Web scraping in R

Ujang Fahmi

KEDATA

Tujuan

UMUM

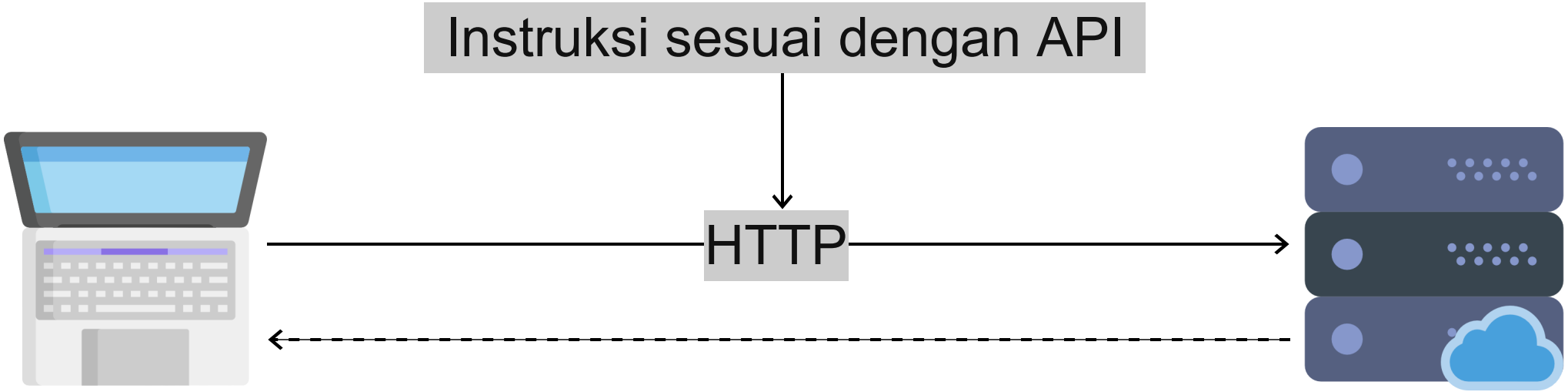
1. Apa web Scraping?
2. Mengapa kita perlu melakukan web Scraping?
3. Bagaimana cara melakukan web Scraping?
4. Prinsip Kerja web Scraping di R dengan paket rvest

KHUSUS

1. Scraping table
2. Scraping static webpage
3. Scraping multipage
4. Storing scraped data in data frame

Apa web Scraping?

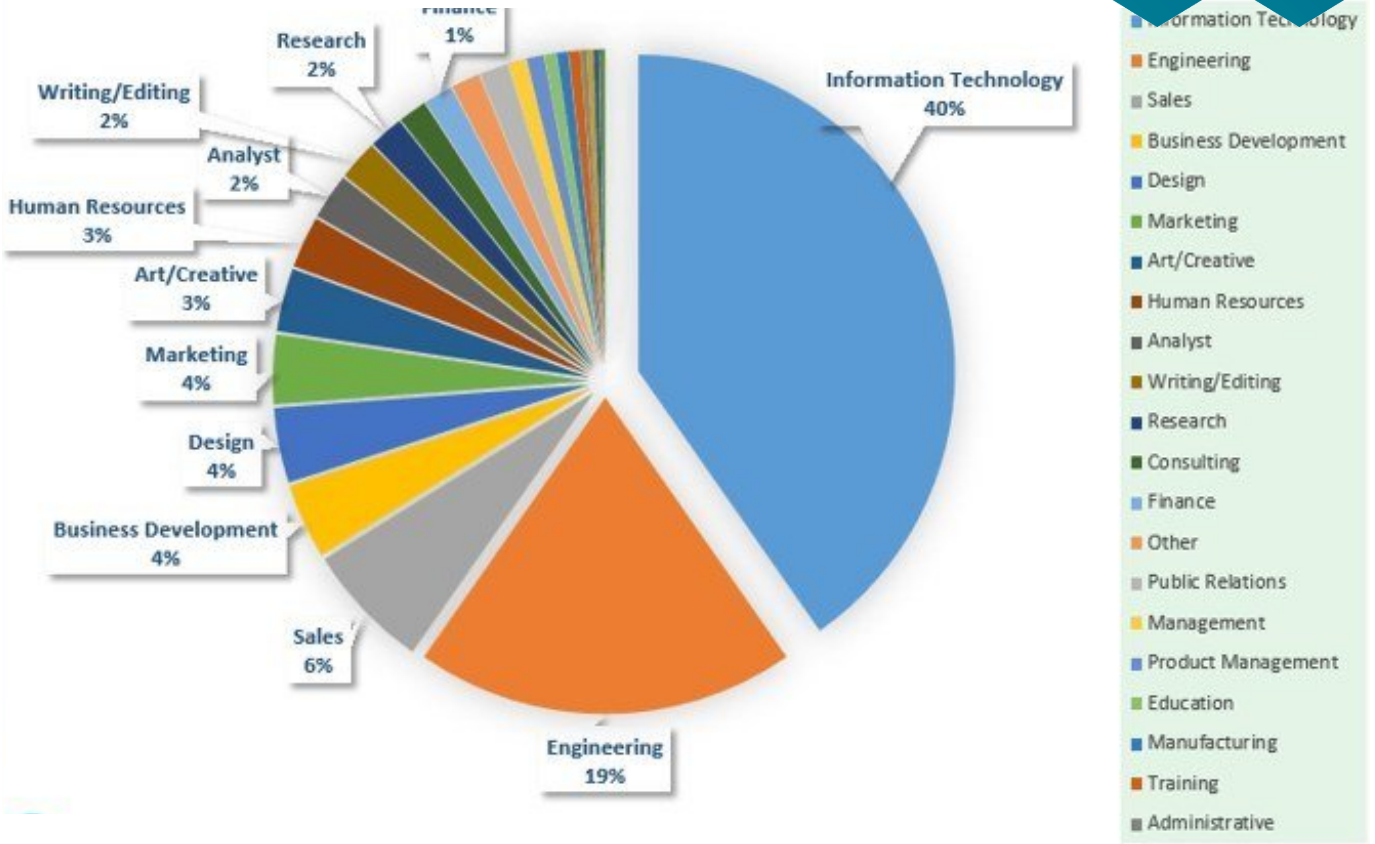
Web scraping, data scraping, web *extraction* adalah proses mengekstrak data dari halaman sebuah website dengan memanfaatkan beberapa teknik seperti *copy paste*, *html parsing*, *DOM parsing*, dan lain-lain.



Mengapa Scraping diperlukan?

Data is new differentiator
Bernard Marr, Forbes

An essential skill to acquire in today's digital world



Bagaimana Scraping di R?

1. Download html using `read_html()`
2. Extract specific nodes using `html_nodes()`
3. Extract element of a nodes using `html_text()`, `html_atr()`, `html_table()`, etc.
4. Pre-process

Menggunakan xpath dan css nodes

```xml
<?xml version="1.0" encoding="UTF-8"?>

<bookstore>

<book>
  <title lang="en">Harry Potter</title>
  <price>29.99</price>
</book>

<book>
  <title lang="en">Learning XML</title>
  <price>39.95</price>
</book>

</bookstore>
```

Expression	Result
nodename	Selects all nodes with the name "*nodename*"
/	Selects from the root node
//	Selects nodes in the document from the current node that match the selection no matter where they are
.	Selects the current node
..	Selects the parent of the current node
@	Selects attributes

Menggunakan xpath dan css nodes

Path Expression	Result
bookstore	Selects all nodes with the name "bookstore"
/bookstore	Selects the root element bookstore Note: If the path starts with a slash (/) it always represents an absolute path to an element!
bookstore/book	Selects all book elements that are children of bookstore
//book	Selects all book elements no matter where they are in the document
bookstore//book	Selects all book elements that are descendant of the bookstore element, no matter where they are under the bookstore element
//@lang	Selects all attributes that are named lang
//book/title | //book/price	Selects all the title AND price elements of all book elements

Contoh xpath

Mendaparkan judul artikel bagian *most shared* dari laman https://www.kdnuggets.com/news/top-stories.html

```
1  library(tidyverse)
2  library(rvest)
3
4  page <- read_html("https://www.kdnuggets.com/news/top-stories.html")
5
6  # xpath
7  page %>%
8    html_nodes(xpath = "//ol[1]/li/a/b") %>%
9    html_text(trim = TRUE)
10
11 page %>%
12   html_nodes(xpath = "//ol[1]//li//a") %>%
13   html_attr("href") %>%
14   ifelse(. == " ", NA, .)
```

Menggunakan xpath dan cssnodes

Selector	Example	Example description
.class	.intro	Selects all elements with class="intro"
.class1.class2	...	Selects all elements with both *name1* and *name2* set within its class attribute
element>element	div > p	Selects all <p> elements where the parent is a element
element+element	div + p	Selects all <p> elements that are placed immediately after elements
:nth-child(*n*)	p:nth-child(2)	Selects every <p> element that is the second child of its parent
element1~element2	p ~ ul	Selects every element that are preceded by a <p> element
element,element	div, p	Selects all elements and all <p> elements

Contoh css

Menggunakan css selector

```r
library(tidyverse)
library(rvest)

page <- read_html("https://www.kdnuggets.com/news/top-stories.html")

page %>%
  html_nodes(css = "ol:nth-child(3) > li > a > b") %>%
  html_text(trim = TRUE) %>%
  data_frame()

page %>%
  html_nodes(css = "ol:nth-child(3) > li > a") %>%
  html_attr("href") %>%
  data_frame()
```

Multiple Page 1

halaman → https://jdih.dprd-diy.go.id/?cat=5

halaman 1 → https://jdih.dprd-diy.go.id/?pagenum=2&totalrow=27&cat=5

halaman 2 → https://jdih.dprd-diy.go.id/?pagenum=2&totalrow=27&cat=5

baseurl	nomor halaman	endurl
https://jdih.dprd-diy.go.id/?pagenum=	angka halaman	&totalrow=27&cat=5

Multiple Page 2

```r
library(rvest)

baseurls <- "https://jdih.dprd-diy.go.id/?pagenum="
page <- (0:2)
endurls <- "&totalrow=27&cat=5"

# list kosong
urls <- list()

# membuat daftar urls
for (i in seq_along(page)) {
  url<- paste0(baseurls, page[i], endurls)
  urls[[i]] <- url
}
```

Target: Membuat daftar url yang akan diambil datanya

```r
# list kosong untuk menampung hasil
undang2 <- list()

# loop over the urls and get the table from each page
for (i in seq_along(urls)) {
  pages <- read_html(urls[[i]])

  tentang <- pages %>%
    html_nodes("tr:nth-child(3) td~ td+ td") %>%
    html_text(trim = TRUE) %>%
    data_frame()

  download <- pages %>%
    html_nodes("tr:nth-child(6) > td") %>%
    html_node("a") %>%
    html_attr("href") %>%
    ifelse(. == " ", NA, .) %>%
    data_frame()

  download$. <- paste0("https://jdih.dprd-diy.go.id/", download$.)
  undang <- bind_cols(tentang, download)
  undang2[[i]] <- undang
}
```

Target: mengambil elemen teks tentang dan downoad dari tiap halaman

Scraping tabel

```r
library(rvest)
library(tidyverse)

pages <- read_html("http://www.dpr.go.id/jdih/pp")

hasil <- html_nodes(pages, "table") [[1]] %>%
  html_table()

hasil <- pages %>%
  html_nodes("table") %>%
  html_table()

hasil <- hasil[[1]]

pages %>%
  html_nodes("table") %>%
  html_table()
```

Target: mengambil tabel dan isinya dari sebuah halaman website

Rangkuman

1. Scraping bisa dilakukan di R
2. Scraping memanfaatkan css nodes dan atau xpath nodes
3. Tidak ada nodes yang lebih baik, terkadang kita harus mencobanya dan melihat hasilnya
4. Melihat perubahan urls merupakan strategi umum yang bisa digunakan untuk melakukan scraping dari beberpa halaman
5. Nodes untuk tabel umumnya adalah table, jika banyak bisa diurukan tabel ke berapa
6. Sering mencoba (praktik)