LECTURE 20

CSV AND JSON

MCS 275 Spring 2023

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LECTURE 20: CSV AND JSON

Reminders and announcements:

- Project 3 coming soon.

INSTALL PILLOW

To prepare for Friday's lecture, you need the Python package *Pillow*. Most people can install it with

```
python3 -m pip install pillow
```

Or substitute the correct interpreter name for your platform.

If you have trouble, check the install instructions and let us know if you don't find a solution there.

READING AND WRITING DATA FILES

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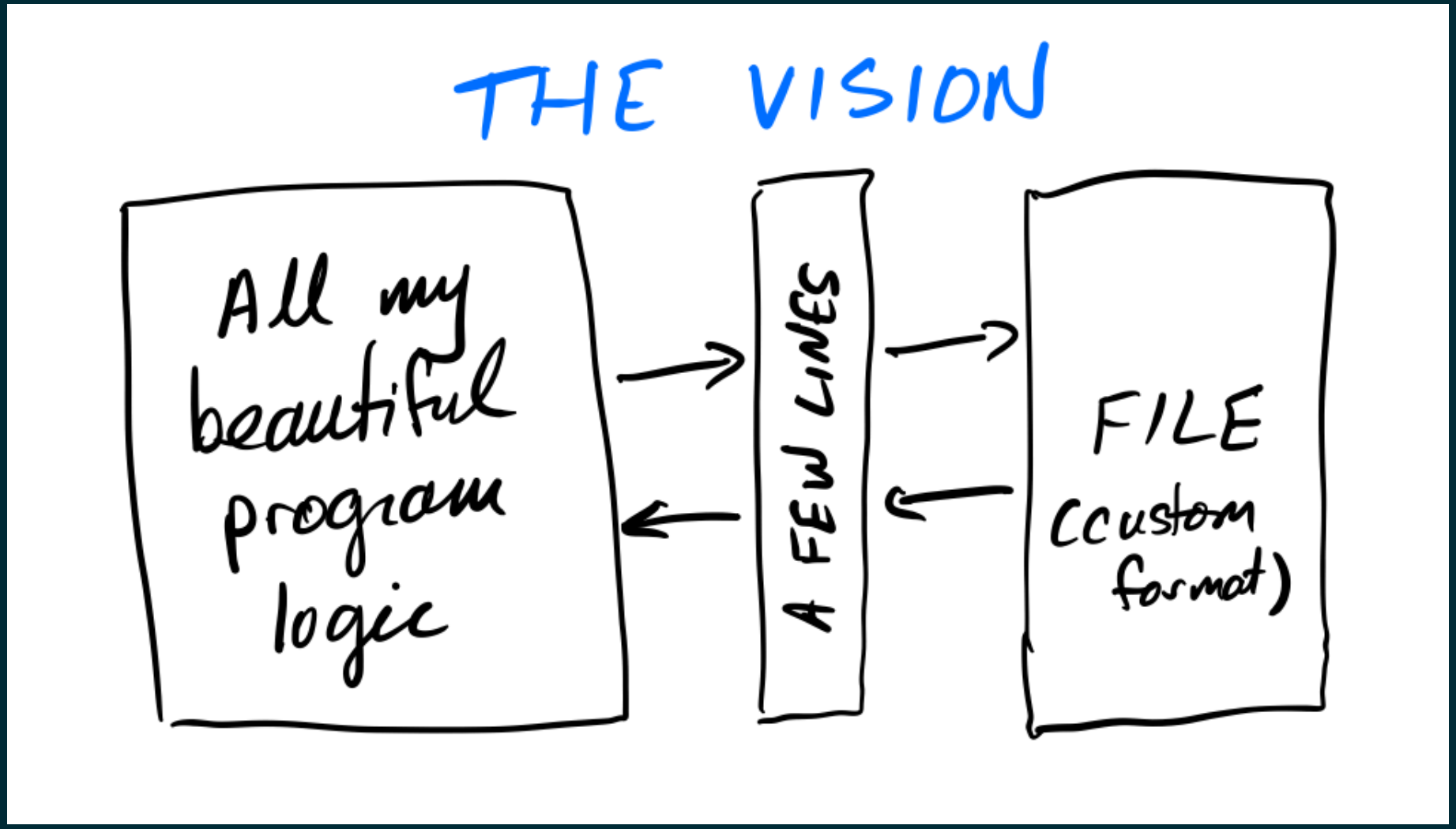

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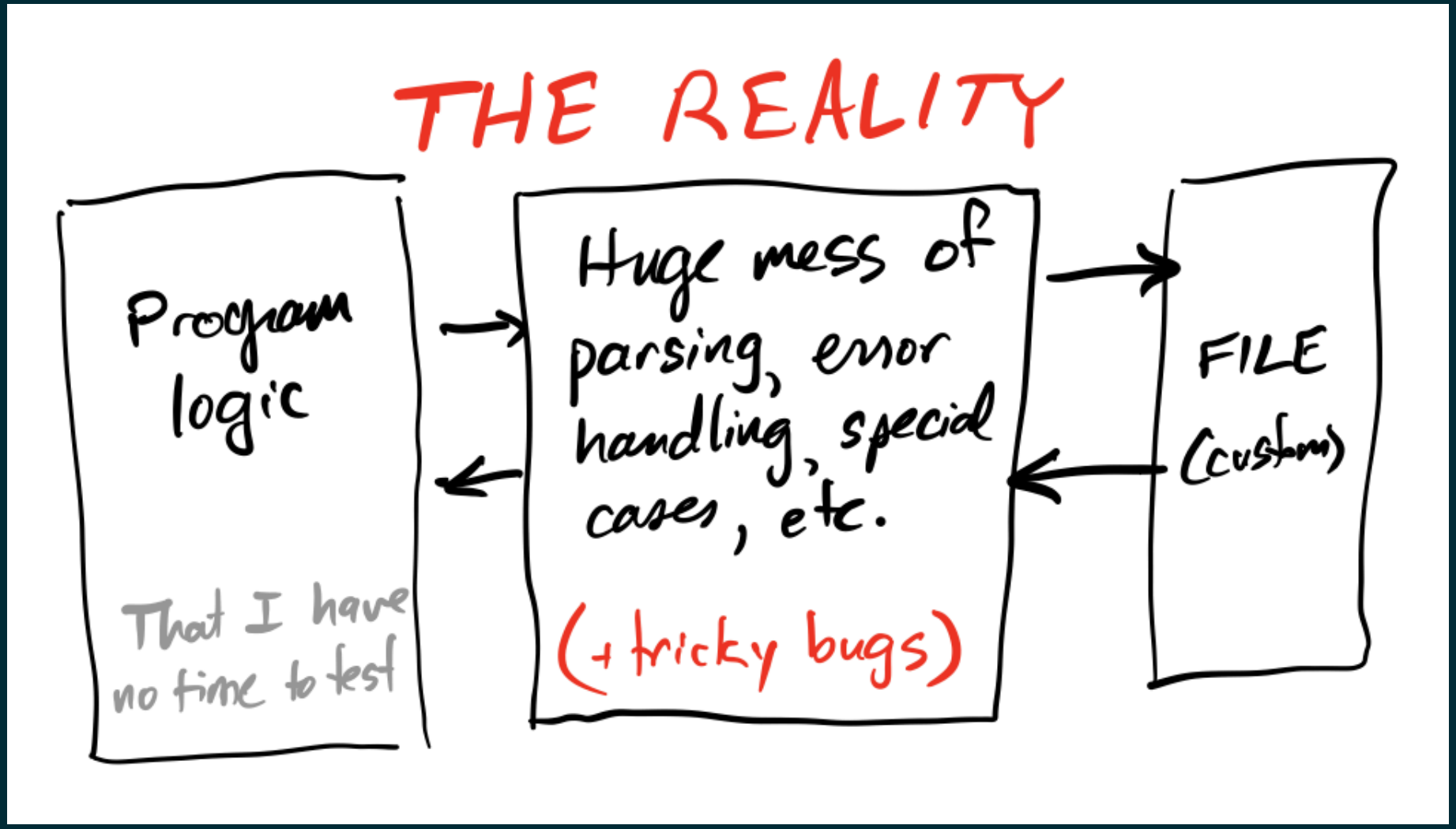

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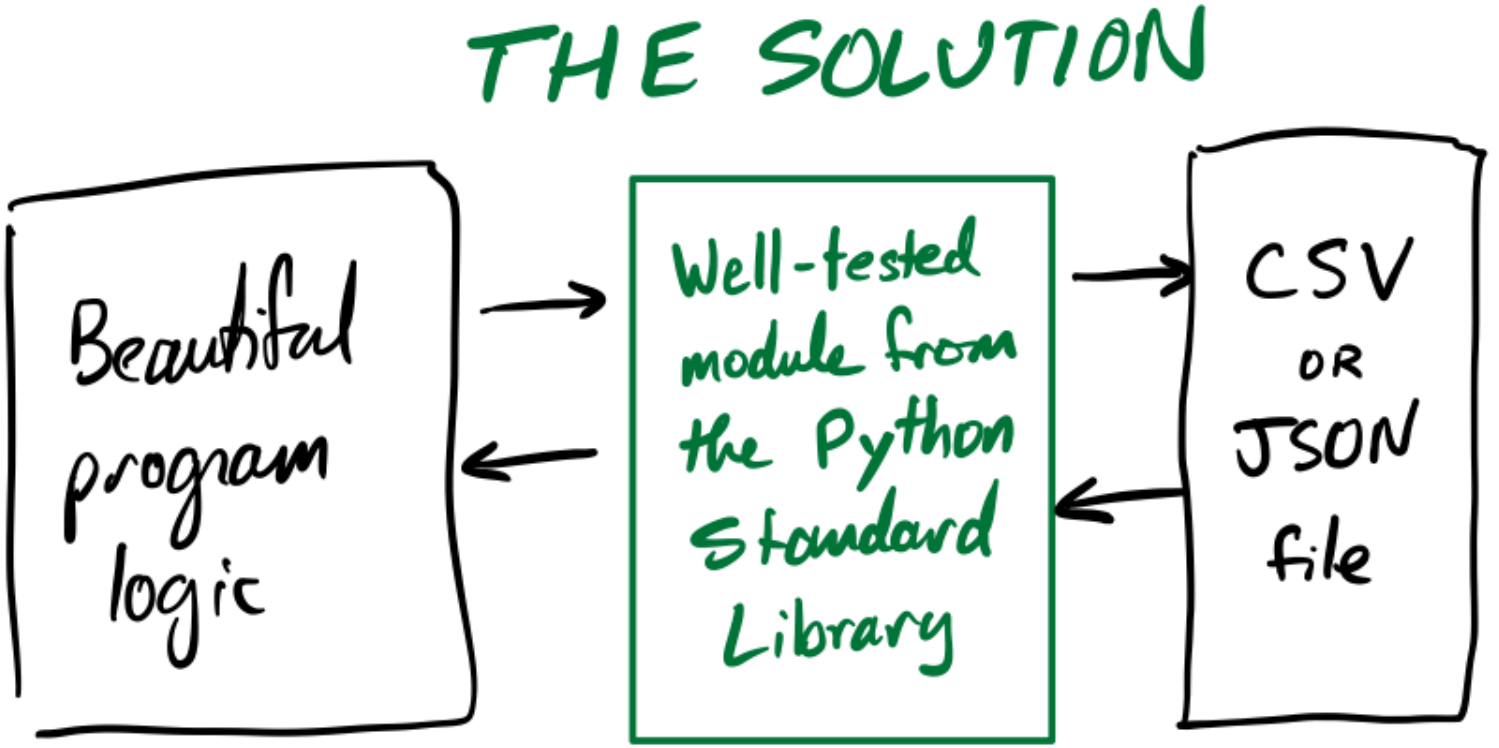
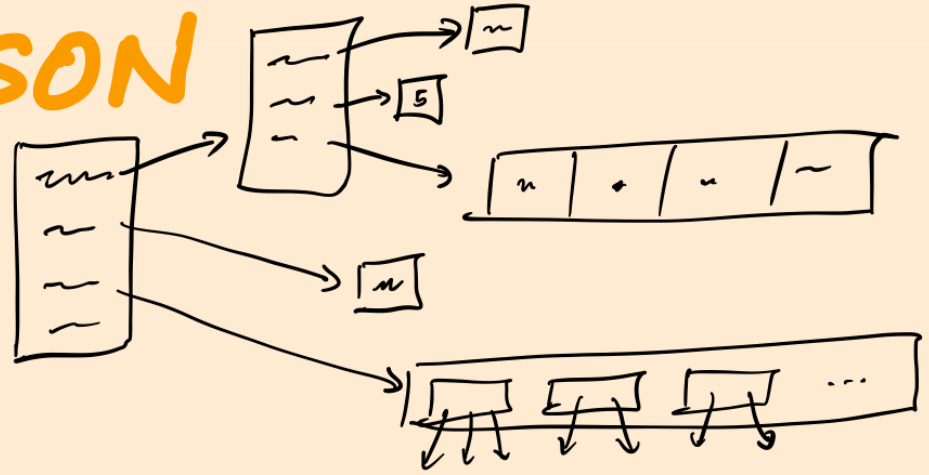


CSV

JSON



CSV

The 90% correct one-line summary:

A way to store a spreadsheet in a text file.

CSV

Comma separated values. A text file format like:

```
State,Capital,Population
Kentucky,Frankfort,25527
South Dakota,Pierre,13646
```

Column headings in the first row (usually).

Untyped. Up to reader to figure out string/float/int/etc.

```
District,Fin-Sub,Chrgbl Fin No,PO Name,Unit Name,Property Address,County,
Greater Boston,431120-G01,431120,BARRINGTON,MAIN OFFICE,200 MIDDLE HWY,BR
Greater Boston,432360-G01,432360,COVENTRY,MAIN OFFICE,1550 NOOSENECK HILL
Greater Boston,434480-G01,434480,HARRISVILLE,MAIN OFFICE,131 HARRISVILLE
Greater Boston,436020-G01,436020,NEWPORT,MAIN OFFICE,320 THAMES ST STE 1,
Greater Boston,436090-G02,436090,NORTH KINGSTOWN,MAIN OFFICE,7715 POST RD
Greater Boston,436580-G02,436580,PASCOAG,MAIN OFFICE,35 BRIDGE WAY,PROVID
Greater Boston,436723-G01,436723,PAWTUCKET,CUMBERLAND BR.,2055 DIAMOND HI
Greater Boston,436720-G03,436720,PAWTUCKET,DARLINGTON,30 MONTICELLO RD,PA
Greater Boston,436720-G01,436720,PAWTUCKET,MAIN OFFICE,40 MONTGOMERY ST,P
Greater Boston,436720-G01,436720,PAWTUCKET,MAIN OFFICE,40 MONTGOMERY ST,P
Greater Boston,436860-G01,436860,PORTSMOUTH,MAIN OFFICE,95 CHASE RD,NEWPO
Greater Boston,437140-G07,437140,PROVIDENCE,CORLISS PK. STA & VMF,55 CORL
Greater Boston,437140-G07,437140,PROVIDENCE,CORLISS PK. STA & VMF,55 CORL
Greater Boston,437178-G01,437178,PROVIDENCE,EAST PROVIDENCE BR.,17 GROVE
Greater Boston,437166-G01,437166,PROVIDENCE,JOHNSTON BRANCH,1530 ATWOOD A
Greater Boston,437170-G01,437170,PROVIDENCE,OLNEYVILLE STA,100 HARTFORD A
Greater Boston,437141-G08,437141,PROVIDENCE,P&DC,24 CORLISS ST RM 100,PRO
Greater Boston,437141-G08,437141,PROVIDENCE,P&DC,24 CORLISS ST RM 100,PRO
Greater Boston,437141-G08,437141,PROVIDENCE,P&DC,24 CORLISS ST RM 100,PRO
Greater Boston,438260-G07,438260,WAKEFIELD,MAIN OFFICE,551 KINGSTOWN RD,W
Greater Boston,438260-G01,438260,WAKEFIELD,NARRAGANSETT BR.,15 MEMORIAL S
Greater Boston,438540-G01,438540,WARREN,MAIN OFFICE,53 CHILD ST,BRISTOL,W
```

Source: USPS

READING CSV

```
with open("datafile.csv","r",newline="",encoding="UTF-8") as fp:
    rdr = csv.DictReader(fp)
    rownum = 1
    for row in rdr:  # reader objects are iterable (ONCE!)
        # row is a dict like {"State": "Kentucky", ...}
        print("Row",rownum)
        rownum += 1
        for colname in row:
            print("{}: {}".format(colname,row[colname]))
```

WRITING CSV

```
with open("courses.csv","w",newline="",encoding="UTF-8") as fp:
    w = csv.DictWriter(fp, fieldnames=["course","instructor"])
    # Write the column headers
    w.writeheader()
    # Now write the rows of data
    w.writerow({"course": "MCS 260",
                "instructor": "Dumas"})
    w.writerow({"course": "MCS 275",
                "instructor": "Dumas"}
```

WRITING CSV

```
with open("courses.csv","w",newline="",encoding="UTF-8") as fp:
    w = csv.writer(fp)
    # Write the column headers
    w.writerow(["course","instructor"])
    # Now write the rows of data
    w.writerow(["MCS 260","Dumas"])
    w.writerow(["MCS 275","Dumas"])
```

JSON

The 90% correct one-line summary:

A way to store a `dict` in a file.

JSON

JSON stands for **JavaScript object notation**. It is a text-based format for **typed** hierarchical data.

```
{
    "title": "Fighting robotic wasps",
    "authors": [
      "Paolo Cortázar"
    ],
    "year": 2426,
    "tags": [
      "nonfiction",
      "self-help"
    ],
    "credits": {
      "editor": "Fayez Okoye-Sarkis",
      "cover design": "Teresa Duarte"
    },
    "checked out": true,
    "avg star rating": 4.89
  }
```

```
{
    "newsFeedItemList": [
      {
        "title": "Illinois Ranks #2 State in the Nation for Corporate Inv
        "type": "Press Release",
        "date": "Wednesday, March 01",
        "year": "2023",
        "description": "CHICAGO — Site Selection Magazine - an internatio
        "thumbnail": "https://www2.illinois.gov/IISNewsImages/rollupimage
        "url": "https://www.illinois.gov/news/press-release.26121.html",
        "altText": ""
      },
      {
        "title": "State of Illinois Launches Coalition in Effort to Elim
        "type": "Press Release",
        "date": "Tuesday, February 28",
        "year": "2023",
        "description": "CHICAGO - The Illinois Department of Public Healt
        "thumbnail": "https://www2.illinois.gov/IISNewsImages/rollupimage
        "url": "https://www.illinois.gov/news/press-release.26117.html",
        "altText": ""
      },
      {
```


Source: illinois.gov home page

JSON VALUE TYPES

- **string** — must use double quotes.
- **number** — float, int, other? Up to reader.
- **boolean** — lower case names `true`, `false`.
- **null** — like Python `None`.
- **array** — like Python `list`. Brackets and commas.
- **object** — like Python `dict`. Curly braces, colons, and commas. Keys must be strings.

READING JSON

```
with open("in.json","r",encoding="UTF-8") as fp:
    val = json.load(fp) # read from file

# OR if you have a string
val = json.loads(s)
```

The object returned can be hard to use if you don't have documentation for the layout of the file. But since it has keys and values, it is at least explorable.

WRITING JSON

```
val = {
        "temperature": 451.3,
        "primes": [2,3,5,7,11],
        "awesome": True,
        "starter": "charmander"
      }
with open("out.json","w",encoding="UTF-8") as fp:
    json.dump(val,fp) # save exactly one object to file

# OR if you just want the JSON as a string
s = json.dumps(val)
```

KEY JSON FEATURES

- Does not require data to be tabular.
- Has excellent standardization and cross-language support.
- Most HTTP APIs (e.g. data portals) return JSON.
- Semi-readable and semi-writeable for humans.

Conversion table for Python → JSON

- `dict` → `object`
- `list` or `tuple` → `array`
- `int` or `float` → `number`
- `bool` → `boolean`
- `None` → `null`

REFERENCES

- MCS 260 Fall 2021:
  - Lecture 15: JSON
  - Lecture 16: CSV
- `csv` module documentation
- `json` module documentation
- Awesome JSON data sets

REVISION HISTORY

- 2022-03-04 Last year's lecture on this topic finalized
- 2023-03-01 Updated for 2023