

AI IN THE BUILT ENVIRONMENT

DCP4300

University of Florida
College of Design Construction and Planning

Professors:
Dr. Karla Saldana Ochoa
Dr. Charles Wang

TA:

Mobina Noorani
Jianhao Gao



Data and Information

As people move through the city, they produce, collect, share, store, leave traces of their daily activities. In cities, a tremendous amount of data is being produced either intentionally, via blogs, social media, discussion forums, news, messages, or unintentionally via online and offline interactions.



Vahid Moosavi

Modeling urban traffic dynamics in coexistence with urban data streams

6-February--2008

Rouvroy, A. (2016). "Of Data and Men" Fundamental Rights and Freedoms in a World of Big Data. Bureau of the consultative committee of the convention for the protection of individuals with regard to automatic processing of personal data. Estrasburgo.

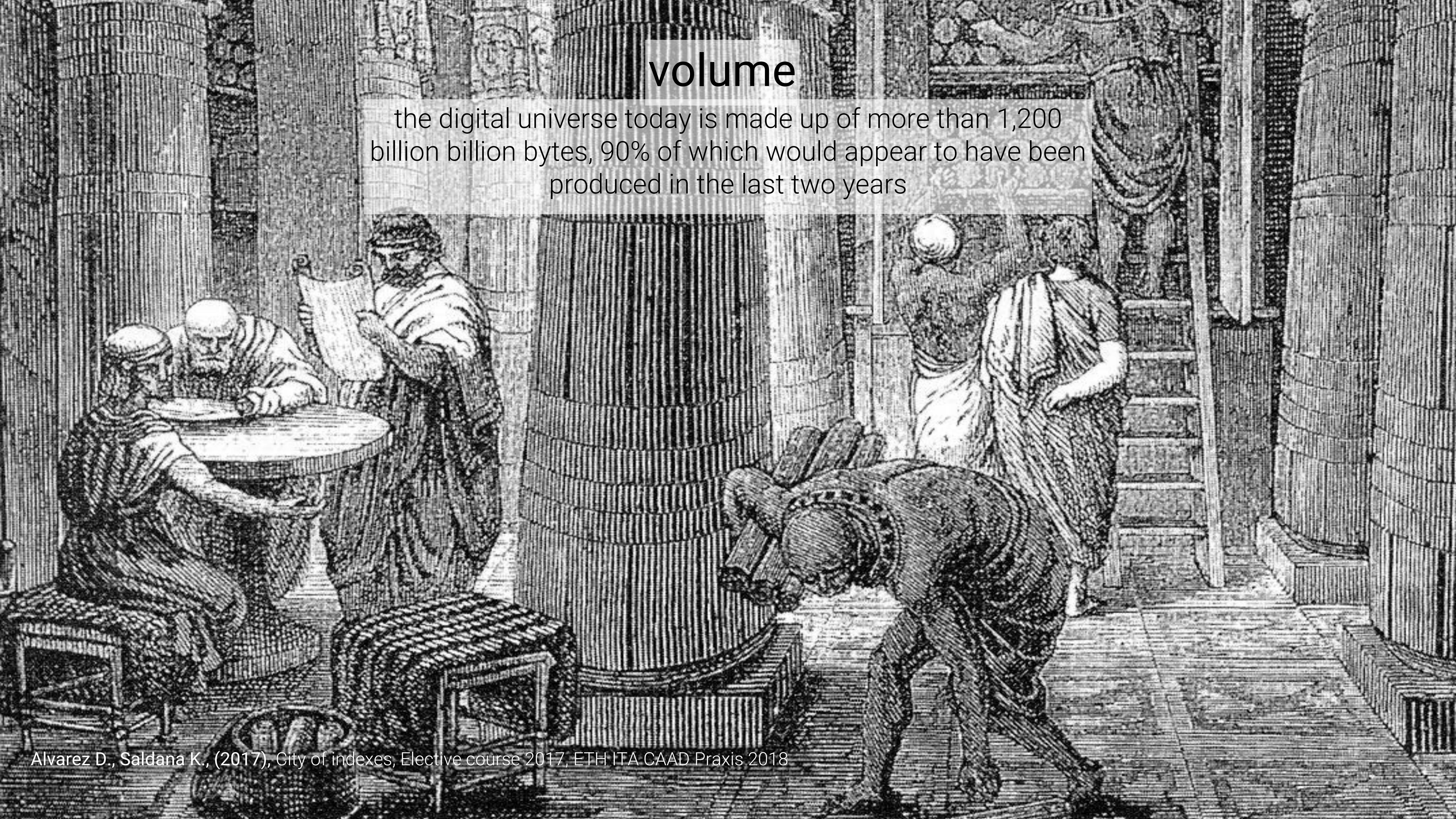
What is *big-data*?

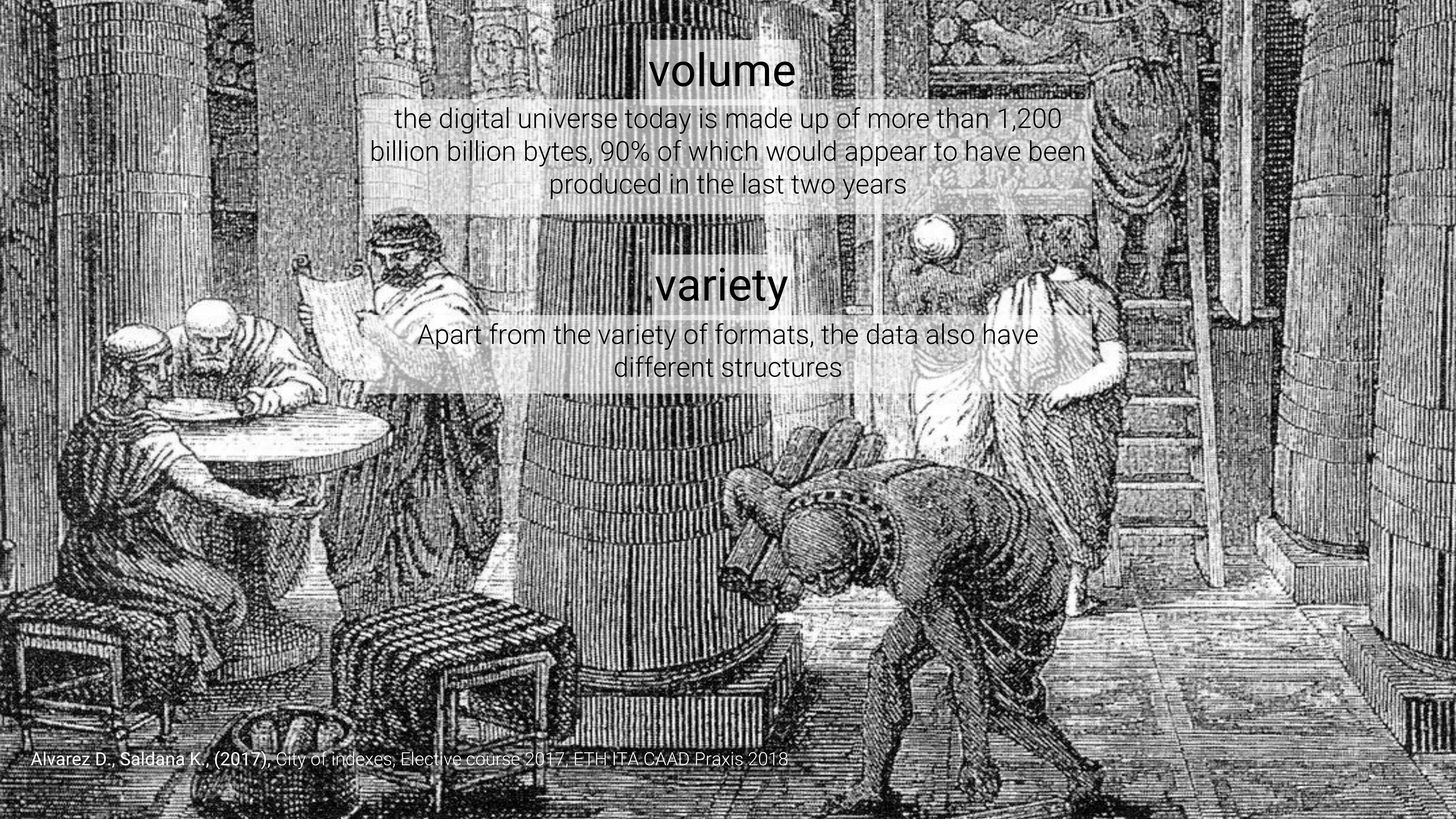
Big-data refers to the digital byproducts of human activity.



volume

the digital universe today is made up of more than 1,200 billion billion bytes, 90% of which would appear to have been produced in the last two years



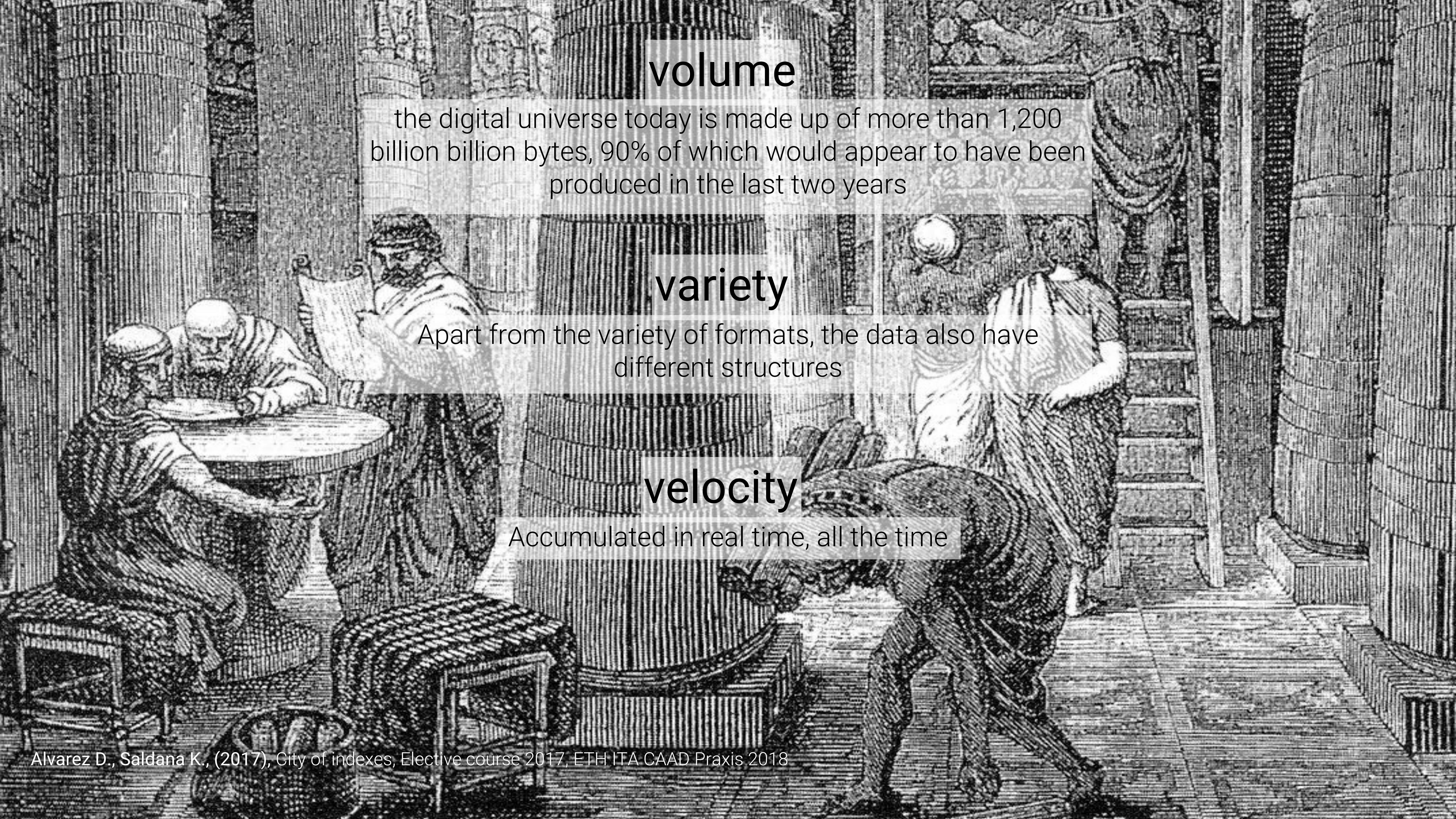


volume

the digital universe today is made up of more than 1,200 billion billion bytes, 90% of which would appear to have been produced in the last two years

variety

Apart from the variety of formats, the data also have different structures



volume

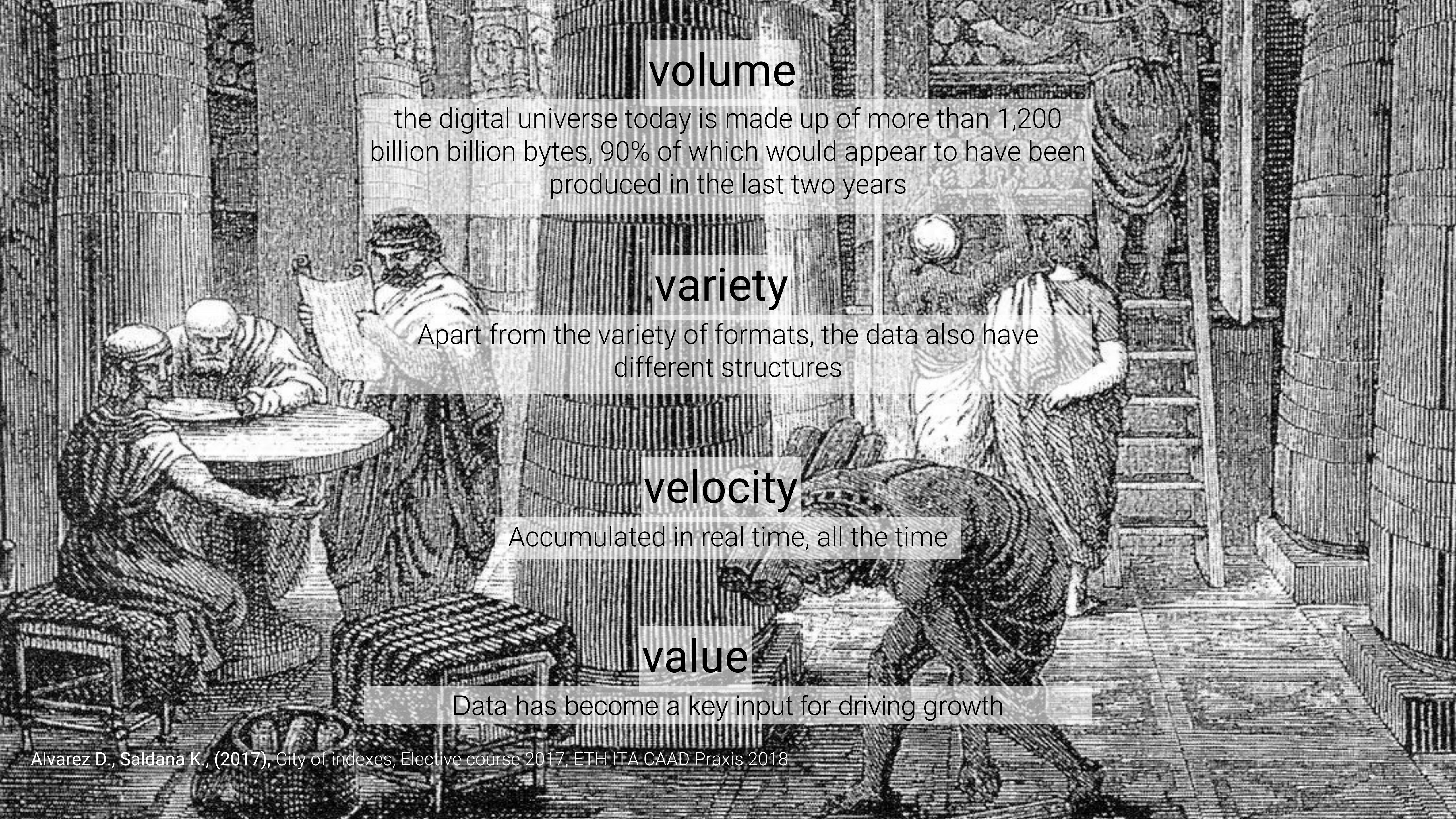
the digital universe today is made up of more than 1,200 billion billion bytes, 90% of which would appear to have been produced in the last two years

variety

Apart from the variety of formats, the data also have different structures

velocity

Accumulated in real time, all the time



volume

the digital universe today is made up of more than 1,200 billion billion bytes, 90% of which would appear to have been produced in the last two years

variety

Apart from the variety of formats, the data also have different structures

velocity

Accumulated in real time, all the time

value

Data has become a key input for driving growth

being flooded with data

What is *information*?

late 14c., informacion, "**act of informing**, communication of news," from Old French informacion, enformacion "advice, instruction," from Latin informationem (nominative informatio) "outline, concept, idea," noun of action from past participle stem of informare "to train, instruct, educate; shape, give form to"

What is the relation between
*data, information, artificial
intelligence, and human
intelligence?*

Human Intelligence

“It is almost impossible that our judgment could be so clear or so solid, as it might have been, had we had the entire use of our reason from the time of our birth, and been always guided by it alone.”

Decartes

A photograph of a baby crawling on a white surface. The baby is seen from the side, moving towards the right. The background is plain white.

Human Intelligence

Embracing obstacles

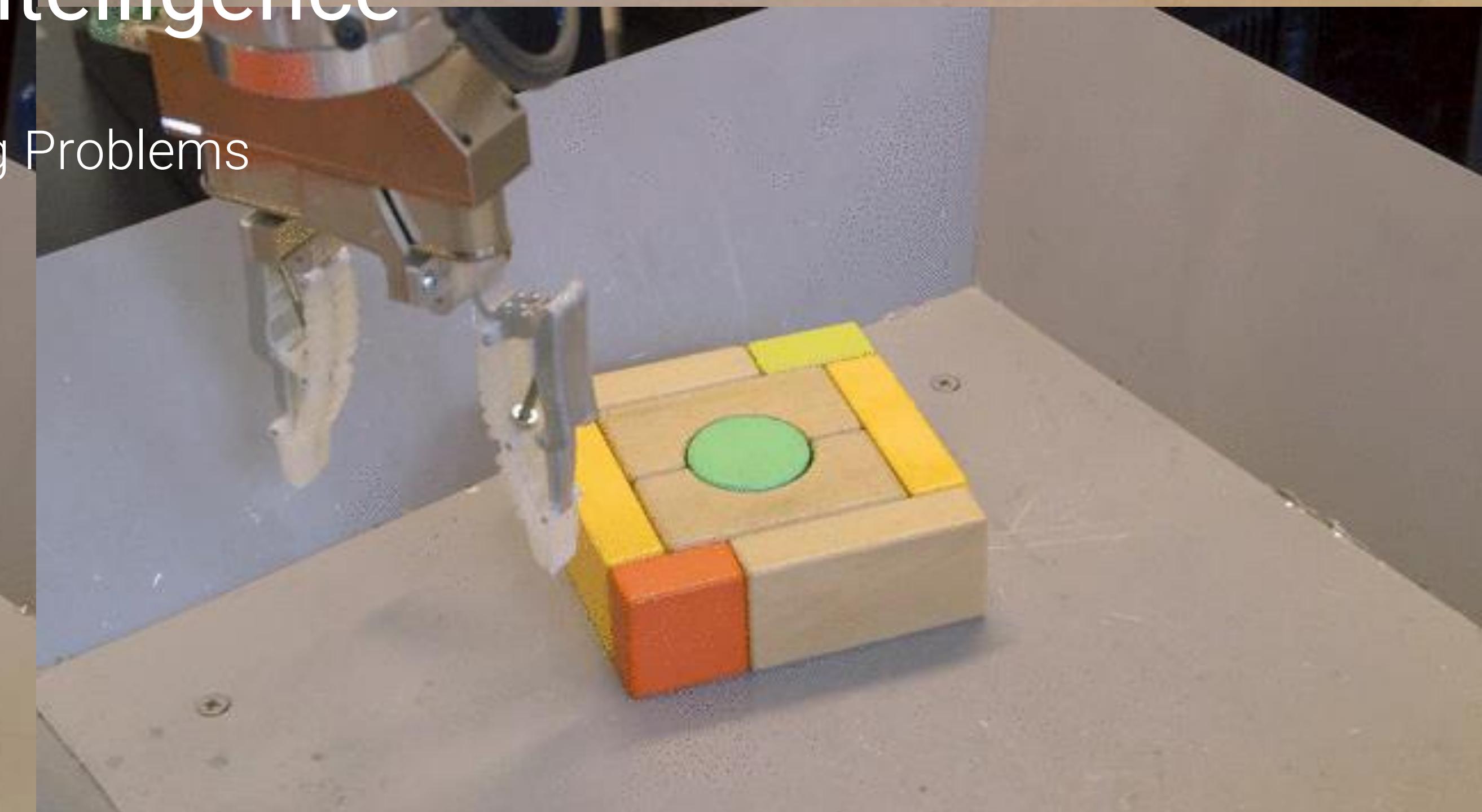
Artificial Intelligence

machine intelligence algorithms are seen as a **problem-solving tool**, attuned to a specific set of problems. These algorithms are fast, computationally powerful and grow exponentially in capacity to process, store and communication



Artificial Intelligence

Solving Problems



ARTIFICIAL INTELLIGENCE

Towards Symbolic Manipulation

⋮
rule system

⋮
Decision tree

⋮
Logic Based

Towards Neuro-Simulation

⋮
artificial neural network

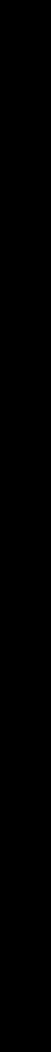
⋮
Explainable

⋮
neuro science

⋮
Mathematical Abstraction

⋮
Alpha go

⋮
Probabilistic Based



Towards Symbolic Manipulation

Expert
Systems

Computer
Vision

Natural Language
Processing

Towards Neuro-Simulation

Robotics

Machine
Learning

Parametric
generators

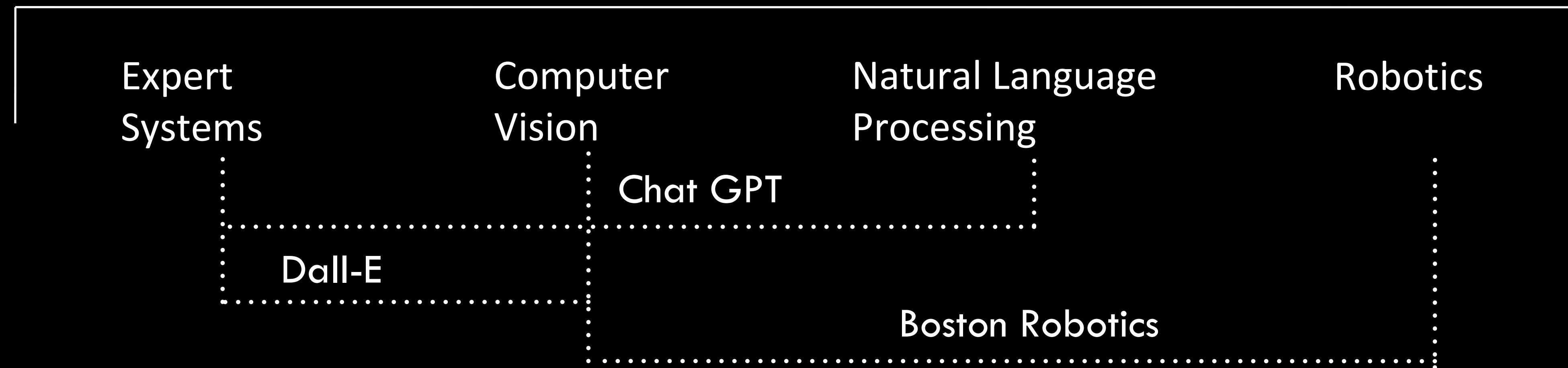
Edge
detection

Bag of
words

Rule-based
movement

Logistic
regression

MACHINE LEARNING



CRAWLING DATA

WHAT IS CRAWLING

Crawling is to browse the World Wide Web in a methodical, automated manner

Crawling vs. Scraping: sometimes interchangeable

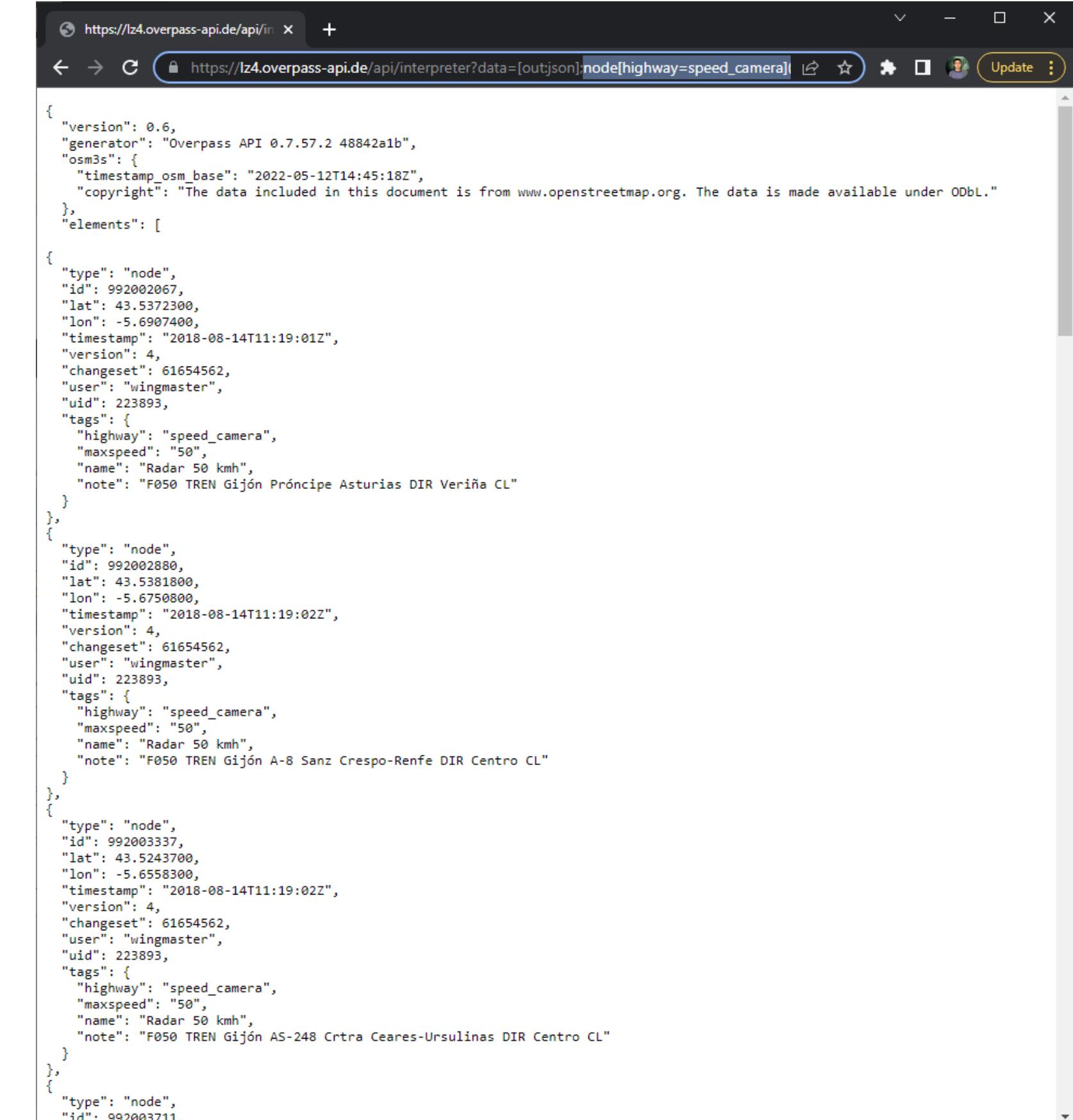
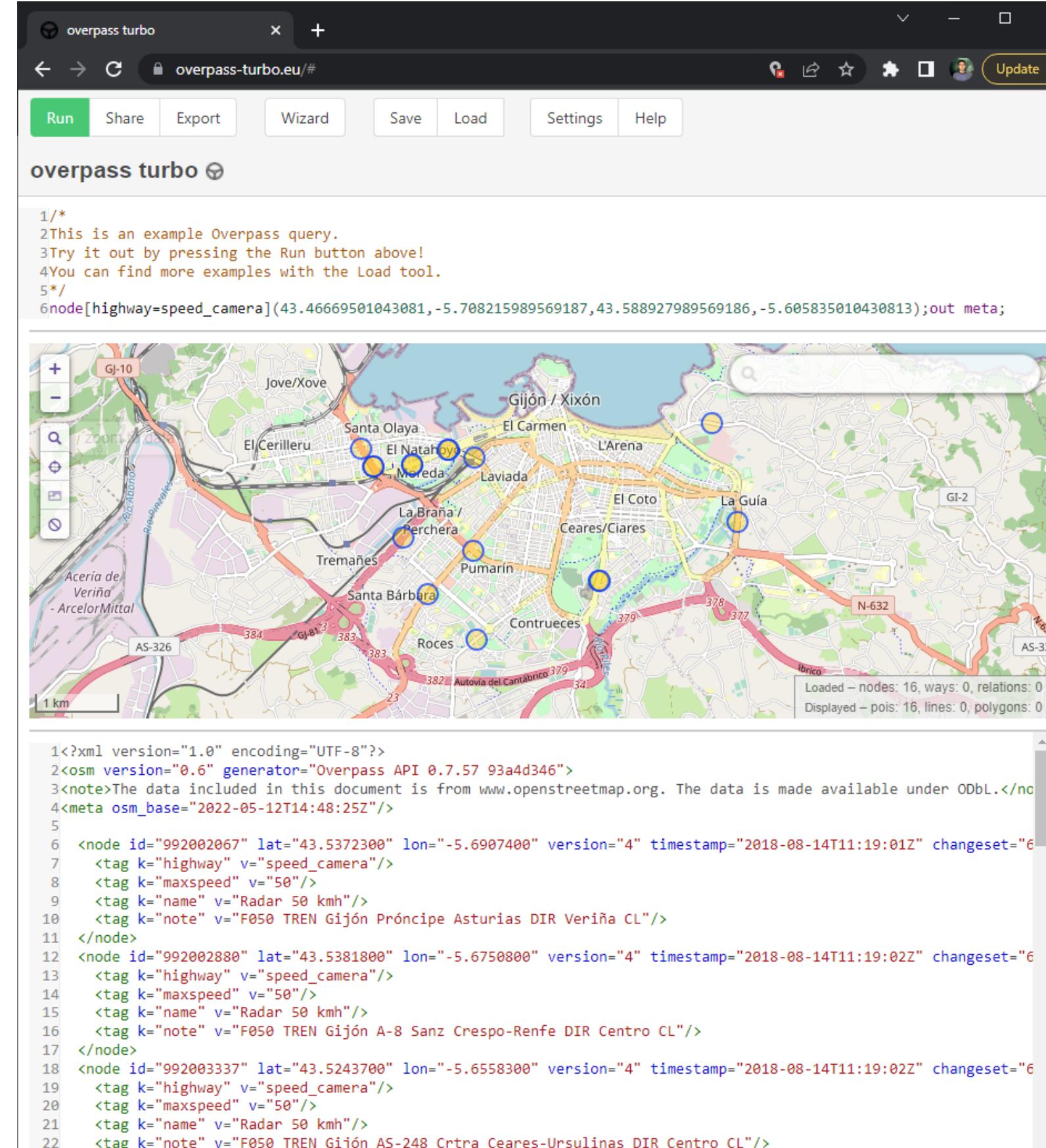
Crawling is the indexing of the information, while Scraping is the copying data to your computer

HOW TO CRAWLE THE WEB

API

API (Application Programming Interface) is a type of software interface
For the connection between computers or computer programs

Many APIs are made as
http links



```
1/*  
2This is an example Overpass query.  
3Try it out by pressing the Run button above!  
4You can find more examples with the Load tool.  
5*/  
6node[highway=speed_camera](43.46669501043081,-5.708215989569187,43.588927989569186,-5.605835010430813);out meta;  
  
1<?xml version="1.0" encoding="UTF-8"?>  
2<osm version="0.6" generator="Overpass API 0.7.57 93a4d346">  
3<note>The data included in this document is from www.openstreetmap.org. The data is made available under ODbL.</note>  
4<meta osm_base="2022-05-12T14:48:25Z"/>  
5  
6  <node id="992002067" lat="43.5372300" lon="-5.6907400" version="4" timestamp="2018-08-14T11:19:01Z" changeset="61654562"  
7    <tag k="highway" v="speed_camera"/>  
8    <tag k="maxspeed" v="50"/>  
9    <tag k="name" v="Radar 50 kmh"/>  
10   <tag k="note" v="F050 TREN Gijón Príncipe Asturias DIR Veriña CL"/>  
11 </node>  
12 <node id="992002880" lat="43.5381800" lon="-5.6750800" version="4" timestamp="2018-08-14T11:19:02Z" changeset="61654562"  
13   <tag k="highway" v="speed_camera"/>  
14   <tag k="maxspeed" v="50"/>  
15   <tag k="name" v="Radar 50 kmh"/>  
16   <tag k="note" v="F050 TREN Gijón A-8 Sanz Crespo-Renfe DIR Centro CL"/>  
17 </node>  
18 <node id="992003337" lat="43.5243700" lon="-5.6558300" version="4" timestamp="2018-08-14T11:19:02Z" changeset="61654562"  
19   <tag k="highway" v="speed_camera"/>  
20   <tag k="maxspeed" v="50"/>  
21   <tag k="name" v="Radar 50 kmh"/>  
22   <tag k="note" v="F050 TREN Gijón AS-248 Crtra Ceares-Ursulinas DIR Centro CL"/>
```

[https://lz4.overpass-api.de/api/interpreter?data=\[out:json\];node\[highway=speed_camera\]\(43.46669501043081,-5.708215989569187,43.588927989569186,-5.605835010430813\);out%20meta;](https://lz4.overpass-api.de/api/interpreter?data=[out:json];node[highway=speed_camera](43.46669501043081,-5.708215989569187,43.588927989569186,-5.605835010430813);out%20meta;)

API

the API



[https://lz4.overpass-api.de/api/interpreter?data=\[out:json\];node\[highway=speed_camera\]\(43.46669501043081,-5.708215989569187,43.588927989569186,-5.605835010430813\);out%20meta;](https://lz4.overpass-api.de/api/interpreter?data=[out:json];node[highway=speed_camera](43.46669501043081,-5.708215989569187,43.588927989569186,-5.605835010430813);out%20meta;)

the parameters



API

Scientific papers

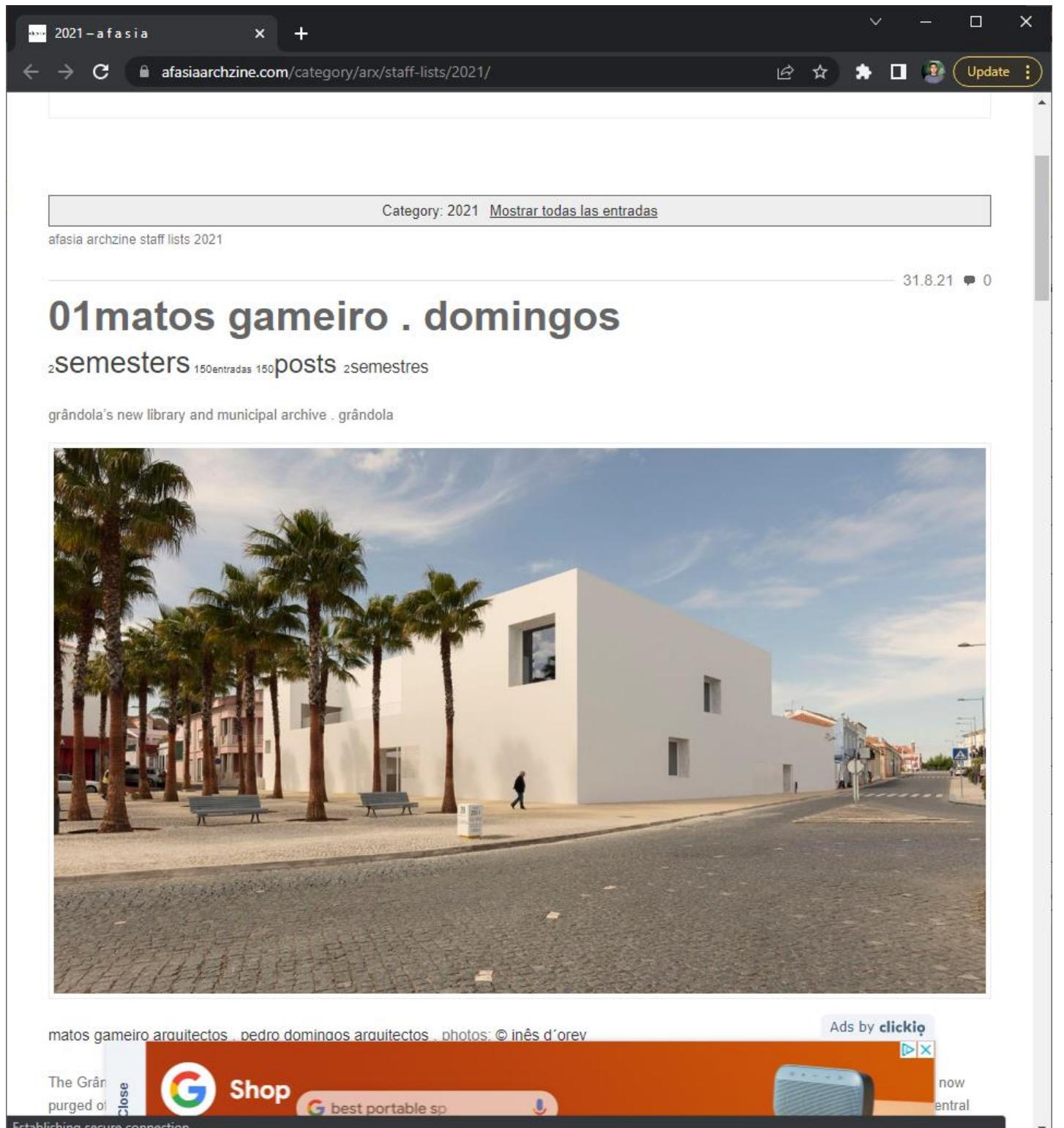
The screenshot shows the Elsevier Developer Portal at dev.elsevier.com/sd_apis.html. The page title is "Elsevier Developer Portal". The main content area is titled "Elsevier ScienceDirect APIs" and includes sections on "What are the ScienceDirect APIs?", "Who can use ScienceDirect APIs?", "Where do I start?", "Where do I get an API key?", "What do I get access to with my API key?", "How do I get help?", and "What are the benefits of using ScienceDirect APIs?". The "ScienceDirect APIs Specification" link in the navigation bar is underlined.

GoogleMap images

The screenshot shows the Google Developers documentation at developers.google.com/maps/documentation/embed/get-api-key. The page title is "Google Developers". It features a sidebar with links to "On this page" (Before you begin, Creating API keys, Restricting API keys, Adding the API key to your request) and a main content area with a heading "Before you begin" and a video thumbnail titled "How to generate and restrict API keys". The "Console" tab is selected in the navigation bar.

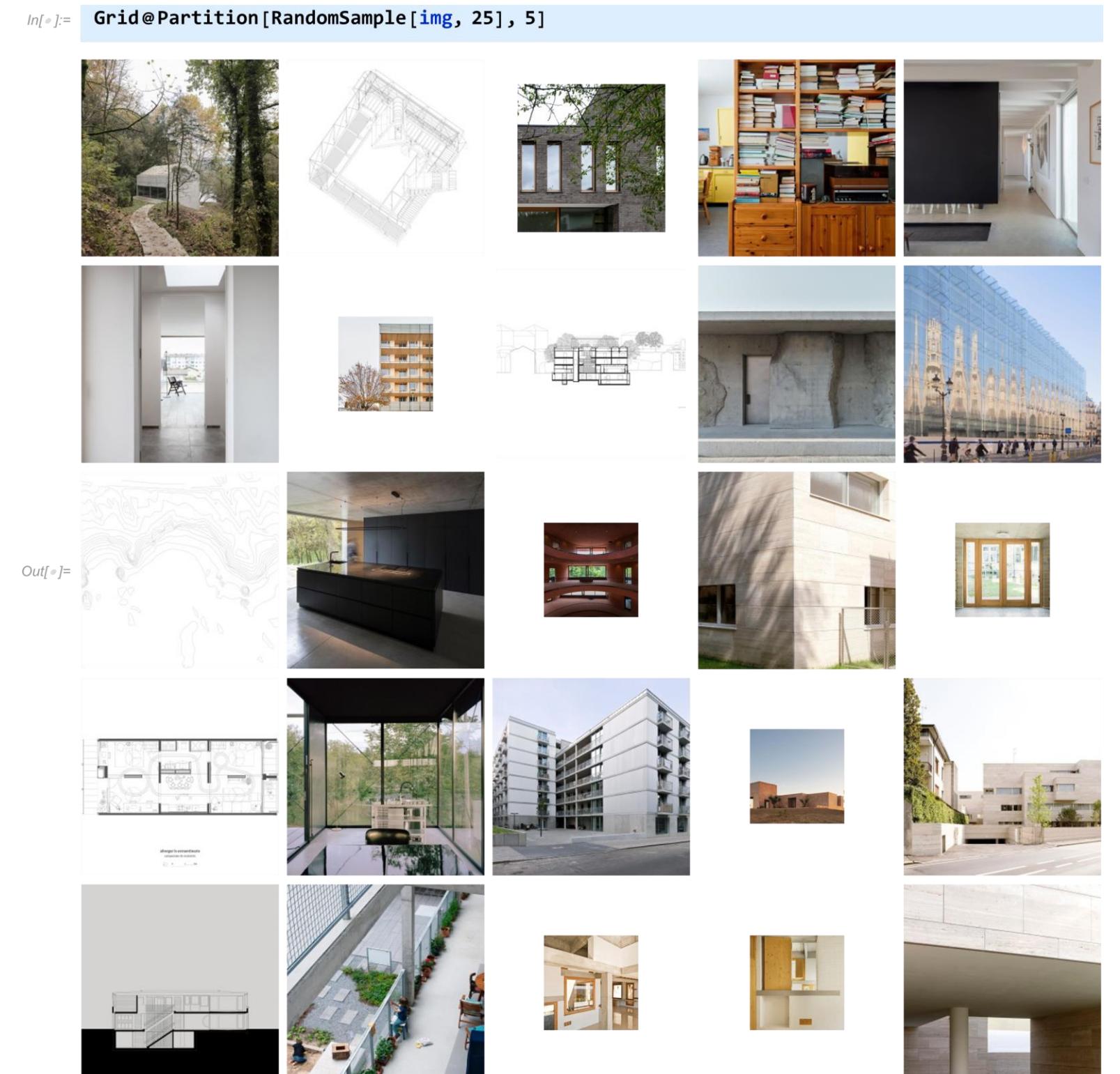
Webpage Source

Webpage

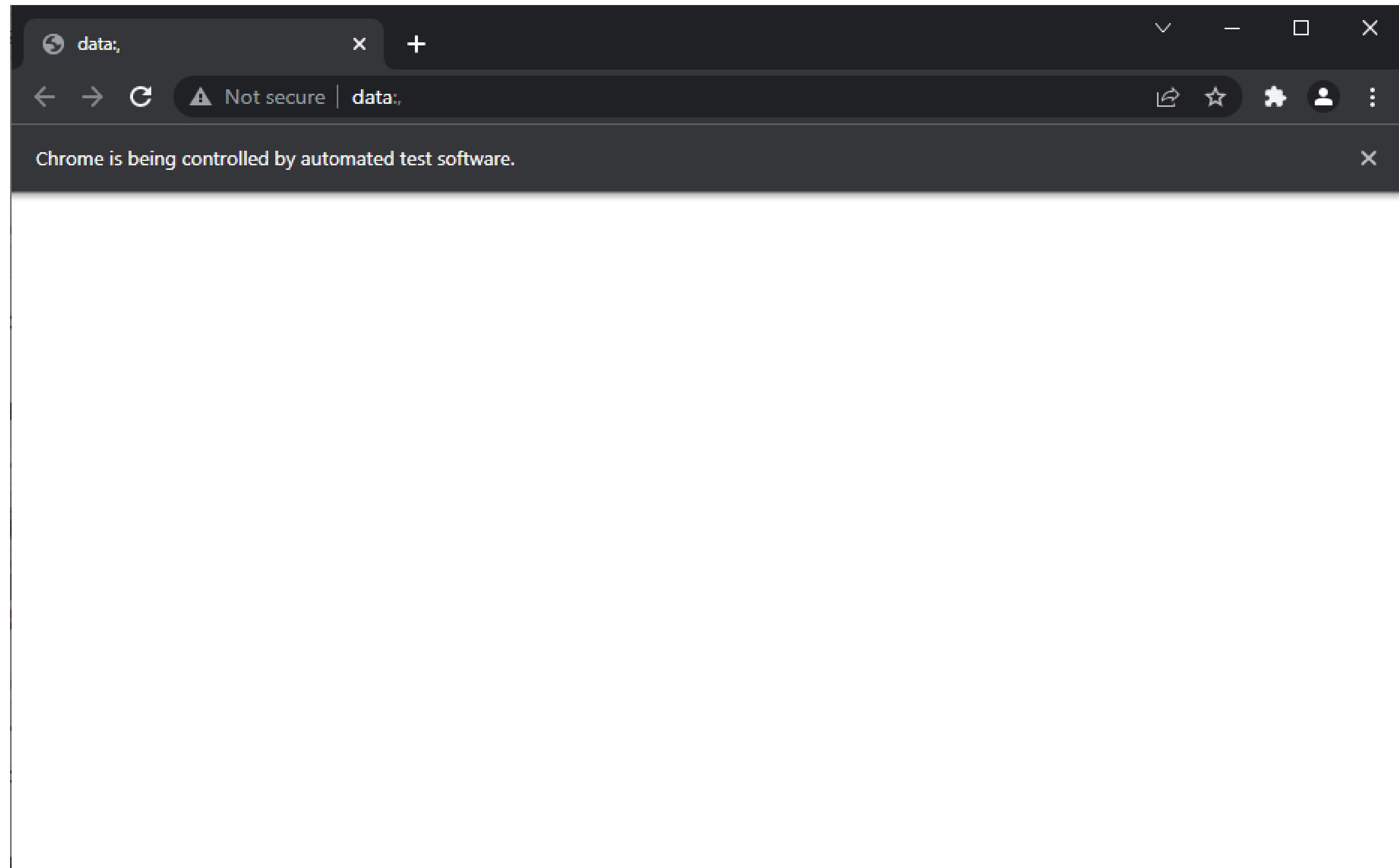


Source code

Data



Web Browser Automation



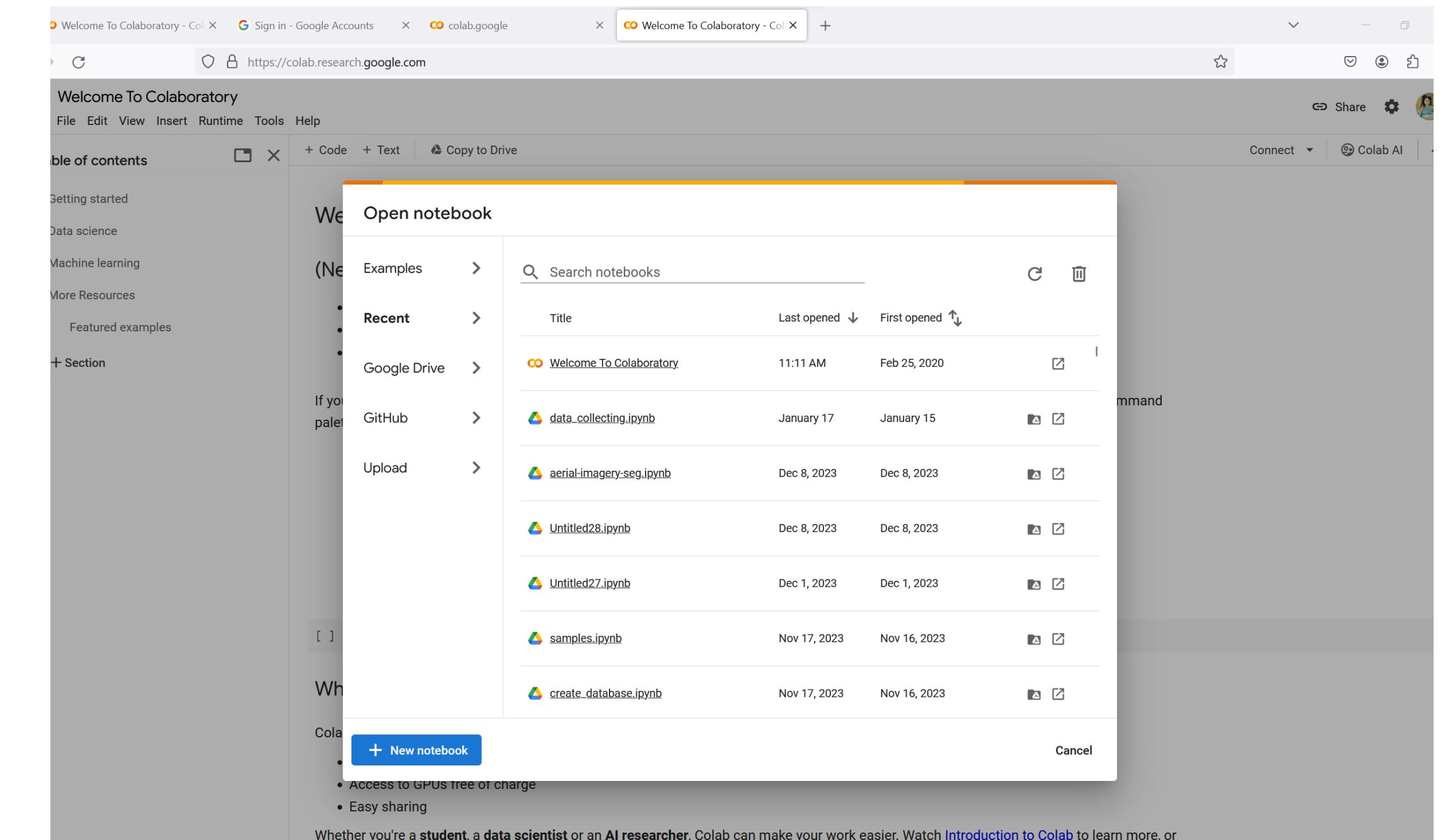
Some website uses JavaScript to support complex user interactions (such as loading data while scrolling down)

we need a web browser to mimic this process

GETTING STARTED WITH PYTHON AND JUPYTER NOTEBOOK

Google Colab

- *Colab* is a hosted Jupyter Notebook service that requires no setup to use and provides free access to computing resources, including GPUs and TPUs.
- <https://colab.research.google.com/>



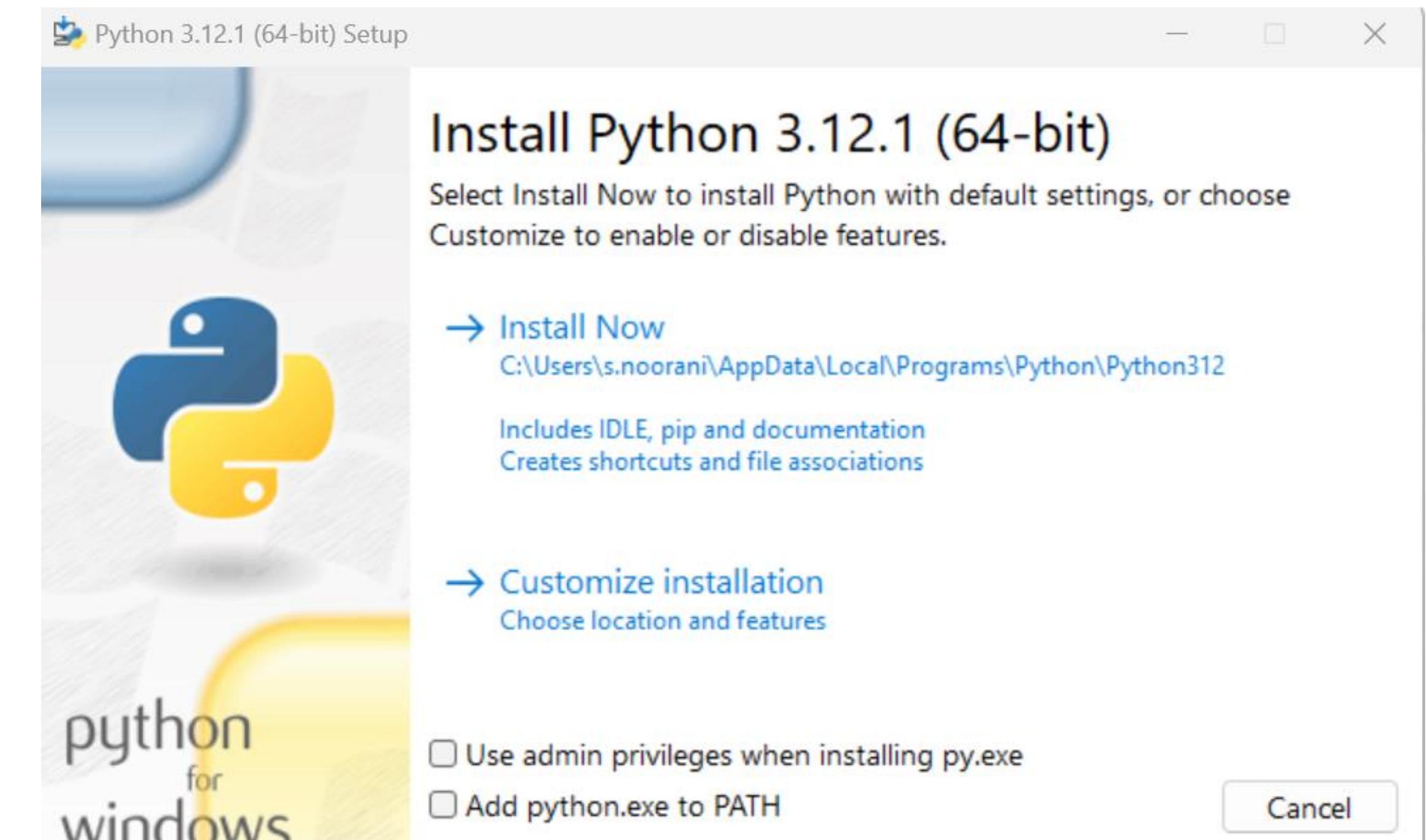
Installing Python

- Download Python from python.org, or you can first download IDE(vocode) and then install Python.
- when you download a compatible version of Python with your computer, DO NOT FORGET TO:
 - “Add Python to PATH” because, during installation, this makes it easier to run Python from the command line.
 - For checking: open the command line or terminal

```
Command Prompt

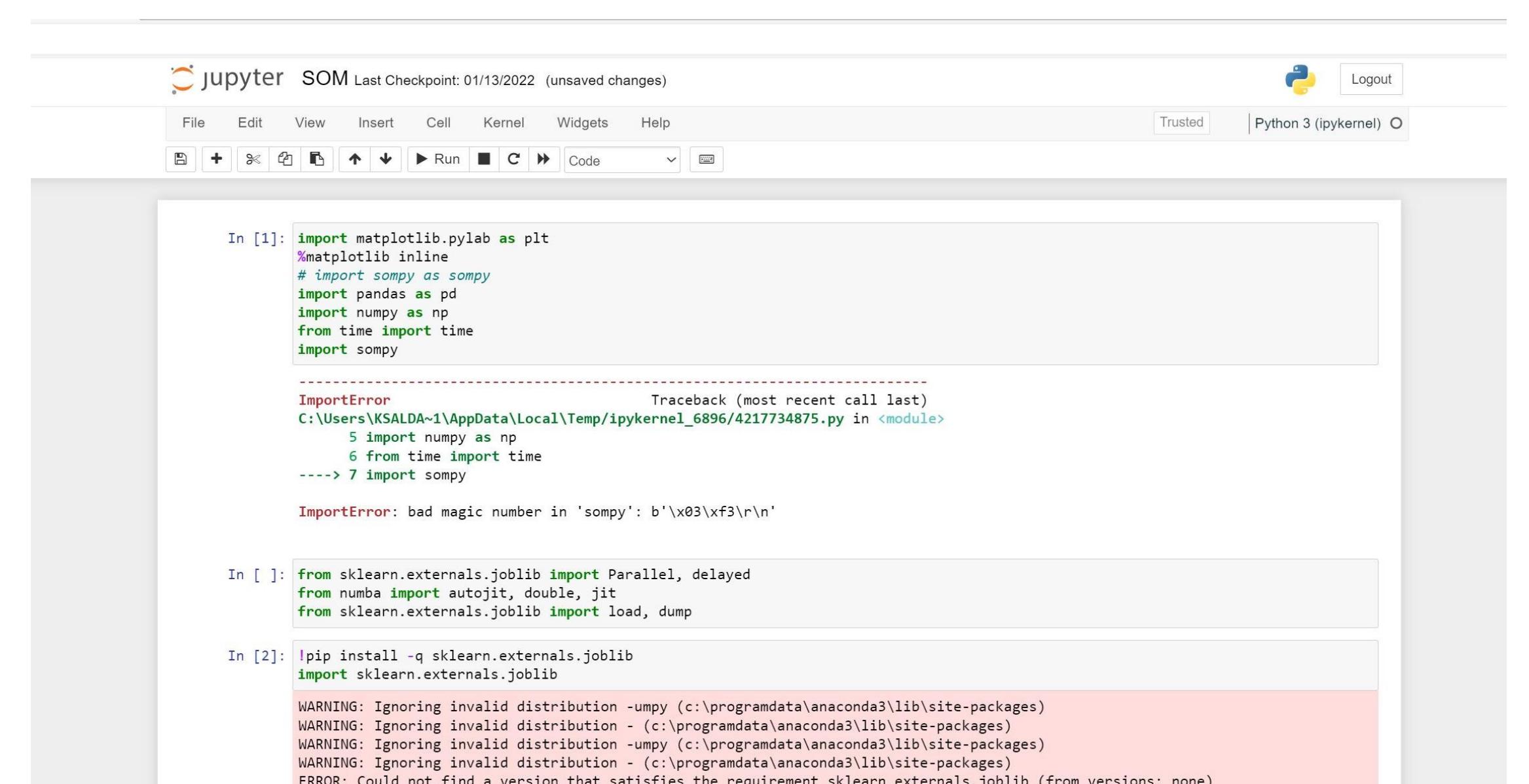
Microsoft Windows [Version 10.0.22631.2428]
(c) Microsoft Corporation. All rights reserved.

C:\Users\s.noorani>python --version
Python 3.11.7
```



Installing Jupyter Notebook

- Jupyter Notebook as an interactive computing environment that allows you to write and execute Python code in a web browser.
- its features like the ability to include live code, rich text, and visualizations in a single document.
- installing Jupyter Notebook using Python's package manager, pip. This can be done by typing pip install notebook in the command line or terminal.
- how to launch Jupyter Notebook by typing jupyter notebook in the command line or terminal.



The screenshot shows a Jupyter Notebook interface with the following content:

```
In [1]: import matplotlib.pyplot as plt
%matplotlib inline
# import sompy as sompy
import pandas as pd
import numpy as np
from time import time
import sompy

-----  
ImportError: Traceback (most recent call last)  
C:\Users\KSALDA~1\AppData\Local\Temp\ipykernel_6896\4217734875.py in <module>  
      5 import numpy as np  
      6 from time import time  
----> 7 import sompy

ImportError: bad magic number in 'sompy': b'\x03\xf3\r\n'

In [ ]: from sklearn.externals.joblib import Parallel, delayed
        from numba import autojit, double, jit
        from sklearn.externals.joblib import load, dump

In [2]: !pip install -q sklearn.externals.joblib
        import sklearn.externals.joblib

WARNING: Ignoring invalid distribution -umpy (c:\programdata\anaconda3\lib\site-packages)
WARNING: Ignoring invalid distribution - (c:\programdata\anaconda3\lib\site-packages)
WARNING: Ignoring invalid distribution -umpy (c:\programdata\anaconda3\lib\site-packages)
WARNING: Ignoring invalid distribution - (c:\programdata\anaconda3\lib\site-packages)
ERROR: Could not find a version that satisfies the requirement sklearn.externals.joblib (from versions: none)
```

CRAWLING DATA IN GOOGLE COLAB