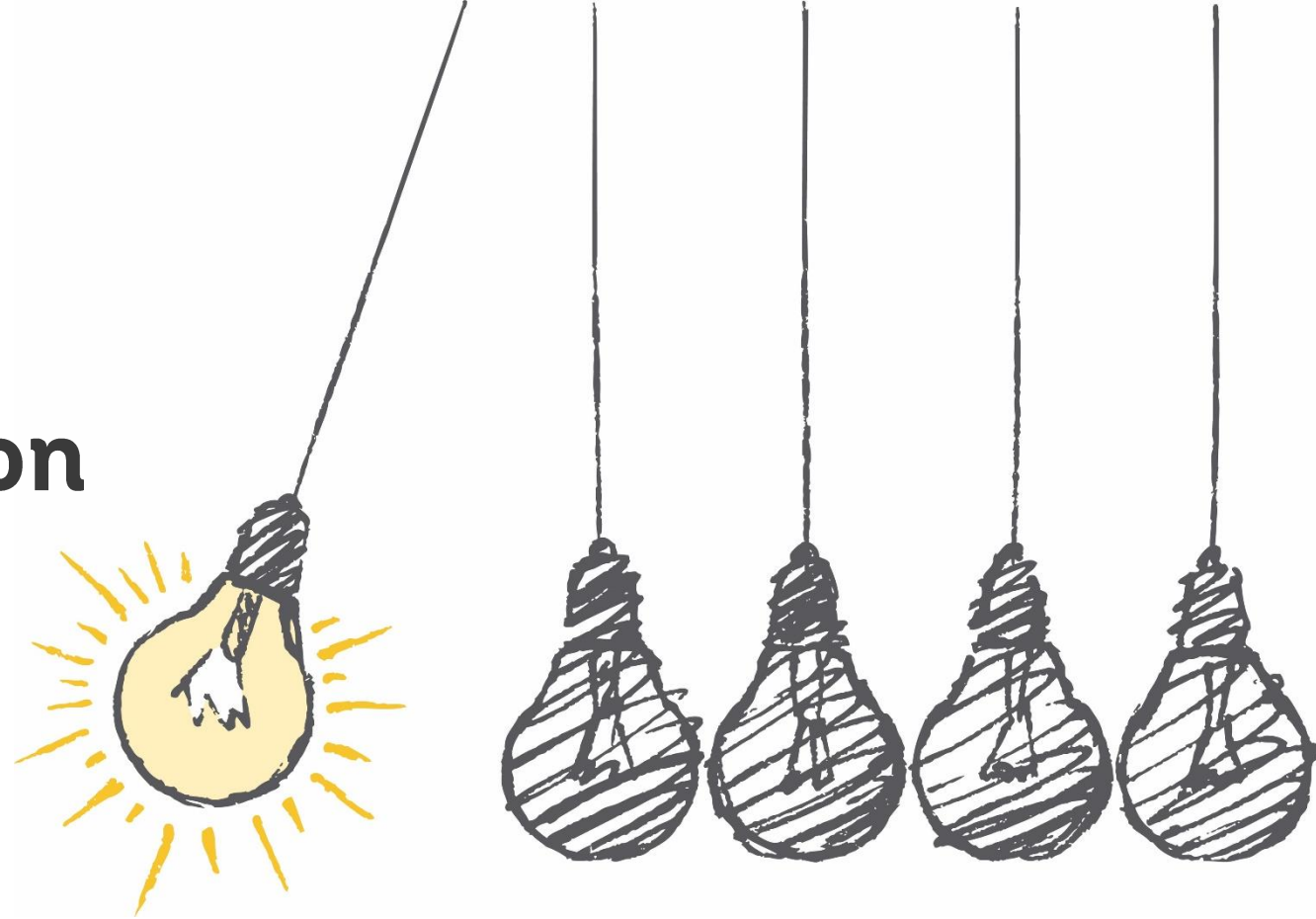


# Session 4 - Introduction to APIs

## Foundations of Python for Data Science



Gaurav Bhardwaj, Kristoffer Bjärkefur, Wei Lu, Luis Eduardo San Martin

The World Bank | [WB GitHub](#)

February 2023

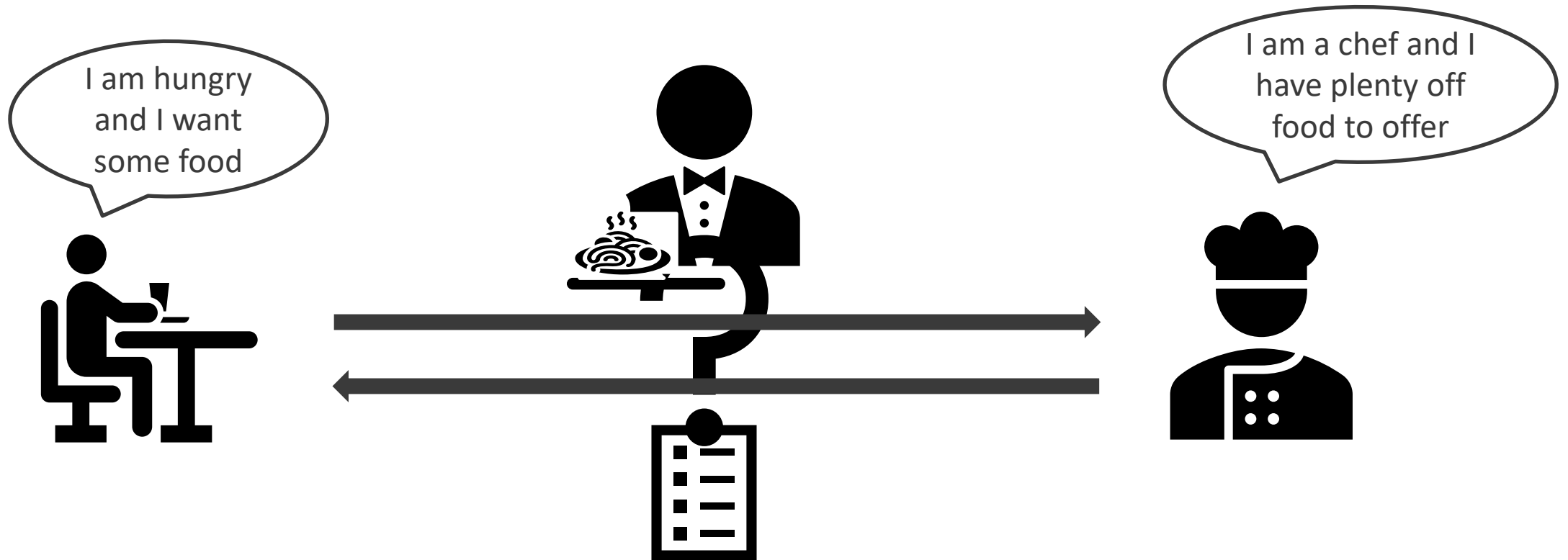


What is an API?  
(Application Programming  
Interface)

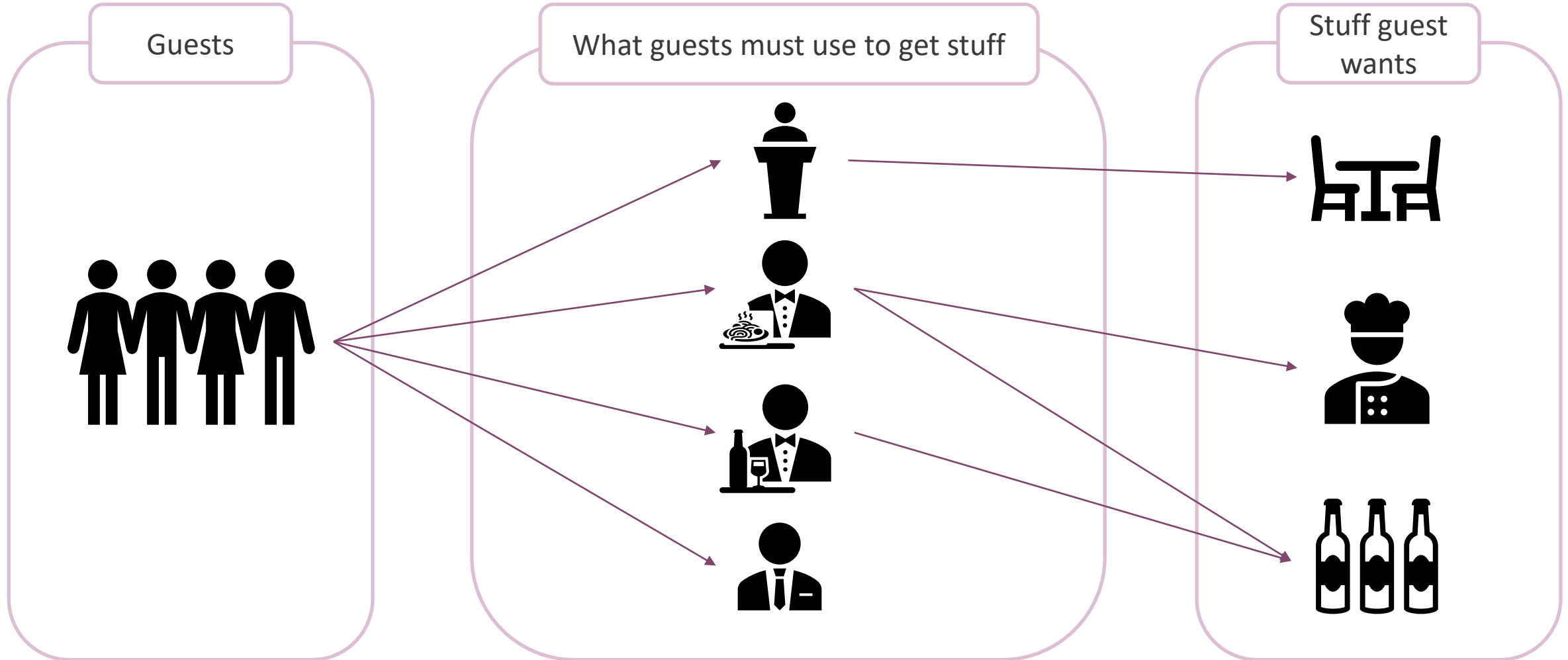


# restaurant.com

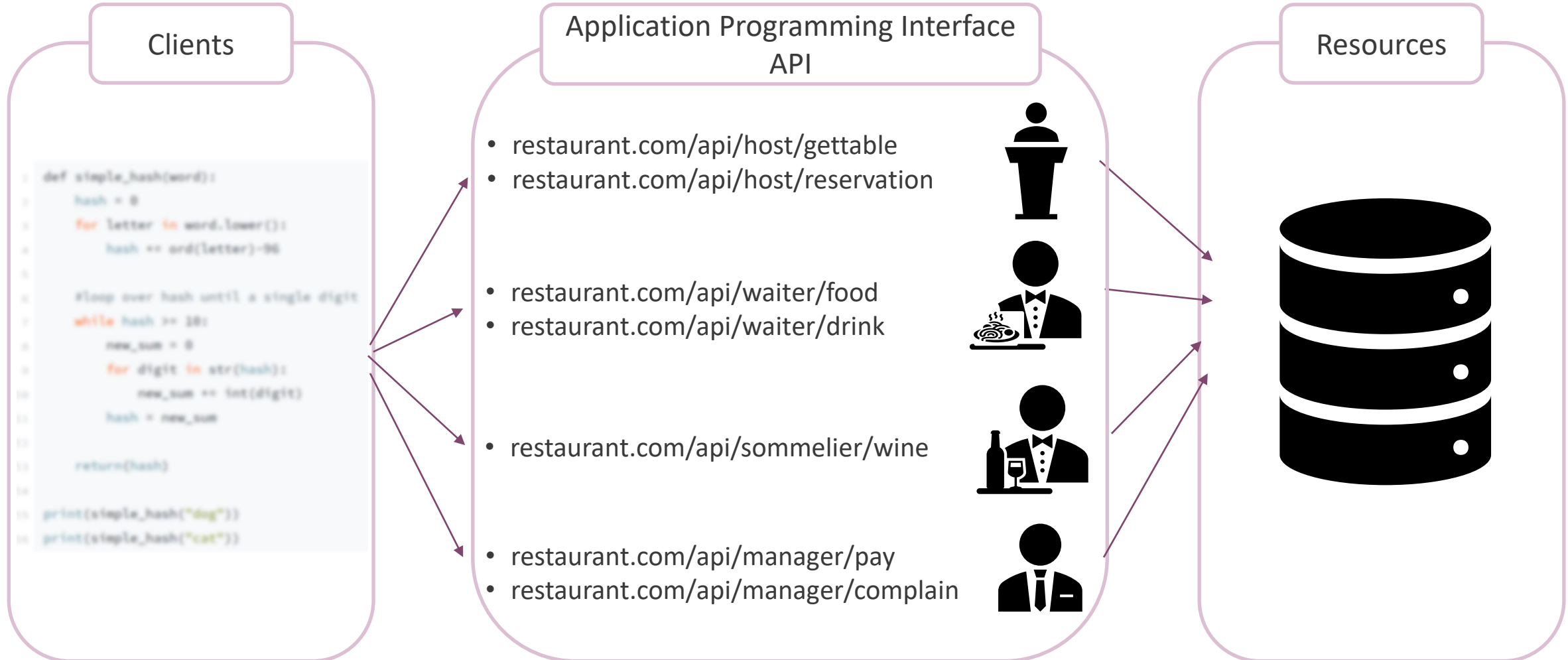
---



# restaurant.com



# restaurant.com



# Application Programming Interfaces (APIs)

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- An API is a channel to interact with a web server
- In data science, these interactions are mostly used to retrieve data from data bases

# Application Programming Interfaces (APIs)

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- Why an API?
  - Allows to access data programmatically
    - No more sharing data and code for a project, only code
  - Allows to run code on the most recent data available

# Application Programming Interfaces (APIs)

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- How to use an API
  1. Read the API documentation
  2. Find the API endpoint
  3. Explore the endpoint
    - Start by trying a simple query in your web browser
  4. Explore the API result
    - JSON is a widely used data format. It consists of nested dictionaries and lists
  5. Write code to send custom API requests



# API Example 1: <http://open-notify.org/>

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A very simple API to get real time data about the International Space Station

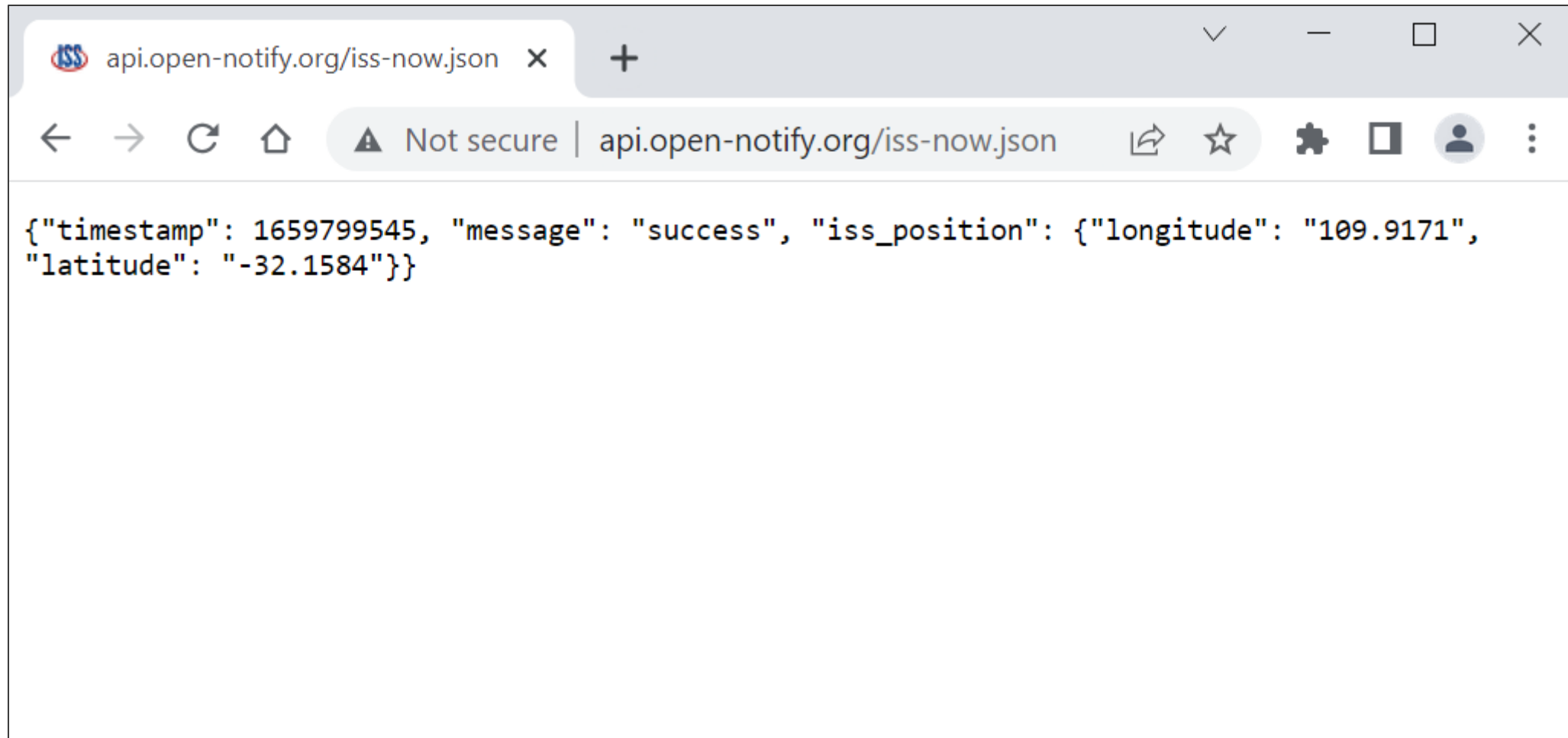
You can find the documentation here: <http://open-notify.org>

## Two endpoints:

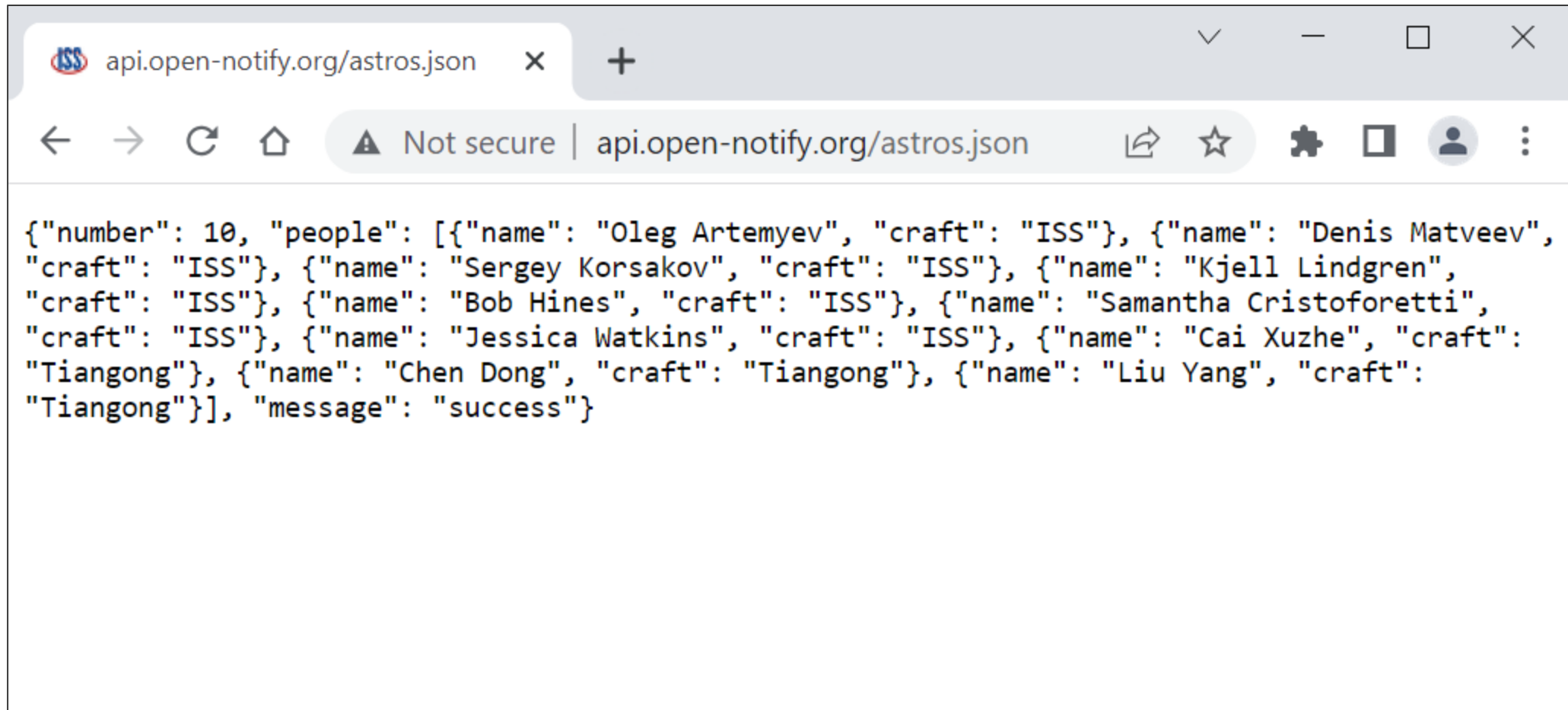
- Current location of the ISS: <http://api.open-notify.org/iss-now.json>
- Astronauts in space now: <http://api.open-notify.org/astros.json>

# API Example 1: <http://open-notify.org/>

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# API Example 1: <http://open-notify.org/>



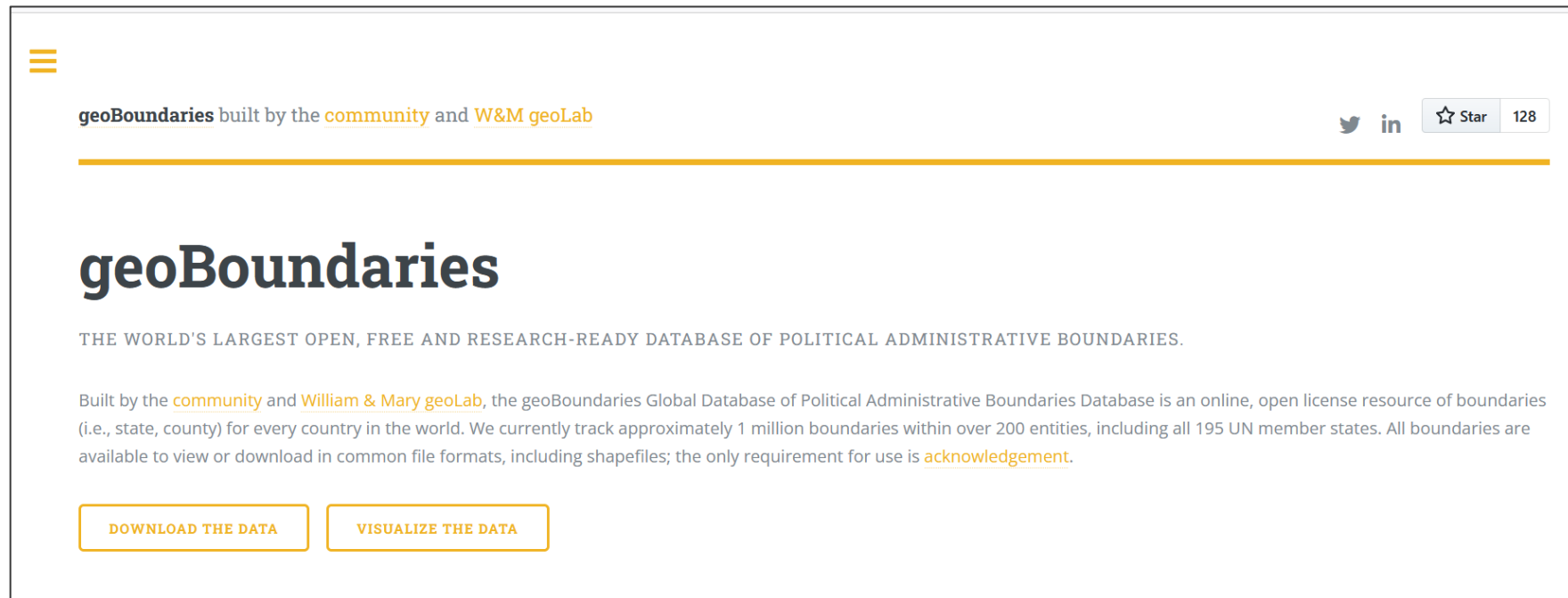
```
{
  "number": 10,
  "people": [
    {
      "name": "Oleg Artemyev",
      "craft": "ISS"
    },
    {
      "name": "Denis Matveev",
      "craft": "ISS"
    },
    {
      "name": "Sergey Korsakov",
      "craft": "ISS"
    },
    {
      "name": "Kjell Lindgren",
      "craft": "ISS"
    },
    {
      "name": "Bob Hines",
      "craft": "ISS"
    },
    {
      "name": "Samantha Cristoforetti",
      "craft": "ISS"
    },
    {
      "name": "Jessica Watkins",
      "craft": "ISS"
    },
    {
      "name": "Cai Xuzhe",
      "craft": "Tiangong"
    },
    {
      "name": "Chen Dong",
      "craft": "Tiangong"
    },
    {
      "name": "Liu Yang",
      "craft": "Tiangong"
    }
  ],
  "message": "success"
}
```

# API Example 2: <https://www.geoboundaries.org/>

---

API to fetch geographic country data.

Documentation: <https://www.geoboundaries.org/api.html>



# API Example 2: <https://www.geoboundaries.org/>

---

From the documentation:

To find information on the most up-to-date boundaries available:

```
https://www.geoboundaries.org/api/current/gbOpen/[3-LETTER-ISO-CODE]/[ADM-LEVEL]/
```

Users can also enter the special phrase "ALL" for either "[ADM-LEVEL]" or "[3-LETTER-ISO-CODE]" to get a multi-boundary return. Each requested boundary returns all metadata available for that boundary in the gbOpen release, including a link to both the full-resolution, large-file size and the minor simplification (~5%), small-file size versions. In cases where a gbHumanitarian or gbAuthoritative release is available for a boundary, that information is provided in sub-objects within the returned json. Users can additionally replace "gbOpen" with either "gbAuthoritative" or "gbHumanitarian" to filter results to only include boundaries from those two respective releases. Finally, "current" can be replaced with a major version to retrieve information specific to that major release (e.g., "v4" will provide the IDs of v4 boundaries, which can be used with the below historic API to retrieve the boundary metadata for a specific version).

# Custom API calls

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Most APIs require users to pass information through the URL to specify how they want to interact with the web server.

Examples:

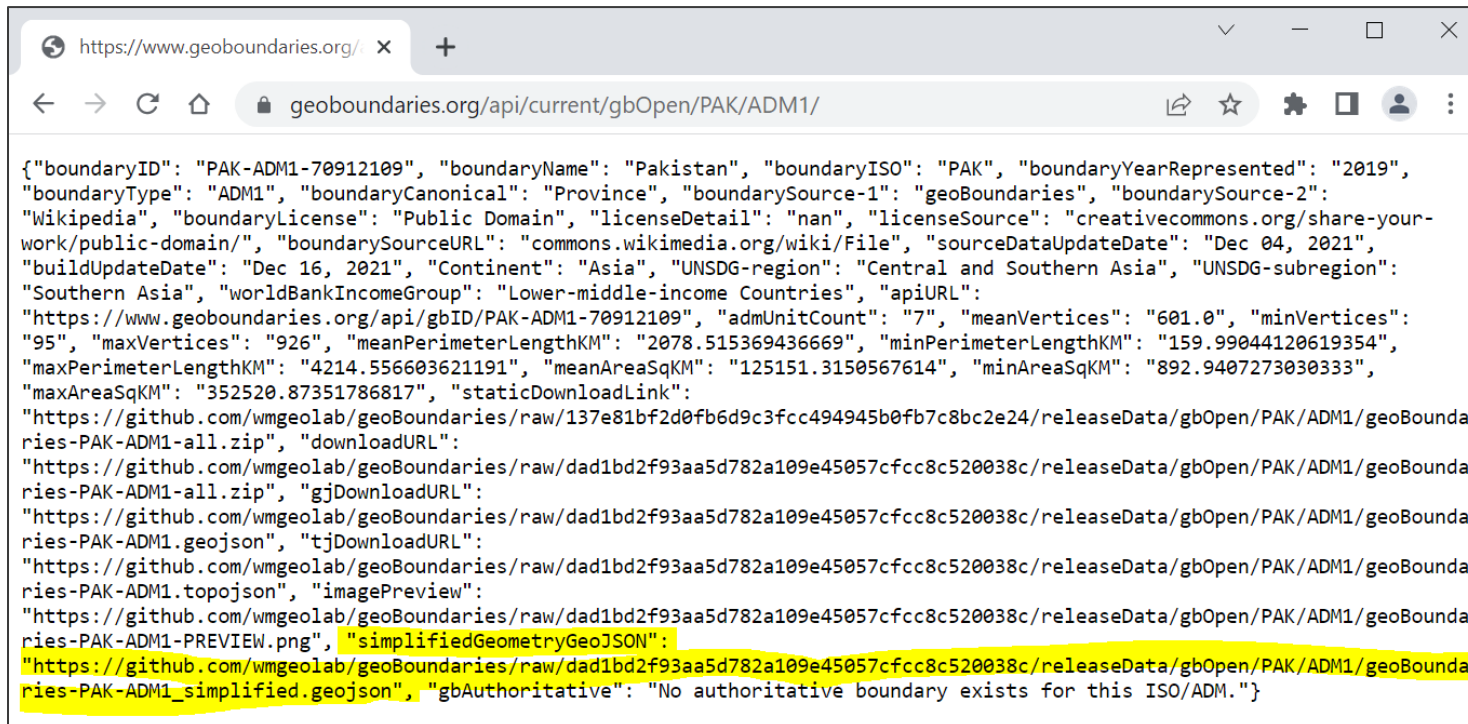
To find information on the most up-to-date boundaries available:

```
https://www.geoboundaries.org/api/current/gbOpen/[3-LETTER-ISO-CODE]/[ADM-LEVEL]/
```

- Colombia national boundaries:  
<https://www.geoboundaries.org/api/current/gbOpen/COL/ADM0/>
- Pakistan first-level administrative boundaries:  
<https://www.geoboundaries.org/api/current/gbOpen/PAK/ADM1/>

# Exploring API results

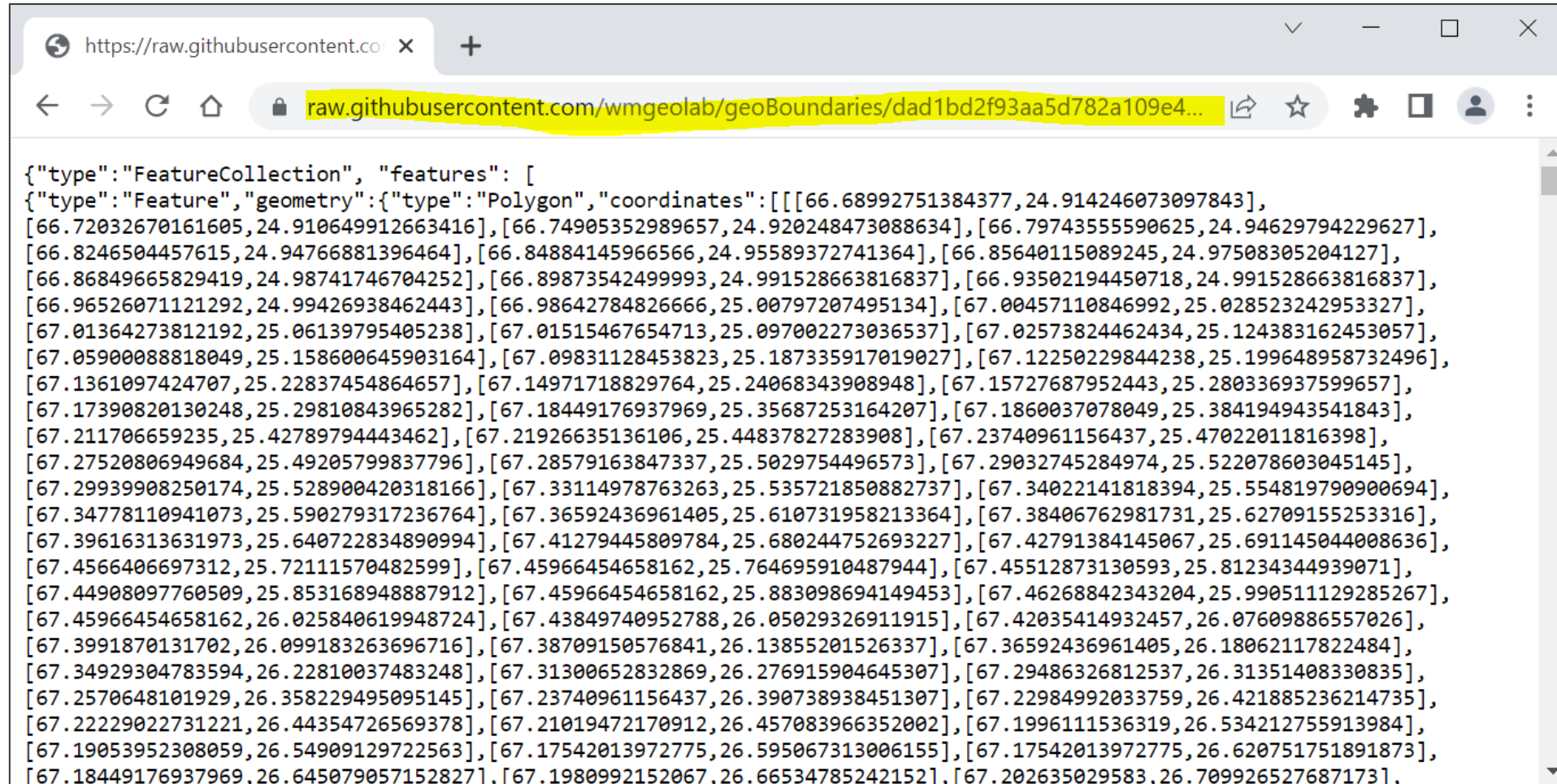
- Many APIs will return extra information and metadata we don't always need
- You should explore the returning JSON to locate relevant information and data



The screenshot shows a web browser window with the address bar displaying `https://www.geoboundaries.org/` and the page URL `geoboundaries.org/api/current/gbOpen/PAK/ADM1/`. The main content area displays a large JSON object representing the API response. The JSON includes fields for boundary ID, name, ISO code, year, type, canonical name, source, license, update dates, continent, region, subregion, income group, API URL, unit count, vertices, perimeter, area, static download link, and various download URLs for different formats (zip, geojson, topojson, preview). The `simplifiedGeometryGeoJSON` field is highlighted in yellow, showing a URL to a simplified geometry file and a note that no authoritative boundary exists for this ISO/ADM.

```
{
  "boundaryID": "PAK-ADM1-70912109",
  "boundaryName": "Pakistan",
  "boundaryISO": "PAK",
  "boundaryYearRepresented": "2019",
  "boundaryType": "ADM1",
  "boundaryCanonical": "Province",
  "boundarySource-1": "geoBoundaries",
  "boundarySource-2": "Wikipedia",
  "boundaryLicense": "Public Domain",
  "licenseDetail": "nan",
  "licenseSource": "creativecommons.org/share-your-work/public-domain/",
  "boundarySourceURL": "commons.wikimedia.org/wiki/File",
  "sourceDataUpdateDate": "Dec 04, 2021",
  "buildUpdateDate": "Dec 16, 2021",
  "Continent": "Asia",
  "UNSDG-region": "Central and Southern Asia",
  "UNSDG-subregion": "Southern Asia",
  "worldBankIncomeGroup": "Lower-middle-income Countries",
  "apiURL": "https://www.geoboundaries.org/api/gbID/PAK-ADM1-70912109",
  "admUnitCount": "7",
  "meanVertices": "601.0",
  "minVertices": "95",
  "maxVertices": "926",
  "meanPerimeterLengthKM": "2078.515369436669",
  "minPerimeterLengthKM": "159.99044120619354",
  "maxPerimeterLengthKM": "4214.556603621191",
  "meanAreaSqKM": "125151.3150567614",
  "minAreaSqKM": "892.9407273030333",
  "maxAreaSqKM": "352520.87351786817",
  "staticDownloadLink": "https://github.com/wmgeolab/geoBoundaries/raw/137e81bf2d0fb6d9c3fcc494945b0fb7c8bc2e24/releaseData/gbOpen/PAK/ADM1/geoBoundaries-PAK-ADM1-all.zip",
  "downloadURL": "https://github.com/wmgeolab/geoBoundaries/raw/dad1bd2f93aa5d782a109e45057cfcc8c520038c/releaseData/gbOpen/PAK/ADM1/geoBoundaries-PAK-ADM1-all.zip",
  "gjDownloadURL": "https://github.com/wmgeolab/geoBoundaries/raw/dad1bd2f93aa5d782a109e45057cfcc8c520038c/releaseData/gbOpen/PAK/ADM1/geoBoundaries-PAK-ADM1.geojson",
  "tjDownloadURL": "https://github.com/wmgeolab/geoBoundaries/raw/dad1bd2f93aa5d782a109e45057cfcc8c520038c/releaseData/gbOpen/PAK/ADM1/geoBoundaries-PAK-ADM1.topojson",
  "imagePreview": "https://github.com/wmgeolab/geoBoundaries/raw/dad1bd2f93aa5d782a109e45057cfcc8c520038c/releaseData/gbOpen/PAK/ADM1/geoBoundaries-PAK-ADM1-PREVIEW.png",
  "simplifiedGeometryGeoJSON": "https://github.com/wmgeolab/geoBoundaries/raw/dad1bd2f93aa5d782a109e45057cfcc8c520038c/releaseData/gbOpen/PAK/ADM1/geoBoundaries-PAK-ADM1_simplified.geojson",
  "gbAuthoritative": "No authoritative boundary exists for this ISO/ADM."
}
```

# Exploring API results



```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "geometry": {
        "type": "Polygon",
        "coordinates": [
          [
            [66.68992751384377, 24.914246073097843],
            [66.72032670161605, 24.910649912663416],
            [66.74905352989657, 24.920248473088634],
            [66.79743555590625, 24.94629794229627],
            [66.8246504457615, 24.94766881396464],
            [66.84884145966566, 24.95589372741364],
            [66.85640115089245, 24.97508305204127],
            [66.86849665829419, 24.98741746704252],
            [66.89873542499993, 24.991528663816837],
            [66.93502194450718, 24.991528663816837],
            [66.96526071121292, 24.99426938462443],
            [66.98642784826666, 25.00797207495134],
            [67.00457110846992, 25.028523242953327],
            [67.01364273812192, 25.06139795405238],
            [67.01515467654713, 25.097002273036537],
            [67.02573824462434, 25.124383162453057],
            [67.05900088818049, 25.158600645903164],
            [67.09831128453823, 25.187335917019027],
            [67.12250229844238, 25.199648958732496],
            [67.1361097424707, 25.22837454864657],
            [67.14971718829764, 25.24068343908948],
            [67.15727687952443, 25.280336937599657],
            [67.17390820130248, 25.29810843965282],
            [67.18449176937969, 25.35687253164207],
            [67.1860037078049, 25.384194943541843],
            [67.211706659235, 25.42789794443462],
            [67.21926635136106, 25.44837827283908],
            [67.23740961156437, 25.47022011816398],
            [67.27520806949684, 25.49205799837796],
            [67.28579163847337, 25.5029754496573],
            [67.29032745284974, 25.522078603045145],
            [67.29939908250174, 25.528900420318166],
            [67.33114978763263, 25.535721850882737],
            [67.34022141818394, 25.554819790900694],
            [67.34778110941073, 25.590279317236764],
            [67.36592436961405, 25.610731958213364],
            [67.38406762981731, 25.62709155253316],
            [67.39616313631973, 25.640722834890994],
            [67.41279445809784, 25.680244752693227],
            [67.42791384145067, 25.691145044008636],
            [67.4566406697312, 25.72111570482599],
            [67.45966454658162, 25.764695910487944],
            [67.45512873130593, 25.81234344939071],
            [67.44908097760509, 25.853168948887912],
            [67.45966454658162, 25.883098694149453],
            [67.46268842343204, 25.990511129285267],
            [67.45966454658162, 26.025840619948724],
            [67.43849740952788, 26.05029326911915],
            [67.42035414932457, 26.07609886557026],
            [67.3991870131702, 26.099183263696716],
            [67.38709150576841, 26.13855201526337],
            [67.36592436961405, 26.18062117822484],
            [67.34929304783594, 26.22810037483248],
            [67.31300652832869, 26.276915904645307],
            [67.29486326812537, 26.31351408330835],
            [67.2570648101929, 26.358229495095145],
            [67.23740961156437, 26.390738938451307],
            [67.22984992033759, 26.421885236214735],
            [67.22229022731221, 26.44354726569378],
            [67.21019472170912, 26.457083966352002],
            [67.1996111536319, 26.534212755913984],
            [67.19053952308059, 26.54909129722563],
            [67.17542013972775, 26.595067313006155],
            [67.17542013972775, 26.620751751891873],
            [67.18449176937969, 26.645079057152827],
            [67.1980992152067, 26.66534785242152],
            [67.202635029583, 26.709926527687173],
            [66.68992751384377, 24.914246073097843]
          ]
        ]
      }
    ]
  ]
}
```



Thank you!

