POIR 613: Computational Social Science

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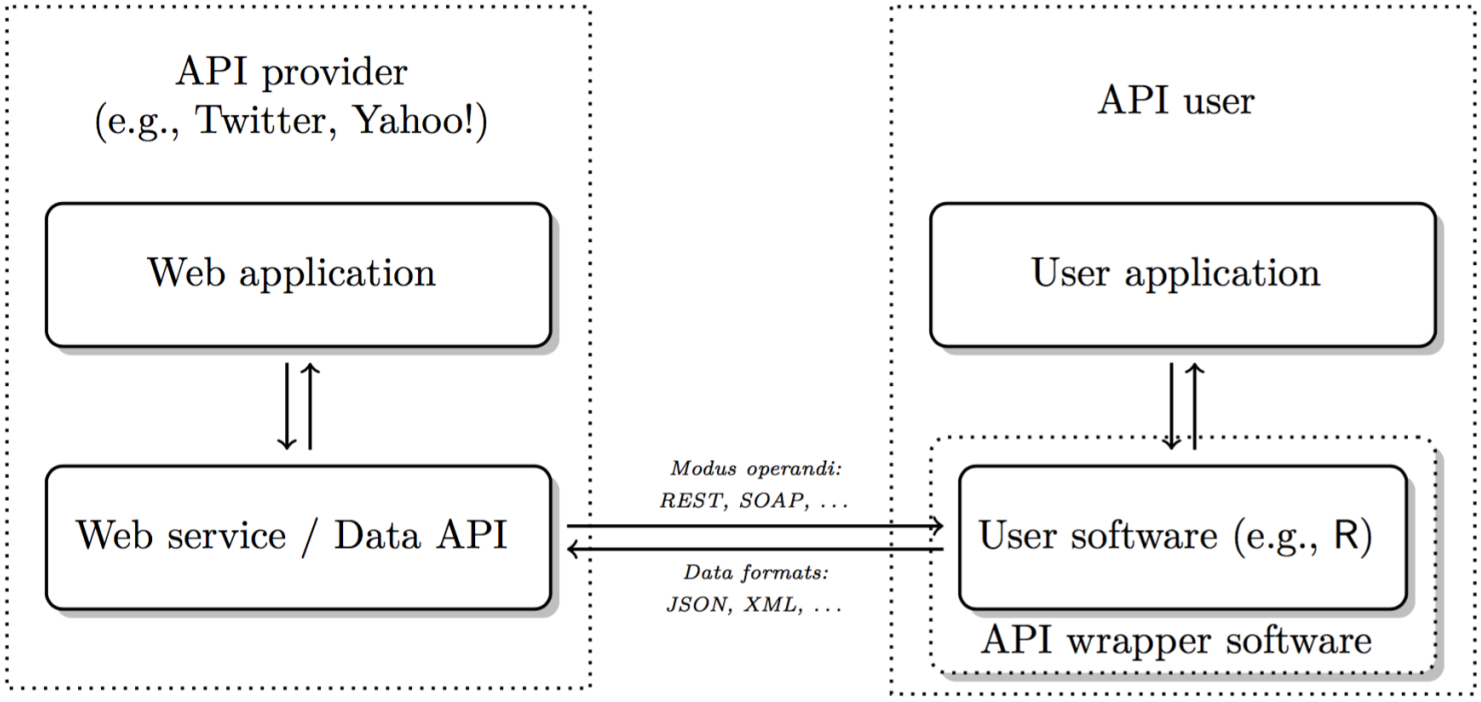
APIs

APIs

API = Application Programming Interface; a set of structured http requests that return data in a lightweight format.

HTTP = Hypertext Transfer Protocol; how browsers and e-mail clients communicate with servers.



Source: Munzert et al, 2014, Figure 9.8

APIs

Types of APIs:

1. RESTful APIs: queries for static information at current moment (e.g. user profiles, posts, etc.)
2. Streaming APIs: changes in users' data in real time (e.g. new tweets, weather alerts...)

APIs generally have extensive documentation:

- Written for developers, so must be understandable for humans
- What to look for: endpoints and parameters.

Most APIs are rate-limited:

- Restrictions on number of API calls by user/IP address and period of time.
- Commercial APIs may impose a monthly fee

Connecting with an API

Constructing a REST API call:

- Baseline URL endpoint:
  `https://maps.googleapis.com/maps/api/geocode/json`
- Parameters: `?address=budapest`
- Authentication token (optional): `&key=XXXXX`

From R, use `httr` package to make `GET` request:

```
library(httr)
r <- GET(
"https://maps.googleapis.com/maps/api/geocode/json",
query=list(address="budapest"))
```

If request was successful, returned code will be `200`, where `4xx` indicates client errors and `5xx` indicates server errors.
If you need to attach data, use `POST` request.

```
{
   "results" : [
      {
         "address_components" : [
            {
               "long_name" : "Budapest",
               "short_name" : "Budapest",
               "types" : [ "locality", "political" ]
            },
            {
               "long_name" : "Hungary",
               "short_name" : "HU",
               "types" : [ "country", "political" ]
            }
         ],
         "formatted_address" : "Budapest, Hungary",
         "geometry" : {
            "bounds" : {
               "northeast" : {
                  "lat" : 47.6130119,
                  "lng" : 19.3345049
               },
               "southwest" : {
                  "lat" : 47.349415,
                  "lng" : 18.9261011
               }
            },
            "location" : {
               "lat" : 47.497912,
               "lng" : 19.040235
            },
...
}
```

```
{
...
            "location_type" : "APPROXIMATE",
            "viewport" : {
               "northeast" : {
                  "lat" : 47.6130119,
                  "lng" : 19.3345049
               },
               "southwest" : {
                  "lat" : 47.349415,
                  "lng" : 18.9261011
               }
            }
         },
         "place_id" : "ChIJyc_U0TTDQUcRYBEeDCnEAAQ",
         "types" : [ "locality", "political" ]
      }
   ],
   "status" : "OK"
}
```

JSON

Response is often in JSON format (Javascript Object Notation).

- Type: `content(r, "text")`
- Data stored in key-value pairs. Why? Lightweight, more flexible than traditional table format.
- Curly brackets embrace objets; square brackets enclose arrays (vectors)
- Use `fromJSON` function in `jsonlite` the package or `stream_in` in `ndjson` the package to read JSON data
- But many packages have their own specific functions to read data in JSON format; `content(r, "parsed")`

Authentication

- Many APIs require an access key or token
- An alternative, open standard is called OAuth
- Connections without sharing username or password, only temporary tokens that can be refreshed
- `httr` package in R implements most cases (examples)

R packages

Before starting a new project, worth checking if there's already an R package for that API. Where to look?

- CRAN Web Technologies Task View (but only packages released in CRAN)
- GitHub (including unreleased packages and most recent versions of packages)
- rOpenSci Consortium

Also see this great list of APIs in case you need inspiration.

Why APIs?

Advantages:

- 'Pure' data collection: avoid malformed HTML, no legal issues, clear data structures, more trust in data collection...
- Standardized data access procedures: transparency, replicability
- Robustness: benefits from 'wisdom of the crowds'

Disadvantages

- They're not too common (yet!)
- Dependency on API providers
- Lack of natural connection to R