ST445 Managing and Visualizing Data

Working with APIs and Social Media Data

Week 5 Lecture, MT 2017 - Kenneth Benoit, Dr. Akitaka Matsuo

Plan for today

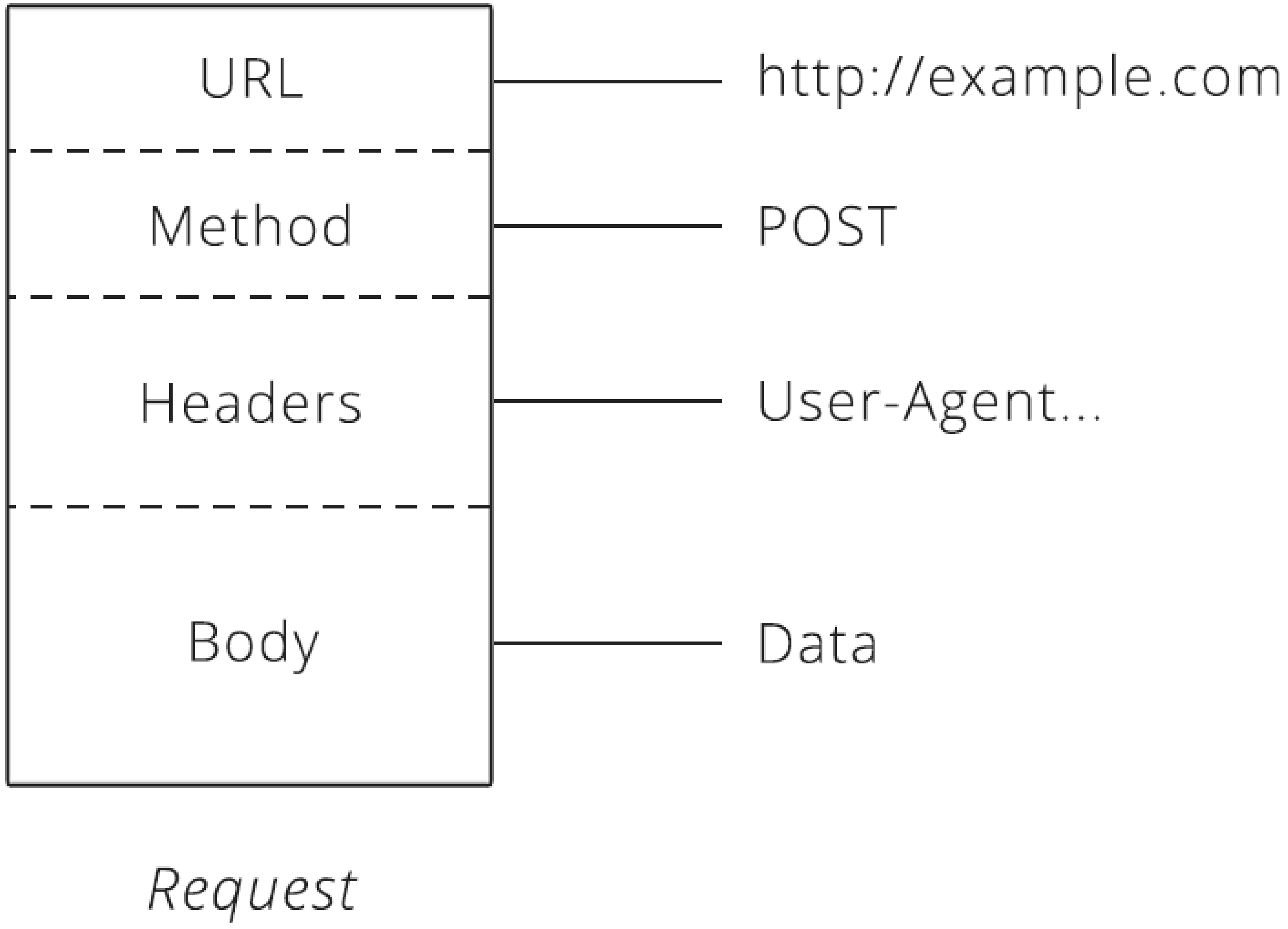
- APIs
- API Examples
- Using the Twitter API
- Working with text

HTTP requests

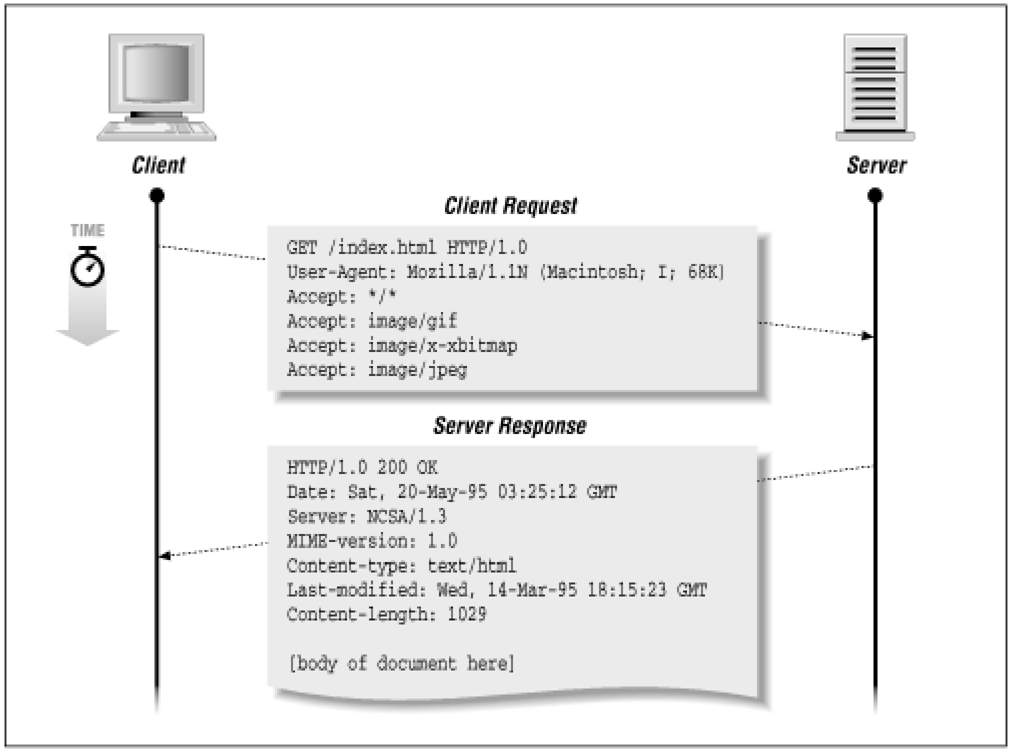
To make a valid request, the client needs to include four things:

1. URL (Uniform Resource Locator)
2. Method: the request "verb"
3. List of Headers
    - meta-information about a request
    - a simple list of items, such as the date-time of the client request, size of the request body, etc.
4. Body: The data tyhe client wants to send the server

structure of an http request



structure of an http request



```
GET /index.html HTTP/1.0
User-Agent: Mozilla/1.1N (Macintosh; I; 68K)
Accept: */*
Accept: image/gif
Accept: image/x-xbitmap
Accept: image/jpeg
```

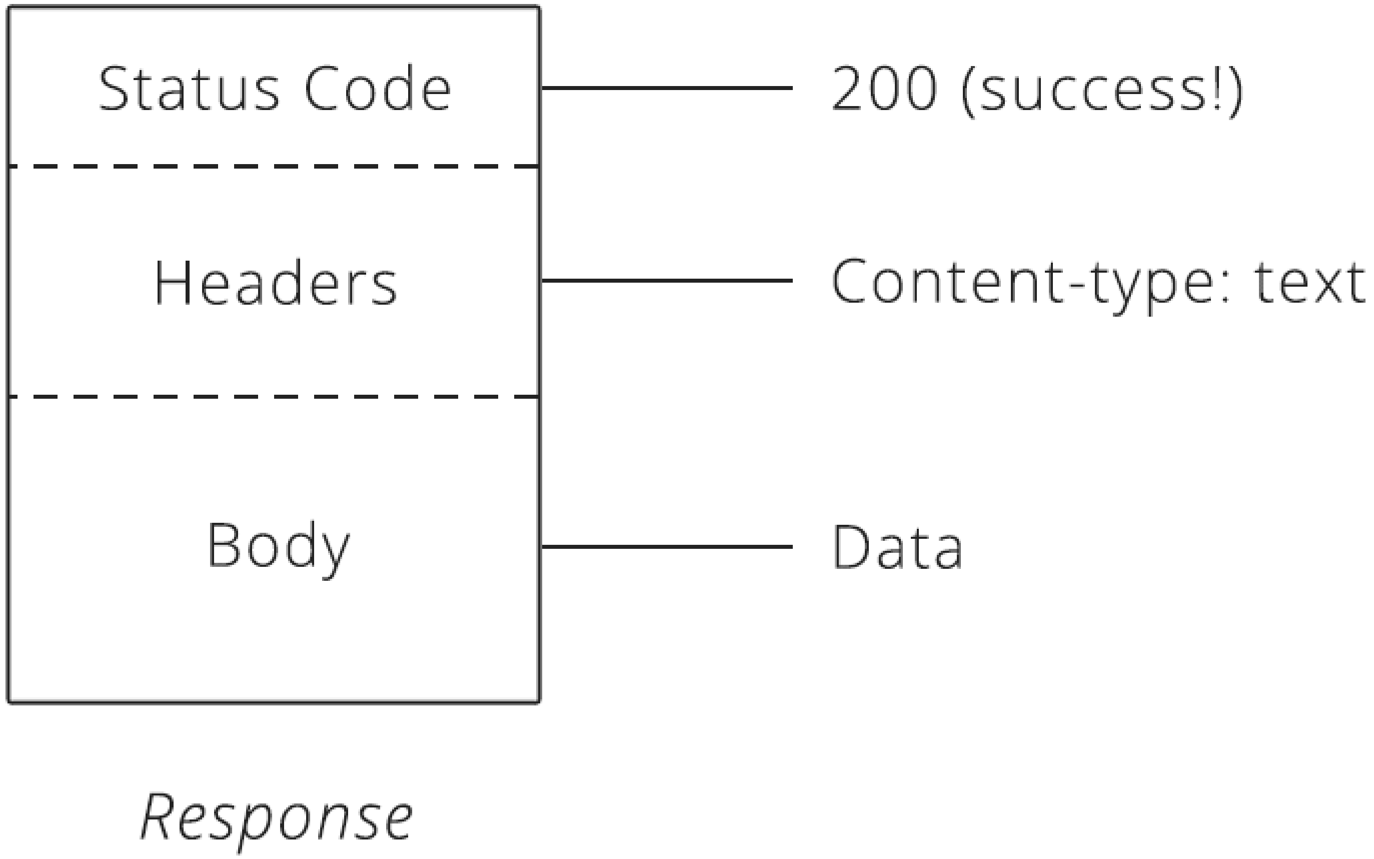
```
HTTP/1.0 200 OK
Date: Sat, 20-May-95 03:25:12 GMT
Server: NCSA/1.3
MIME-version: 1.0
Content-type: text/html
Last-modified: Wed, 14-Mar-95 18:15:23 GMT
Content-length: 1029

[body of document here]
```

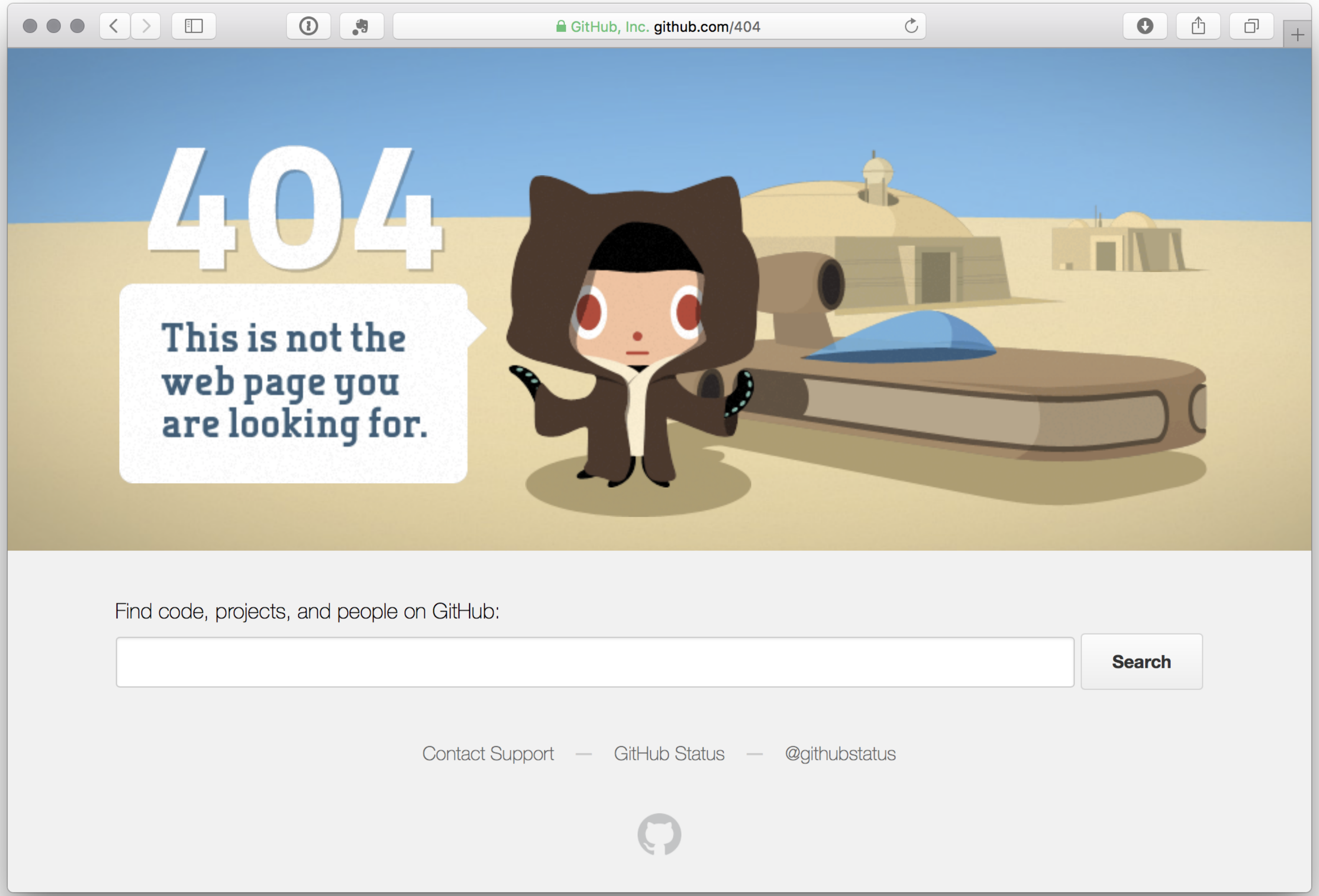
API verbs

- `GET` - Asks the server to retrieve a resource
- `POST` - Asks the server to create a new resource
- `PUT` - Asks the server to edit/update an existing resource
- `DELETE` - Asks the server to delete a resource

structure of an http response



Example: 404 Status Message


GitHub, Inc. github.com/404
404
This is not the web page you are looking for.
Search

Find code, projects, and people on GitHub:

Contact Support — GitHub Status — @githubstatus

(https://github.com/404)

curl

- a general tool to transfer data from or to a server, using one of the application protocols (from last week)
- Originally: "see URL"
- has a ton of options
- a good command-line tool for using APIs

```
KBMacBook:~ kbenoit$ curl www.example.com

<!doctype html>
<html>
<head>
    <title>Example Domain</title>

    <meta charset="utf-8" />
    <meta http-equiv="Content-type" content="text/html; charset=utf-8" />
    <meta name="viewport" content="width=device-width, initial-scale=1" />
    <style type="text/css">
    body {
        background-color: #f0f0f2;
        margin: 0;
        padding: 0;
        font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;

    }

[...]
```

REST APIs

- Representational state transfer (REST)
- "allow requesting systems to access and manipulate textual representations of Web resources using a uniform and predefined set of stateless operations"
- *stateless* means that the communication retains no informatio by either sender or receiver; there is no receipt acknowledged by receiver to the sender
- HTTP is a stateless protocol
- standard APIs are stateless

Examples of commercial data providers' APIs

- Crowdflower (https://success.crowdflower.com/hc/en-us/articles/202703425-CrowdFlower-API-Requests-Guide)
- Facebook (https://developers.facebook.com/docs/)
- LinkedIn (https://developer.linkedin.com/docs/rest-api#)
- Twitter (https://developer.twitter.com/en/docs)
- Instagram (https://www.instagram.com/developer/)
- OpenWeather (https://openweathermap.org/api)
- GitHub (https://developer.github.com/v3/repos/contents/)
- Yelp (https://www.yelp.com/developers/documentation/v3)

Twitter API

The Twitter API can be a powerful tool for your research. Because:

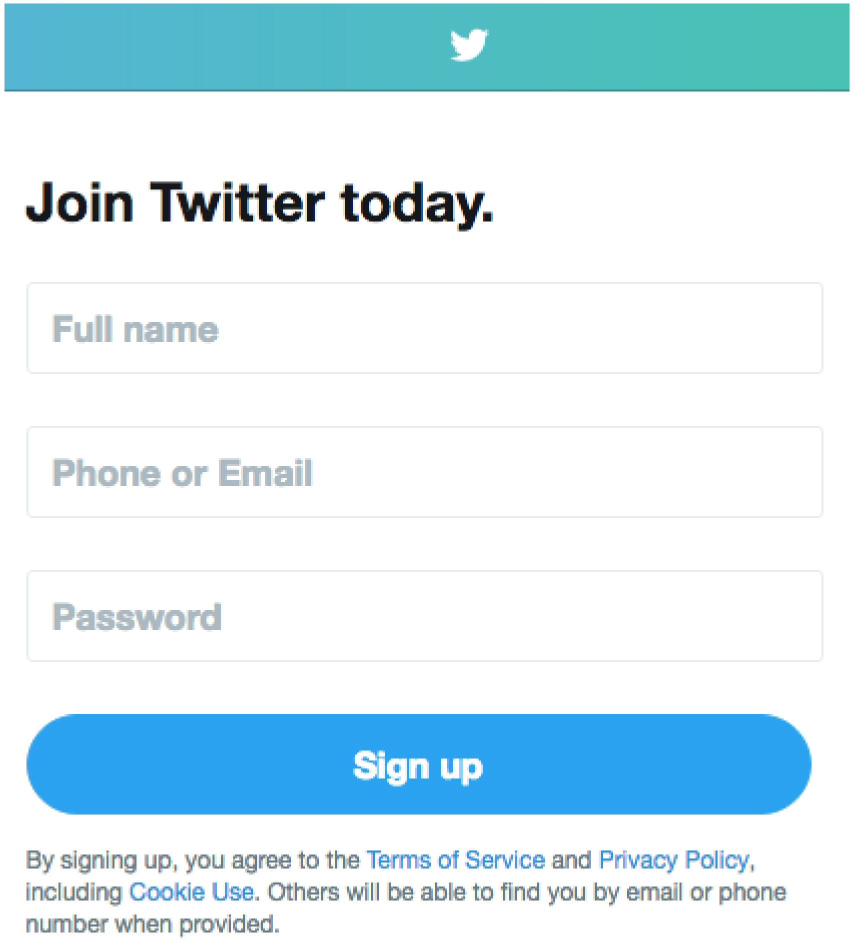
1. Free
2. Easy to access
3. Vast amount of data
    - e.g. more than 20M brexit tweets, especially more than 5M tweets are generated on 23rd June, 2016

Requirement to use Twitter API

1. Twitter account (of course it's free)
2. Programming environment (python or R)
3. Stable internet connection (if you stream tweets)
4. Database solution (DB? flat text?)

Open Twitter accounts

- It's recommended to have a separate account for twitter scraping
- You can open a twitter account using a free email account (e.g. Gmail) https://twitter.com/signup (https://twitter.com/signup)


Join Twitter today.

Full name

Phone or Email

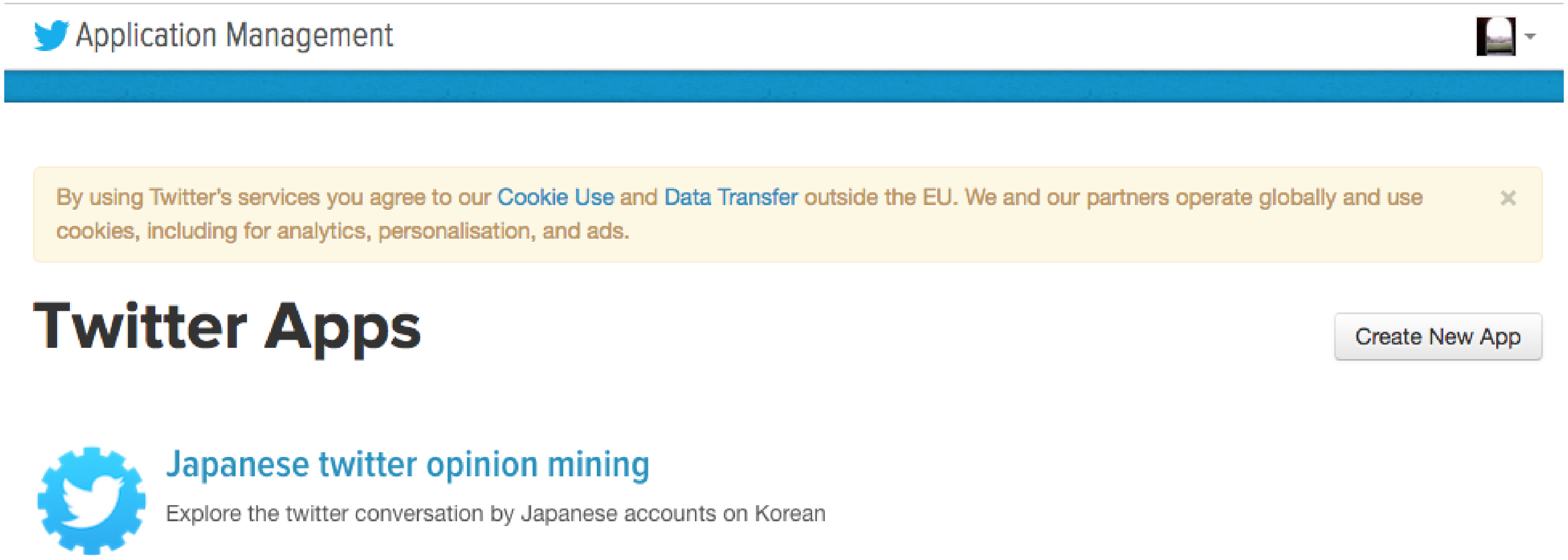
Password

Sign up

By signing up, you agree to the Terms of Service and Privacy Policy, including Cookie Use. Others will be able to find you by email or phone number when provided.

Create an Twitter app

- You can get the API access keys and tokens by registering a web-app for Twitter
- Go to the apps page https://apps.twitter.com/ (https://apps.twitter.com/)
- Create New App



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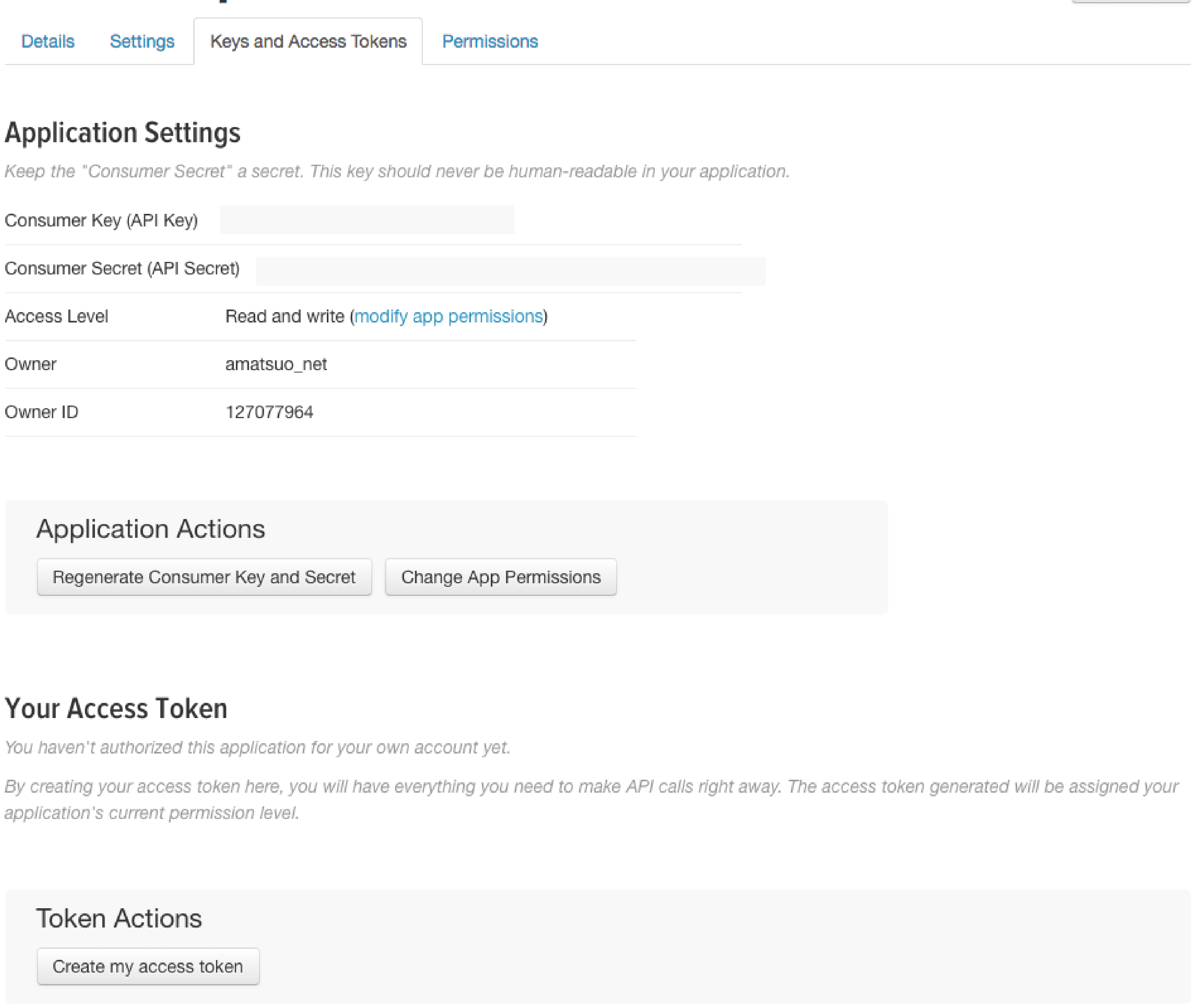
Twitter Apps

Japanese twitter opinion mining

Explore the twitter conversation by Japanese accounts on Korean

Get keys and tokens

- Go to "Keys and Access Tokens" page of the app you've just register
- Generate tokens
- Get 4 pieces of information and store them securely
  - Consumer Key, Consumer Secret, Access Token, Access Token Secret
  - Make sure that everything is copied precisely (nothing left out, no additional space)



Application Settings

Keep the "Consumer Secret" a secret. This key should never be human-readable in your application.

Consumer Key (API Key)	
Consumer Secret (API Secret)	
Access Level	Read and write (modify app permissions)
Owner	amatsuo_net
Owner ID	127077964

Application Actions

Your Access Token

You haven't authorized this application for your own account yet.

By creating your access token here, you will have everything you need to make API calls right away. The access token generated will be assigned your application's current permission level.

Token Actions

Authentication

- The keys used on Twitter are examples of *authentication*
- Most common is the **Oauth** authorization framework
    - enables a third-party application to obtain limited access to an HTTP service
    - provides authentication for a session, typically
    - keys are assigned by the provider, and may exist in various combinations

Twitter APIs

There are many methods, but followings are the ones you are likely to use

- Streaming
- User_timeline
- Users-lookup
- Followers and friends (e.g. network analysis)

API (1): Streaming

- Documentation: Streaming API (https://developer.twitter.com/en/docs/tweets/filter-realtime/api-reference/post-statuses-filter.html)
- Filter and stream up to 1% of tweets
- Based on:
    - twitter accounts (< 5000 ids)
    - keywords (< 400 words)
- Most frequently used for research purpose
    - Because it will give you huge amount of free data

API (2): User Timeline

- Documentation: User_timeline (https://developer.twitter.com/en/docs/tweets/timelines/api-reference/get-statuses-user_timeline.html)
- Returns a collection of the most recent Tweets by a user (up to 3200 tweets)
- Based on:
    - user_id or screen_name

API (3): Users Lookup

- Documentation: Users_lookup (https://developer.twitter.com/en/docs/accounts-and-users/follow-search-get-users/api-reference/get-users-lookup)
  - Returns fully-hydrated user objects for up to 100 users per request, as specified by comma-separated values passed to the user_id and/or screen_name parameters.
  - This method is especially useful when used in conjunction with collections of user IDs of followers and friends.
- Based on:
  - user_id or screen_name

Understanding the rate-limit of APIs

- There are limits in the number of api-calls or amount of the data you can get in a time period
- Examples:
  - Users Lookup (100 users in one call, 1500 users in 15 min)
  - Get followers (5000 users per call, 15 calls in 15 min)
- This looks like a lot, but what if you want to get all followers of 100 very popular accounts... (Katy Perry and Justin Bieber > 100M followers)
  - This means for a large scale analysis you need to set up a program that works very long time without breaking down

Libraries and packages for working with Twitter data

Python

- tweepy (esp for streaming)
- python-twitter
- twython

R

- twitteR (for REST API)
- streamR (for streaming API)

Working Twitter API from R

Authentication

```
In [11]:  require(twitteR)
          source("tw_credential.R")
          # the contents of the credential file is like:
          # api_key <- "***"
          # api_secret <- "***"
          # access_token <- "***"
          # access_token_secret <- "***"

          # authorize the Twitter access
          setup_twitter_oauth(api_key, api_secret, access_token, access_token_secret)
```

```
Loading required package: twitteR

[1] "Using direct authentication"
```

Accessing Uesr-timeline

Get latest tweets from "@POTUS"

```
In [12]: ## downloading 3,200 most recent tweets from the President of United States
         tw <- userTimeline("POTUS", n = 1000, includeRts = TRUE)
         twDf <- twListToDF(tw)
```

```
In [14]: library(stringi)
         twDf[["text"]] <- stri_enc_toascii(twDf[["text"]])
         twDf[1:5, ]
```

text	favorited	favoriteCount	replyToSN	created	trun
#OneAmericaAppeal #USA https://t.co/BmbwA8XtGo	FALSE	9855	NA	2017-10-22 00:20:05	FAL
RT @realDonaldTrump: Trump hails liberation of Raqqa as critical breakthrough in anti-ISIS campaign https://t.co/2eoYXJB7h0	FALSE	0	NA	2017-10-21 16:54:42	FAL
RT @realDonaldTrump: Subject to the receipt of further information, I will be allowing, as President, the long blocked and classified JFK F	FALSE	0	NA	2017-10-21 15:01:52	FAL
RT @FLOTUS: Honored today to donate my inaugural couture piece to the @amhistorymuseum! https://t.co/ENU1BeJA02	FALSE	0	NA	2017-10-21 00:17:28	FAL

text	favorited	favoriteCount	replyToSN	created	trun
RT @fema: Protect yourself against scams after disasters like #CAWildfires &amp; #Maria. If you suspect you're a victim of fraud, call: 800-323	FALSE	0	NA	2017-10-21 00:16:37	FALS

Some simple data exploration

- how many retweets?
- who was retweeted?

In [15]:
```
suppressPackageStartupMessages(library(dplyr))
library(stringr)

table(twDf$isRetweet)
```

```
FALSE  TRUE 
  142   858 
```

```
In [16]: texts <-
             filter(twDf, isRetweet == TRUE) %>%  # select only retweets
             select(text) %>%                     # uses just the text field
             unlist()                             # converts list to simple vector
         head(texts)
```

```
text1  'RT @realDonaldTrump: \032Trump hails liberation of Raqqa as
       critical breakthrough in anti-ISIS campaign\032
       https://t.co/2eoYXJB7h0'
text2  'RT @realDonaldTrump: Subject to the receipt of further
       information, I will be allowing, as President, the long blocked and
       classified JFK F\032'
text3  'RT @FLOTUS: Honored today to donate my inaugural couture
       piece to the @amhistorymuseum! https://t.co/ENU1BeJA02'
text4  'RT @fema: Protect yourself against scams after disasters like
       #CAWildfires &amp; #Maria. If you suspect you\'re a victim of
       fraud, call: 800-323\032'
text5  'RT @VP: By lowering the business tax rate under @POTUS\' tax
       reform plan, American companies will be more competitive on
       the world stage. ht\032'
text6  'RT @SecShulkin: .@POTUS @realDonaldTrump and I remain
       focused on providing the best possible care to our nations
       #Veterans https://t.co/AIr\032'
```

```
In [22]: str_extract_all(texts, "@\\w+") %>%  # regular expression
             unlist() %>%                       # because str_extract_all returns a list of c
         haracters
             table() %>%                        # constructs a frequency table
             sort(decreasing = TRUE) %>%        # sorts in order of descending frequency
             head(20)                           # shows first 20 most frequent usernames ment
         ioned
```

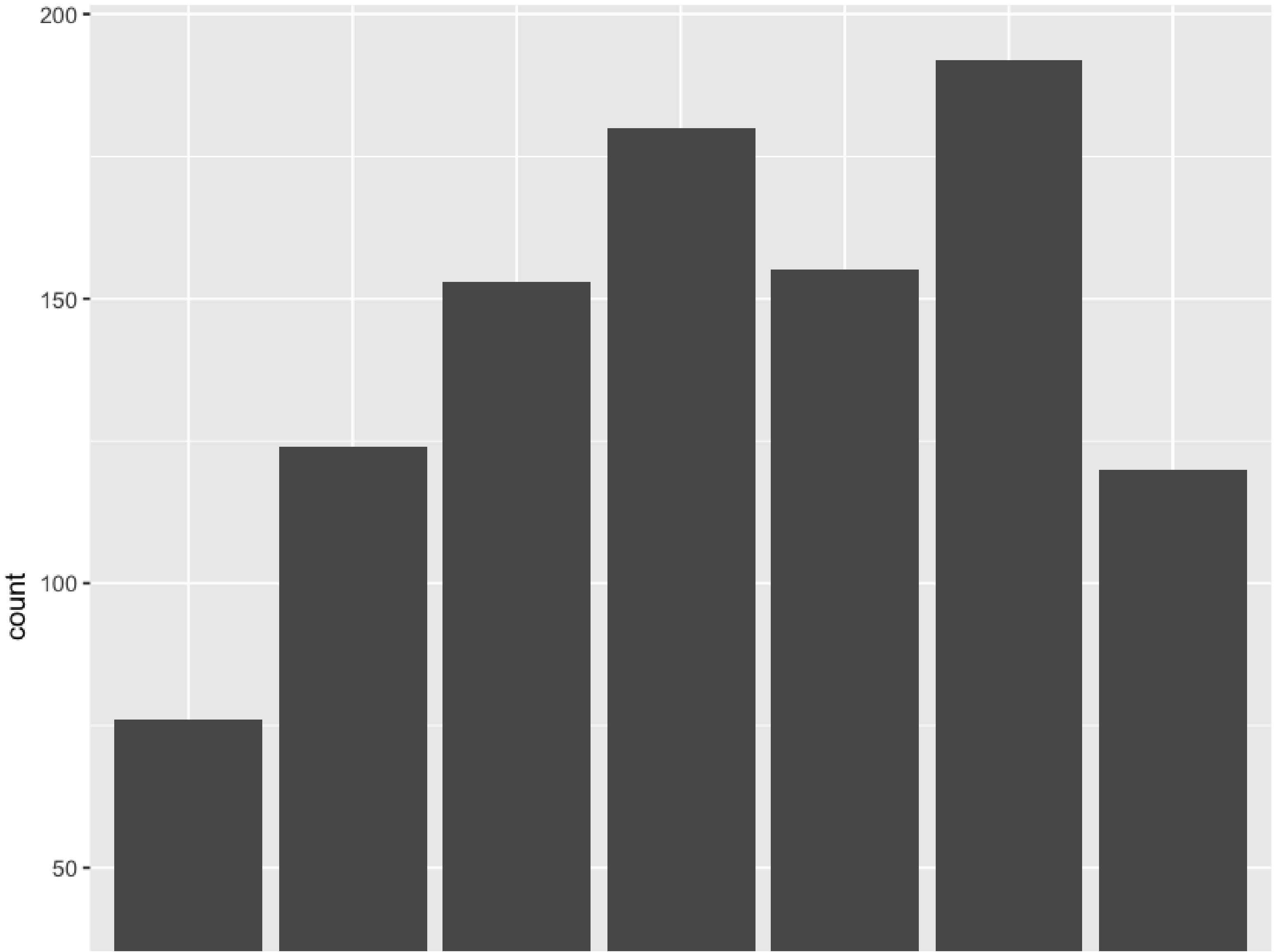
```
.
@realDonaldTrump            @POTUS               @VP       @WhiteHouse
             382               230               137                95
         @FLOTUS        @Scavino45      @IvankaTrump         @PressSec
              71                71                42                24
         @USNavy  @SecretaryPerry       @SecShulkin             @FEMA
              17                15                14                11
      @GOPLeader       @SecPriceMD      @marcorubio               @UN
              10                10                 9                 9
           @fema       @FLGovScott @RicardoRossello       @SecondLady
               8                 8                 8                 8
```

Some simple data exploration

- which month?

In [64]:
```
library(lubridate)
library(ggplot2)

twDf[["month"]] <- month(twDf$created, label = TRUE)
ggplot(twDf, aes(month)) + geom_bar()
```

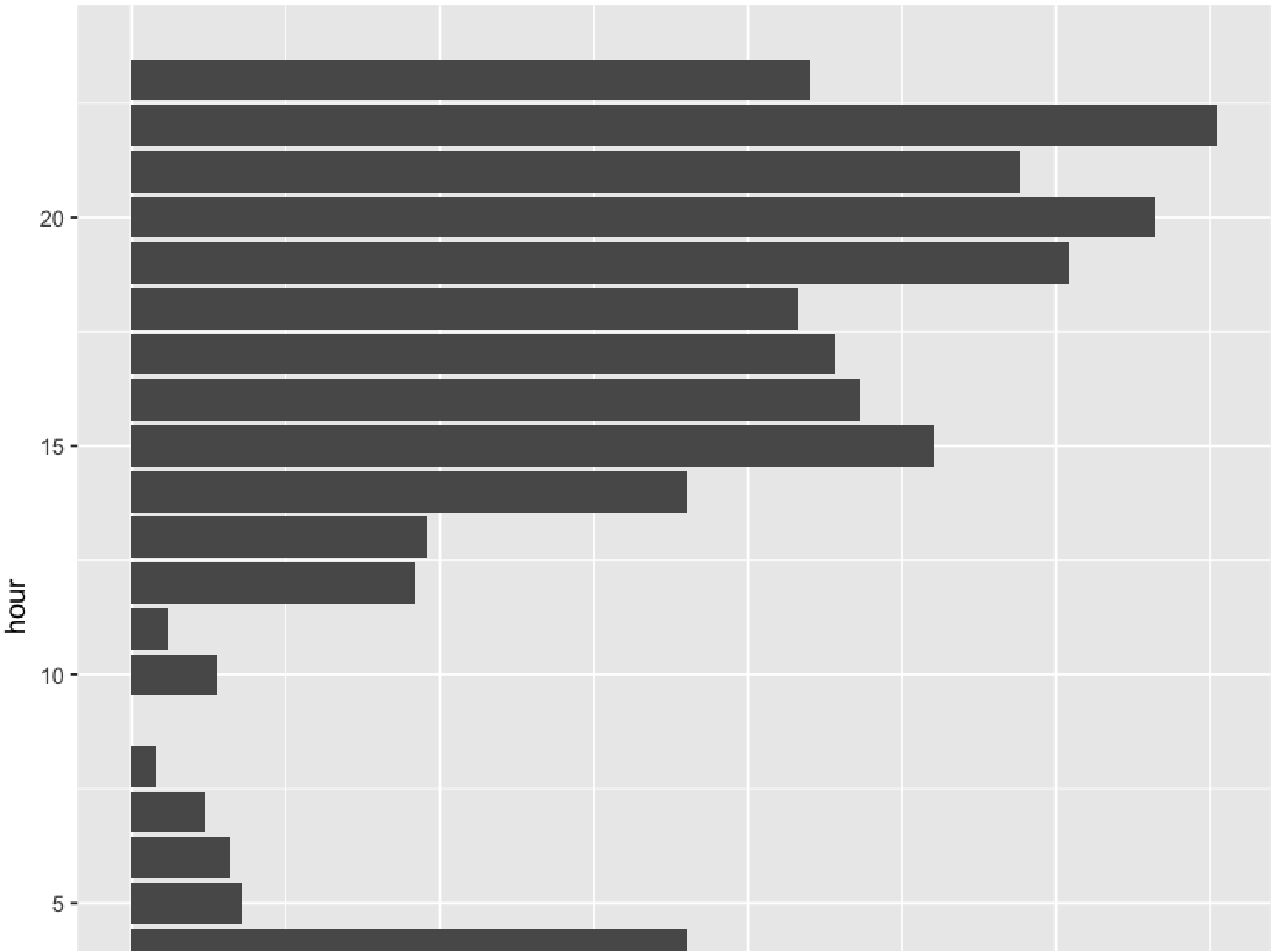


Some simple data exploration

- time of the day?

In [67]:
```
library(lubridate)
library(ggplot2)

twDf[["hour"]] <- hour(twDf[["created"]])
ggplot(twDf, aes(hour)) + geom_bar() + coord_flip()
```



Get some user infomation using `lookupUsers()`

1. extract screen_names from retweeted accounts (30 most retweeted)
2. get the information of these accounts

```
In [69]: rt_user_screen_names <-
            str_replace(texts, "\\n", " ") %>%
            str_replace("^RT\\s*@([[:alnum:]]+).+", "\\1") %>%
            table %>%
            sort(decreasing = T) %>%
            head(30) %>%
            names()
         rt_user_screen_names
         ## FoxNews and foxandfriends are there...
```

```
'realDonaldTrump'  'VP'  'Scavino45'  'WhiteHouse'  'FLOTUS'
'IvankaTrump'  'PressSec'  'SecShulkin'  'SecretaryPerry'  'GOPLeader'
'USNavy'  'SBALinda'  'SecondLady'  'SecPriceMD'  'SHSanders45'
'StateDept'  'foxandfriends'  'FoxNews'  'marcorubio'  'netanyahu'
'TRUCKINGdotORG'  'fema'  'FLGovScott'  'ricardorossello'
'SecretaryAcosta'  'TomBossert45'  'AmbasciataUSA'  'AmericanLegion'
'ESAGovAffairs'  'GovAbbott'
```

Get some user infomation using `lookupUsers()`

1. extract screen_names from retweeted accounts (30 most retweeted)
2. get the information of these accounts

In [70]:
```
library(stringi)
rt_user_information <-
   lookupUsers(rt_user_screen_names) %>%
   twListToDF()
rt_user_information <- rt_user_information %>%
   mutate(description = stri_trans_general(description, "latin-ascii"))
```

Check data

- Who has most followers?

In [9]:
```
rt_user_information %>% select(c("screenName", "followersCount")) %>%
  arrange(desc(followersCount))
```

screenName	followersCount
realDonaldTrump	40996784
NASA	26712586
FoxNews	16220441
WhiteHouse	15715928
FLOTUS	8736466
StateDept	4780381
IvankaTrump	4726903
VP	4720429
marcorubio	3151582
PressSec	2230210
netanyahu	1157393
foxandfriends	1055251
USNavy	965902
fema	696856
SenateMajLdr	322124
CENTCOM	286262
SecondLady	269889

Check data

- Who has most tweets?

In [10]:
```
rt_user_information %>%
  select(c("screenName", "statusesCount")) %>%
  arrange(desc(statusesCount))
```

screenName	statusesCount
FoxNews	337630
foxandfriends	73905
StateDept	50373
NASA	49210
realDonaldTrump	36172
ricardorossello	34395
USNavy	23760
IvankaTrump	13646
fema	13555
CENTCOM	10088
FLGovScott	9453
GOPLeader	8870
marcorubio	7164
TRUCKINGdotORG	5394
netanyahu	2944
VP	2625

Coming soon

- **Lab**: Working with Twitter data and text
- **Week 7**: Data visualization (in Python)
- Recommended: Read up on Python
- MY429: Quantitative Text Analysis