

# J S O N

Department of Computer Sciences  
University of Wisconsin-Madison

Readings:  
Chapter 16 of Sweigart book

Worksheet practice with nesting

# Learning Objectives

## J S O N:

- interpret data format
- differences with Python syntax
- deserialize data from J S O N files to use in Python program (read)
- serialize data into J S O N files for long term storage (write)

Read: Sweigart Ch 16

<https://automatetheboringstuff.com/2e/chapter16/>

“JSON and APIs” to the end


# Python Data Structures and File Formats

**Python**

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

**list of lists**

**File**



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

**CSV file**

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

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]
```

**list of lists**

## File

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

**CSV file**



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

**dict of dicts**



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    "age": 45,  
    "scores": [15,23,17,15]}  
}
```

**dict of dicts**

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  "alice": {  
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  "bob": {  
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    "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]  
]
```

list of lists

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

CSV file

**dicts use curly braces**

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

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  "alice": {  
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]
```

```
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,  
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}
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dict of dicts

```
{  
  "alice": {  
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  ["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]}  
}
```

dict of dicts

```
{  
  "alice": {  
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  ["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]},  
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**JSON file**

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]
```

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

CSV file

list of lists

**integers look like integers**

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

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{  
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```

**JSON file**

# J S O N

## S tands for **J a v a S c r i p t O b j e c t N o t a t i o n**

- J a v a S c r i p t is a language for web development
- J S O N was developed for J a v a S c r i p t programs to store/share data
- J S O N looks like Python code because J a v a S c r i p t is similar to Python

## Minor J a v a S c r i p t vs. Python differences:

	Python	J S O N
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"}	S tr only: {"3": "three"}

remember these!

# Reading J S O N 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 J S O N 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*

**what about writing new files?**

JSON file saved somewhere

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

Python Program

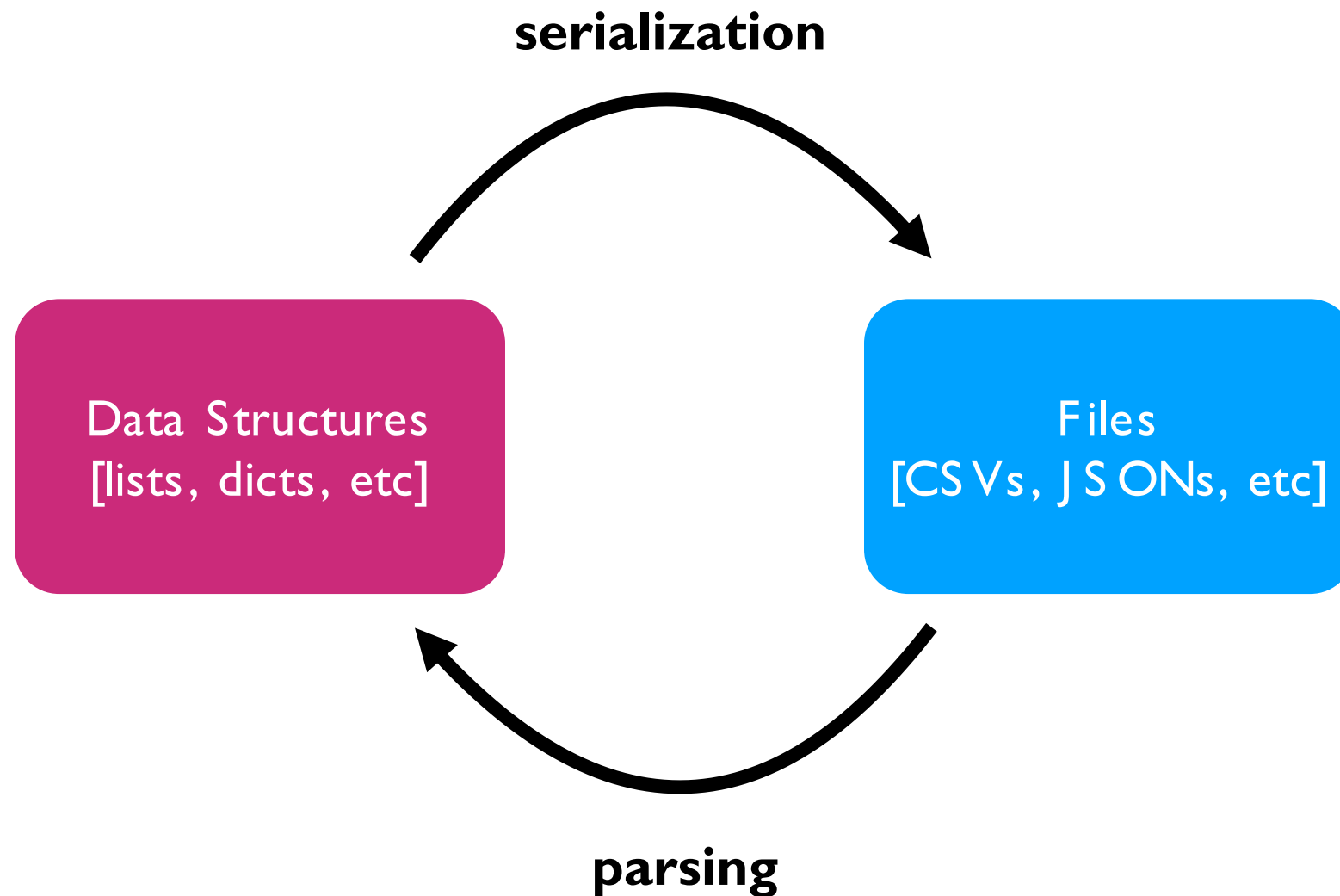
Analysis Code

```
data["cindy"] → 15
```

Parsing Code

**What does this look like?**

# Data Structures and Files



***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 J S O N Files

## Python Program

Code  
`data["cindy"] = 15`

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

Serialization Code

**What does this look like?**

**JSON file saved somewhere**

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



# Writing JSON Files

```
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*

Python Program

Code

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

dict

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

Serialization Code

**What does this look like?**

JSON file saved somewhere

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

# Example: Sum of numbers (simple JSON)

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

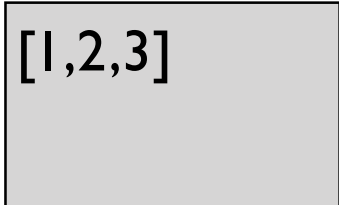
## Input:

- Location of the JSON file

## Output:

- The sum

**Example:** **fileA.json** **output 6**



# Example: 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:

"Enter player name and score": **alice 10**

Alice Avg: 10

"Enter player name and score": **alice 20**

Alice Avg: 15

"Enter player name and score": **bob 13**

Bob Avg: 13

# Example – Exploring kiva.json

Goal: explore a real-world J S O N file

**kiva.json**

```
{
  "data": {
    "lend": {
      "loans": {
        "values": [
          {
            "name": "Polikseni",
            "description": "Polikseni is 70 years old and married. She and her husband are both retired and their main income is a retirement pension of $106 a month for Polikseni and disability income for her husband of $289 a month. <br /><br />Polikseni's husband, even though disabled, works in a very small shop as a watchmaker on short hours, just to provide additional income for his family and to feel useful. Polikseni's husband needs constant medical treatment due to his health problems. She requested another loan, which she will use to continue paying for the therapy her husband needs. With a part of the loan, she is going to pay the remainder of the previous loan.",
            "loanAmount": "1325.00",
            "geocode": {
              "city": "Korce",
              "country": {
                "name": "Albania",
                "region": "Eastern Europe",
                "fundsLentInCountry": 9051250
              }
            }
          }, ...
        ]
      }
    }
  }
}
```

# Challenge - 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

# Challenge - 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:

```
msg: hi
HI
msg: hello
HELLO
msg: h*
1: hi
2: hello
select: 1
HI
```