[220] JSON
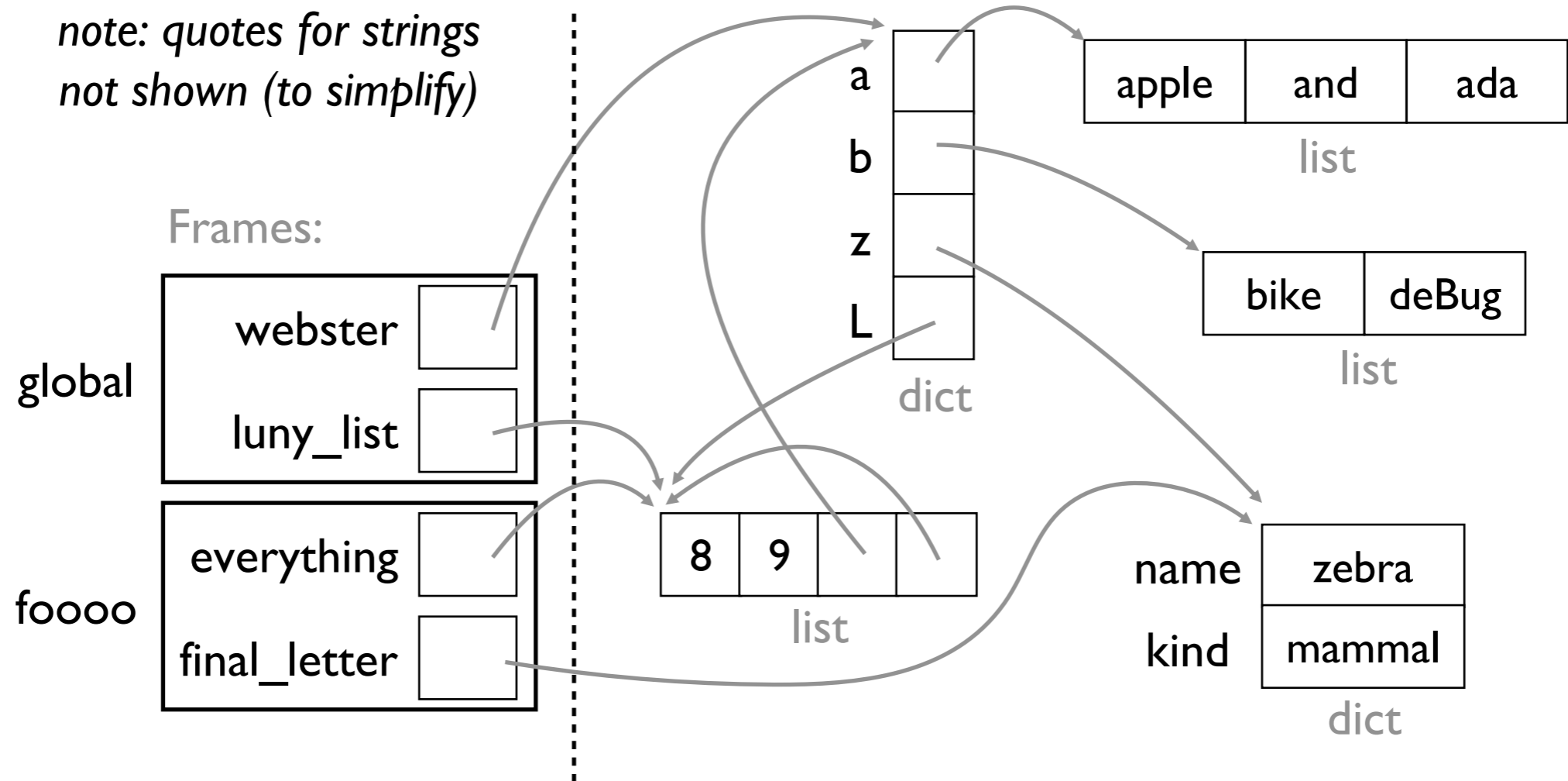
Meena Syamkumar
Mike Doescher

Do not post > 5 lines on Piazza!

**Cheaters caught: 0
(Through P4)**

Practice with nesting...

*note: quotes for strings
not shown (to simplify)*

Frames:

global

| webster | |
| luny_list | |

foooo

| everything | |
| final_letter | |

dict

a	
b	
z	
L	

apple | and | ada

list

bike | deBug

list

| 8 | 9 | | |

list

| name | zebra |
| kind | mammal |

dict

Learning Objectives Today

JSON

- differences with Python syntax
- creating JSON files
- reading JSON files

Read: Sweigart Ch 14
https://automatetheboringstuff.com/2e/chapter16/

"JSON and APIs" to the end

Python Data Structures and File Formats

Python   **File**

```
[
 ["name", "x", "y"],
 ["alice", 100, 150],
 ["bob", -10, 80]
]
```



```
name,x,y
alice,100,150
bob,-10,80
```

CSV file

list of lists

**We can use CSV files to store
data we would want in lists of lists**

Python Data Structures and File Formats

Python   **File**

```
[
 ["name", "x", "y"],
 ["alice", 100, 150],
 ["bob", -10, 80]
]
```
⟷
```
name,x,y
alice,100,150
bob,-10,80
```

CSV file

list of lists

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```
⟷ **?**

dict of dicts

Python Data Structures and File Formats

Python   **File**

```
[
  ["name", "x", "y"],
  ["alice", 100, 150],
  ["bob", -10, 80]
]
```

⟷

```
name,x,y
alice,100,150
bob,-10,80
```

CSV file

list of lists

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

<svg>⟷</svg>

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

dict of dicts

JSON file

Python Data Structures and File Formats

File

JSON files look almost identical to Python code for data structures!

```
[
  ["name", "x", "y"],
  ["alice", 100, 150],
  ["bob", -10, 80]
]
```

name,x,y
alice,100,150
bob,-10,80

list of lists

CSV file

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
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dict of dicts

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

JSON file

Python Data Structures and File Formats

JSON files look almost identical to Python code for data structures!

dicts use curly braces

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

JSON file

Python Data Structures and File Formats

Python

File

JSON files look almost identical to Python code for data structures!

```
[
  ["name", "x", "y"],
  ["alice", 100, 150],
  ["bob", -10, 80]
]
```

```
name,x,y
alice,100,150
bob,-10,80
```

CSV file

list of lists

keys are separated from values with a colon

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

JSON file

dict of dicts

Python Data Structures and File Formats

Python

File

JSON files look almost identical to Python code for data structures!

```
[
  ["name", "x", "y"],
  ["alice", 100, 150],
  ["bob", -10, 80]
]
```

name,x,y
alice,100,150
bob,-10,80

CSV file

list of lists

lists use square brackets

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

dict of dicts

JSON file

Python Data Structures and File Formats

File

JSON files look almost identical to Python code for data structures!

```
[
  ["name", "x", "y"],
  ["alice", 100, 150],
  ["bob", -10, 80]
]
```

list of lists

```
name,x,y
alice,100,150
bob,-10,80
```

CSV file

strings are in quotes

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

dict of dicts

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

JSON file

Python Data Structures and File Formats

JSON files look almost identical to Python code for data structures!

```
[
  ["name", "x", "y"],
  ["alice", 100, 150],
  ["bob", -10, 80]
]
```

```
name,x,y
alice,100,150
bob,-10,80
```

list of lists

CSV file

integers look like integers

```
{
  "alice": {
    "age": 40,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

```
{
  "alice": {
    "age":  40 ,
    "scores": [10,20,19]},
  "bob": {
    "age": 45,
    "scores": [15,23,17,15]}
}
```

dict of dicts

JSON file

JSON

Stands for **JavaScript Object Notation**
- JavaScript is a language for web development
- JSON was developed JavaScript programs to store/share data
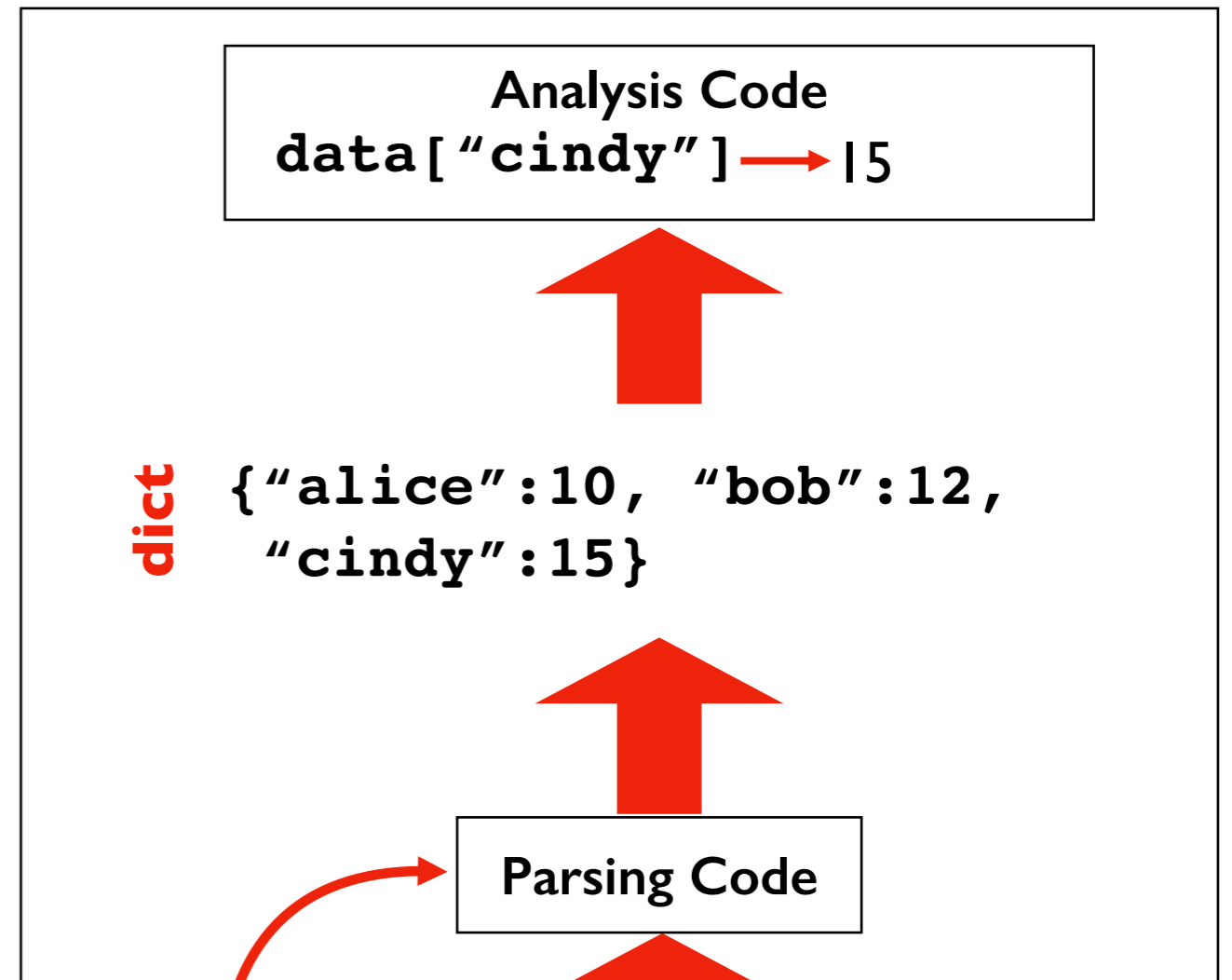- JSON looks like Python code because JavaScript is similar to Python

Minor JavaScript vs. Python differences:

	Python	JSON
Booleans	True, False	true, false
No value	None	null
Quotes	Single (') or double (")	Only double (")
Commas	Extra allowed: [1,2,]	No extra: [1,2]
Keys	Any type: {3: "three"}	Str only: {"3": "three"}

remember these!

Reading JSON Files

Python Program

Analysis Code
`data["cindy"]` ⟶ 15

dict `{"alice":10, "bob":12, "cindy":15}`

Parsing Code

What does this look like?

JSON file saved somewhere

```
{
  "alice": 10,
  "bob": 12,
  "cindy": 15
}
```

Reading JSON Files

```
import json

def read_json(path):
    with open(path, encoding="utf-8") as f:
        return json.load(f) # dict, list, etc
```

CTRL + C

*don't need to understand
this snippet yet*

Parsing Code

What does this look like?

Reading JSON Files

```
import json

def read_json(path):
    with open(path, encoding="utf-8") as f:
        return json.load(f) # dict, list, etc
```

{ "alice":10, "bob":12,
"cindy":15}

CTRL **+** **C**

*don't need to understand
this snippet yet*

what about writing new files?

Parsing Code

What does this look like?

Data Structures and Files

serialization

**Data Structures
[lists, dicts, etc]**

**Files
[CSVs, JSONs, etc]**

parsing
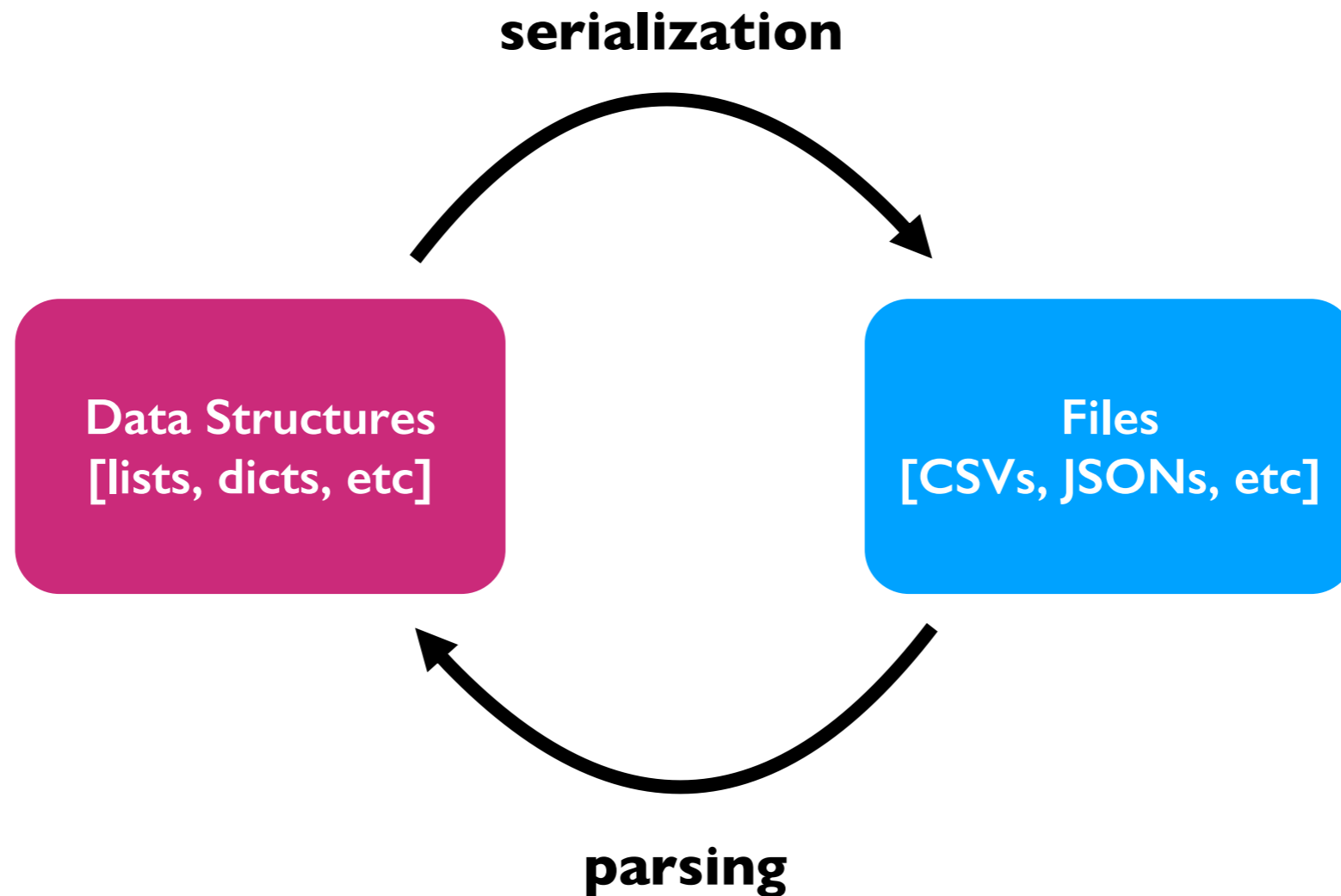
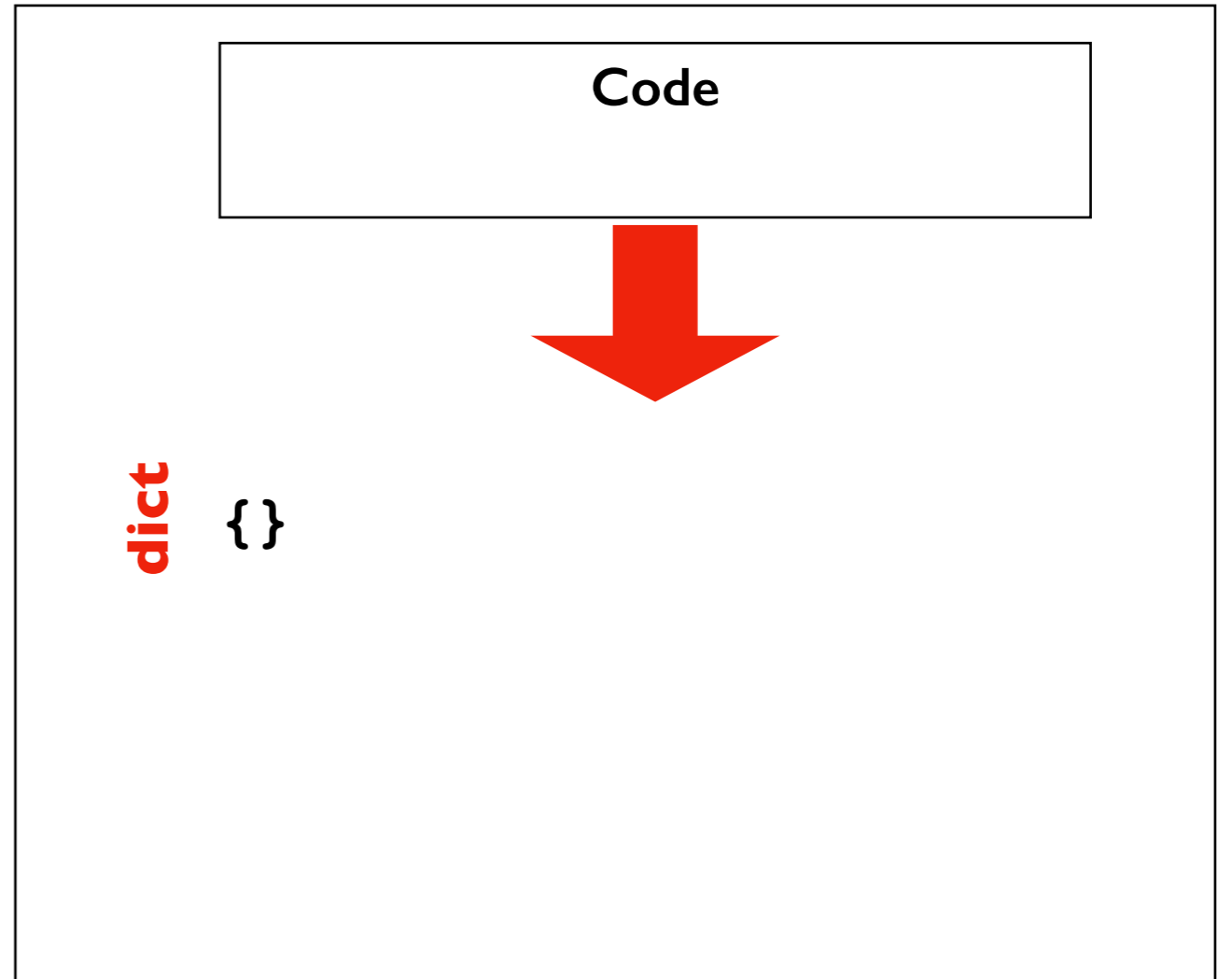*why not just have data structures?*

because our data needs to live somewhere when our programs aren't running

why not just have files?

slow, and Python doesn't understand structure until it is parsed

Writing JSON Files

Python Program

Code

dict `{}`

Writing JSON Files

Code
data["cindy"] = 15

dict **{"cindy": 15}**

Writing JSON Files

Code
```
data["cindy"] = 15
```

dict   `{"cindy": 15}`

Serialization Code

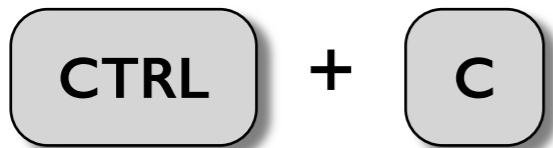**What does this look like?**

JSON file saved somewhere

```
{
  "cindy": 15
}
```

Writing JSON Files

```python
import json

# data is a dict, list, etc
def write_json(path, data):
    with open(path, 'w', encoding="utf-8") as f:
        json.dump(data, f, indent=2)
```

CTRL + C

*don't need to understand
this snippet yet*

Serialization Code

What does this look like?

Demo 1: Number Count

Goal: count the numbers in a list saved as a JSON file

Input:
- Location of the file

Output:
- The sum

Example:

prompt> **python sum.py fileA.json**
6

fileA.json

[1,2,3]

Demo 2: FIFA JSON

Goal: lookup stats about players

Input:
- Player ID and column

Output:
- The value

Example:

prompt> **python lookup.py 20801 name**
Cristiano Ronaldo

fifa.json

```
{
 "20801": {
   "name": "Cristiano Ronaldo",
   "Age": 32,
   "nationality": "Portugal",
   "club": "Real Madrid CF",
   "league": "Spanish Primera Divisi\u00f3n",
   "euro_wage": 565000,
   "networth": 95500000,
   "score_of_100": 94
...
```

Demo 3: Score Tracker

Goal: record scores (save across runs) and print average

Input:
- A **name** and a **score** to record

Output:
- Running average for that person

Example:

prompt> **python record.py alice 10**
Alice Avg: 10
prompt> **python record.py alice 20**
Alice Avg: 15
prompt> **python record.py bob 13**
Bob Avg: 13

Demo 4: Prime Cache

Goal: find number of primes less than N, cache previous return vals

Input:
- An integer N

Output:
- How many primes are less than that number

Demo 5: Upper Autocomplete

Goal: record scores (save across runs) and print average

Input:
- A complete phrase
- A partial phrase ending with a *

Output:
- The upper case version of it
- Options to autocomplete

autocomplete must work
across multiple runs

Example:

prompt> **python shout.py**
msg: hi
HI
msg: hello
HELLO
msg: h*
1: hi
2: hello
select: 1
HI