_join (followers_agg, by = c("region" = "country"), keep = T)

   world %>%
      ggplot () +
         geom_map (map = world, aes (x = long, y = lat, map_id = region,
fill = n)) +
         scale_fill_viridis_c () +
         theme_grey () +
         labs (title = "Distribution of BVB Football Club English Account
Followers") +
         ggsave ("bvb_map.png", width = 11)
```



4. Potential future analyses

We are only scratching the surface of available Twitter data, subsequent data enrichment from complementary packages and subsequent analytics. Second generation followers (followers of followers) could easily be sourced and subtotaled to identify possible impact from a tweet. Or Twitter users that the account itself follows could also be extracted. Another idea is to convert the R code to Shiny to enable interactivity to efficiently change Twitter handles.

5. Conclusion

R offers many powerful tools to source, analyze and visualize Twitter information. The Twitter API (accessed via the rtweet package) enables free sourcing of follower and tweet attributes that can be easily imported into R. The raw data can then be enriched by sourcing geographic attributes from Google’s API via the ggmap package. Tidyverse package such as dplyr, ggplot and GT can then be leveraged to transform and visualize for insight.