Open knowledge in R with Wikimedia APIs

Follow along at `git.io/vSi6a`

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Wikimedia Foundation

Introduction

Wikimedia Foundation is a non-profit that operates free & open projects like Wikipedia, Wiktionary, and Wikidata that anyone can contribute to

No time to talk about me (plus that's always the boring part)[1]

A Markdown copy of this deck is at git.io/vSi6a for following along

R packages required to follow along:

```
install.packages(
  c("magrittr", "rvest", "xml2"
    "pageviews", "WikipediR", "WikidataR",
    "WikidataQueryServiceR"),
  repos = c(CRAN = "https://cran.rstudio.com")
)
```

[1] If you're **really** curious just search for User:MPopov (WMF) on Meta-Wiki

Session Info

- Running R 3.4.0 on macOS Sierra 10.12.5
- Rendered with rmarkdown 1.5 and knitr 1.16
- The pipe (%>%) from magrittr is **occasionally** used
- Using the following versions of packages for demos:

Package	Version	Imports
pageviews	0.3.0	jsonlite, httr, curl
WikipediR	1.5.0	httr, jsonlite
WikidataR	1.3.0	httr, jsonlite, WikipediR, utils
WikidataQueryServiceR	0.1.1	httr, dplyr, jsonlite

Wikipedia

Wikipedia is a free encyclopedia that anyone can edit

You may have heard of it

It is available in 296 languages

English Wikipedia has over 5.3 million articles

Wikipedia is powered by MediaWiki, which includes an API that makes it fast and easy to fetch content

WikipediR

WikipediR is a wrapper for MediaWiki API but aimed at Wikimedia's wikis such as Wikipedia. It can be used to retrieve page text, information about users or the history of pages, and elements of the category tree.

```
library(WikipediR); library(magrittr)
r_wiki <- page_content(
  language = "en",
  project = "wikipedia",
  page_name = "R (programming language)"
)
r_releases <- r_wiki$parse$text$`*` %>%
  xml2::read_html() %>%
  xml2::xml_find_first(".//table[@class='wikitable']") %>%
  rvest::html_table()
```

Release	Date	Description
0.16		This is the last alpha version developed...
0.49	1997-04-23	This is the oldest source release which ...
0.60	1997-12-05	R becomes an official part of the GNU Pr...
0.65.1	1999-10-07	First versions of update.packages and in...
1.0	2000-02-29	Considered by its developers stable enou...
1.4	2001-12-19	S4 methods are introduced and the first ...
2.0	2004-10-04	Introduced lazy loading, which enables f...
2.1	2005-04-18	Support for UTF-8 encoding, and the begi...
2.11	2010-04-22	Support for Windows 64 bit systems....
2.13	2011-04-14	Adding a new compiler function that allo...
2.14	2011-10-31	Added mandatory namespaces for packages....
2.15	2012-03-30	New load balancing functions. Improved s...
3.0	2013-04-03	Support for numeric index values 231 and...

MediaWiki-powered sites' APIs

- Use `language` and `project` arguments for Wikimedia's wikis[2]
- Use `domain` for everything else, such as:
  - Project Gutenberg's wiki:
    `domain = "www.gutenberg.org/w/api.php"`
  - Mozilla Foundation's wiki:
    `domain = "wiki.mozilla.org/api.php"`
  - Geek Feminism wiki:
    `domain = "geekfeminism.wikia.com/api.php"`
  - A Wiki of Ice and Fire:
    `domain = "awoiaf.westeros.org/api.php"`
- **Tip**: if using `random_page`, specify `namespaces = 0` to only get articles

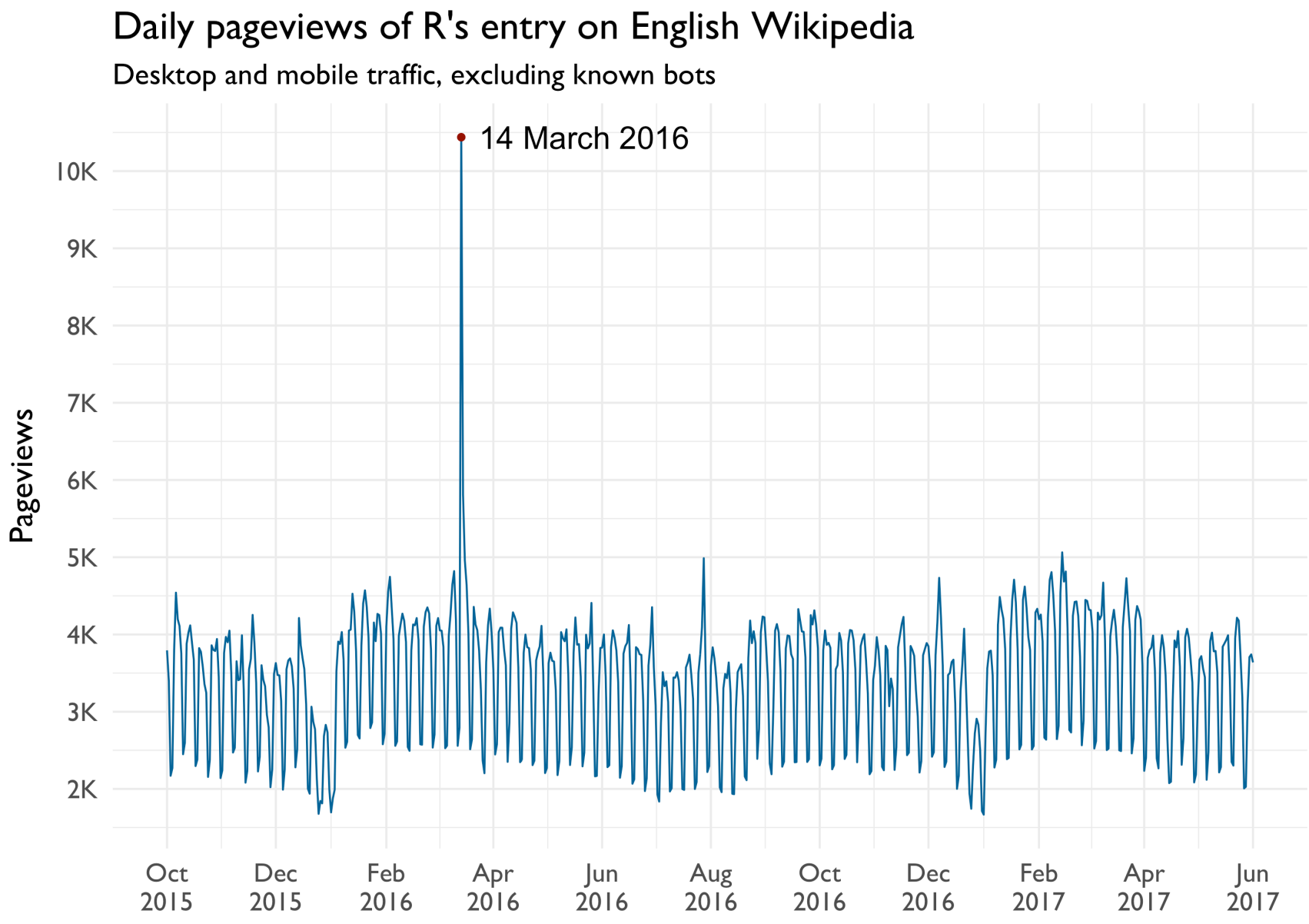
[2] Currently: Commons, Wikivoyage, Wikiquote, Wikisource, Wikibooks, Wikinews, Wikiversity, Wikispecies, MediaWiki, Meta-Wiki, Wiktionary

Pageviews

WMF provides an API for accessing daily and monthly pageviews of any article on any project for counts from 2015 onwards.[3] The package pageviews allows you to get those counts in R:

```
library(pageviews)
r_pageviews <- article_pageviews(
  project = "en.wikipedia",
  article = "R (programming language)",
  user_type = "user", start = "2015100100",
  end = format(Sys.Date() - 1, "%Y%m%d00")
)
```

[3] wikipediatrend package wraps the stats.grok.se API which has historical Wikipedia pageview data for 2008 up to 2016 from these pageview count dumps


Daily pageviews of R's entry on English Wikipedia
Desktop and mobile traffic, excluding known bots
14 March 2016
Pageviews
10K
9K
8K
7K
6K
5K
4K
3K
2K
Oct 2015
Dec 2015
Feb 2016
Apr 2016
Jun 2016
Aug 2016
Oct 2016
Dec 2016
Feb 2017
Apr 2017
Jun 2017

Wikidata

- Wikidata is a language-agnostic open knowledge base
- Facts are expressed as 3-part statements:
    - Subject (resource)
    - Predicate (property type)
    - Object (property value, can be another resource)
- Examples:
    - "R" (Q206904) is an "instance of" (P31) a "programming language" (Q9143)
    - "RStudio" (Q4798119) was "programmed in" (P277) "C++" (Q2407)
    - "Portland" (Q6106) had a "population" (P1082) of 583,776 (in 2010)
- Resources and properties have unique numeric identifiers but can have human-friendly labels in any language

WikidataR

```
library(WikidataR)
r_search <- find_item("R")[[8]]
r_search[c("id", "description")] # check the results
```

```
## $id
## [1] "Q206904"
##
## $description
## [1] "programming language for statistical computing"
```

```
property <- get_property("P31")[[1]]
property$labels$`en`$value # check that we want P31
```

```
## [1] "instance of"
```

```
r_item <- get_item(r_search$id)[[1]]
r_item$claims$P31$mainsnak$datavalue$value$id
```

```
## [1] "Q9143"     "Q341"      "Q20825628" "Q28920142" "Q383950
## [7] "Q1993334"  "Q24529812"
```

This tells us that R is an instance of Q9143, Q341, Q20825628, Q28920142, Q3839507, Q12772052, Q1993334, Q24529812. Great?

Wikidata Query Service (WDQS)

- Allows querying Wikidata with SPARQL
- Provides a public SPARQL endpoint usable via:
  - Web front-end: query.wikidata.org
  - Web API
    (`https://query.wikidata.org/sparql?query=<SPARQL>`)
  - In Python with SPARQLWrapper
  - In R with:
    - SPARQL package
    - WikidataQueryServiceR
- For useful reference links, see

```
help("WDQS", package = "WikidataQueryServiceR")
```

Basic SPARQL Example

```
# PREFIXes are optional when using WDQS
PREFIX wd: <http://www.wikidata.org/entity/>
PREFIX wdt: <http://www.wikidata.org/prop/direct/>
PREFIX wikibase: <http://wikiba.se/ontology#>
PREFIX bd: <http://www.bigdata.com/rdf#>

SELECT DISTINCT ?instanceOfLabel
WHERE {
  wd:Q206904 wdt:P31 ?instanceOf .
  SERVICE wikibase:label {
    bd:serviceParam wikibase:language "en"
  }
}
```

```
library(WikidataQueryServiceR)
query_wikidata('SELECT DISTINCT ?instanceOfLabel
WHERE {
  wd:Q206904 wdt:P31 ?instanceOf .
  SERVICE wikibase:label {
    bd:serviceParam wikibase:language "en"
  }
}') %>% head(5)
```

```
##                       instanceOfLabel
## 1                 programming language
## 2                       free software
## 3 multi-paradigm programming language
## 4                 interpreted language
## 5     functional programming language
```

```
query_wikidata('SELECT DISTINCT ?instanceOfLabel
WHERE {
  wd:Q206904 wdt:P31 ?instanceOf .
  SERVICE wikibase:label {
    bd:serviceParam wikibase:language "fr"
  }
}') %>% head(5)
```

```
##            instanceOfLabel
## 1                Q28920142
## 2 langage de programmation
## 3          logiciel libre
## 4 logiciel de statistiques
## 5       langage interprété
```

Advanced SPARQL Example

- Prefix `wd:` points to an entity
- Prefix `p:` points not to the object, but to a statement node
- Prefix `ps:` within the statement node retrieves the object (value)
- Prefix `pq:` within the statement node retrieves the qualifier info

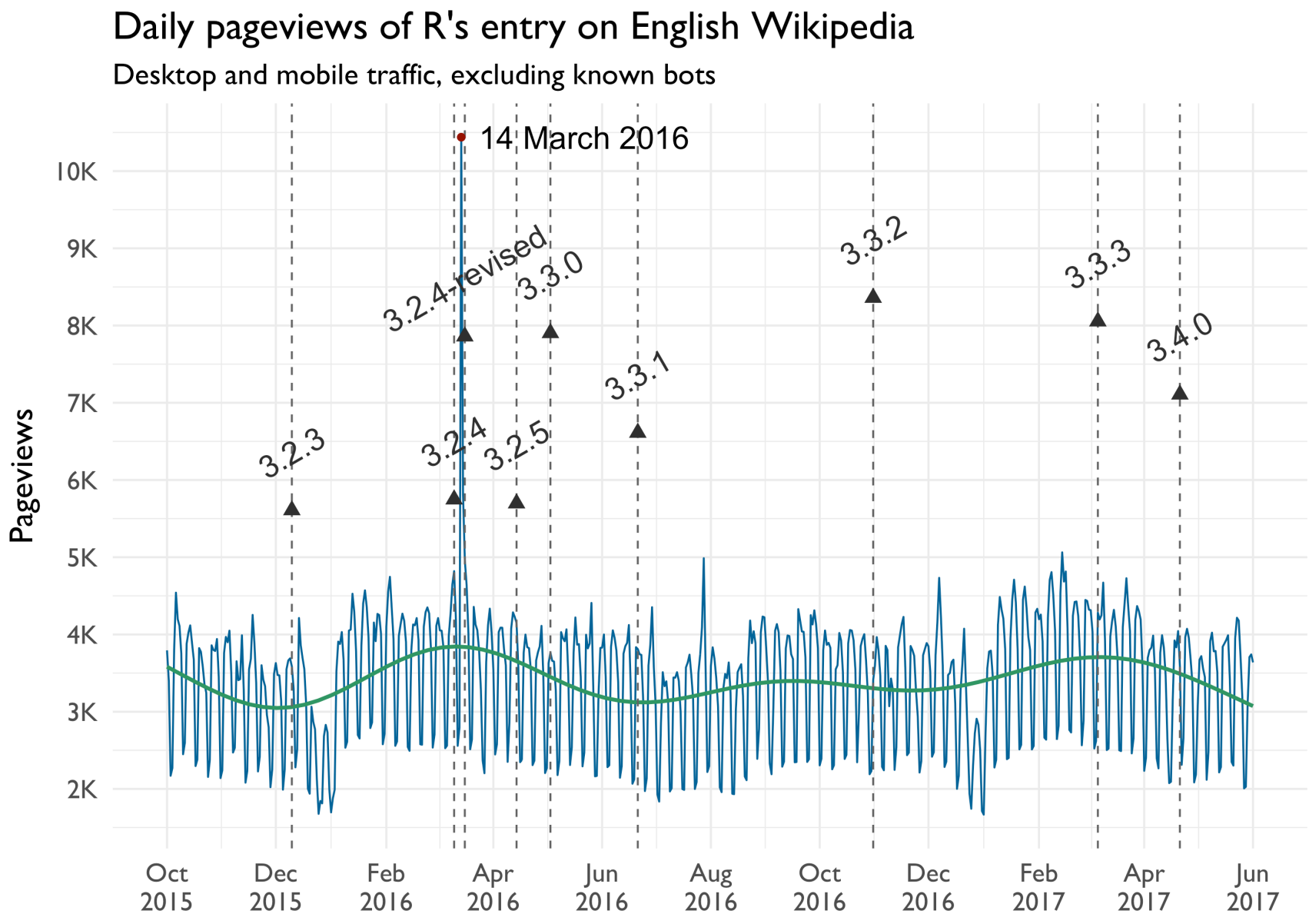
```
r_versions_query <- "SELECT DISTINCT
  ?softwareVersion ?publicationDate
WHERE {
  BIND(wd:Q206904 AS ?R)
  ?R p:P348 [
    ps:P348 ?softwareVersion;
    pq:P577 ?publicationDate
  ] .
}"
```

```
r_versions_results <- query_wikidata(
  r_versions_query, format = "smart"
)
# "smart" mode formats the datetime columns
head(r_versions_results, 3)
```

```
##   softwareVersion publicationDate
## 1           3.3.3      2017-03-06
## 2           3.1.0      2014-04-10
## 3           3.1.2      2014-10-31
```

```
range(r_versions_results$publicationDate)
```

```
## [1] "2000-02-29 GMT" "2017-04-21 GMT"
```


Daily pageviews of R's entry on English Wikipedia
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5K
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3K
2K
3.2.3
3.2.4-revised
3.2.4
3.2.5
3.3.0
3.3.1
3.3.2
3.3.3
3.4.0
Oct 2015
Dec 2015
Feb 2016
Apr 2016
Jun 2016
Aug 2016
Oct 2016
Dec 2016
Feb 2017
Apr 2017
Jun 2017

Final Remarks

Source for the whole shebang is up on GitHub: bearloga/wmf,[4] available under CC BY-SA 4.0

Sorry for not leaving time for questions! If you have any, here's my

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[4] Specifically: wmf/presentations/talks/Cascadia R Conference 2017/