REST APIs

Ryan Henning

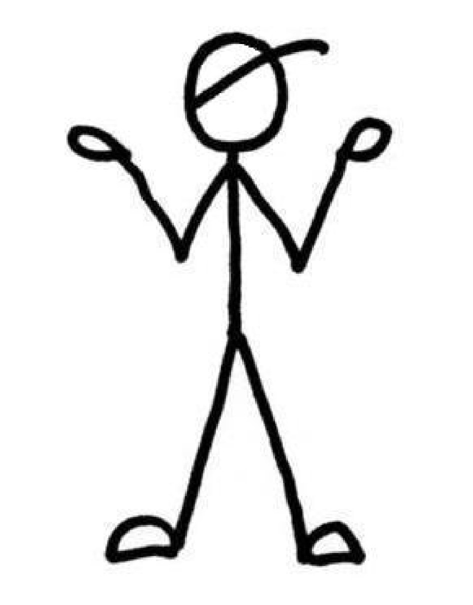
galvanize

- Application Programming Interface (API)
- What makes a good API?
- REST APIs
- Steps to build a REST API:

  (one sprint-worth of steps)

  a. Gather requirements
  b. Build and deploy a *mock* API
  c. Validate the *mock* API
  d. Build and deploy the *real* API
  e. Validate & verify the *real* API
- Demo: *Text Sentiment REST API*

Motivation



WDI Student

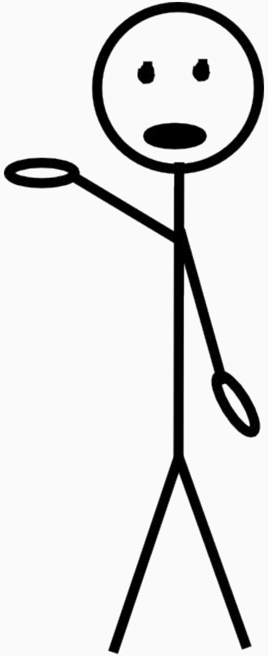
Yo, let’s collaborate!

Okay! Do you know Python?

Nope! Do you know JavaScript?

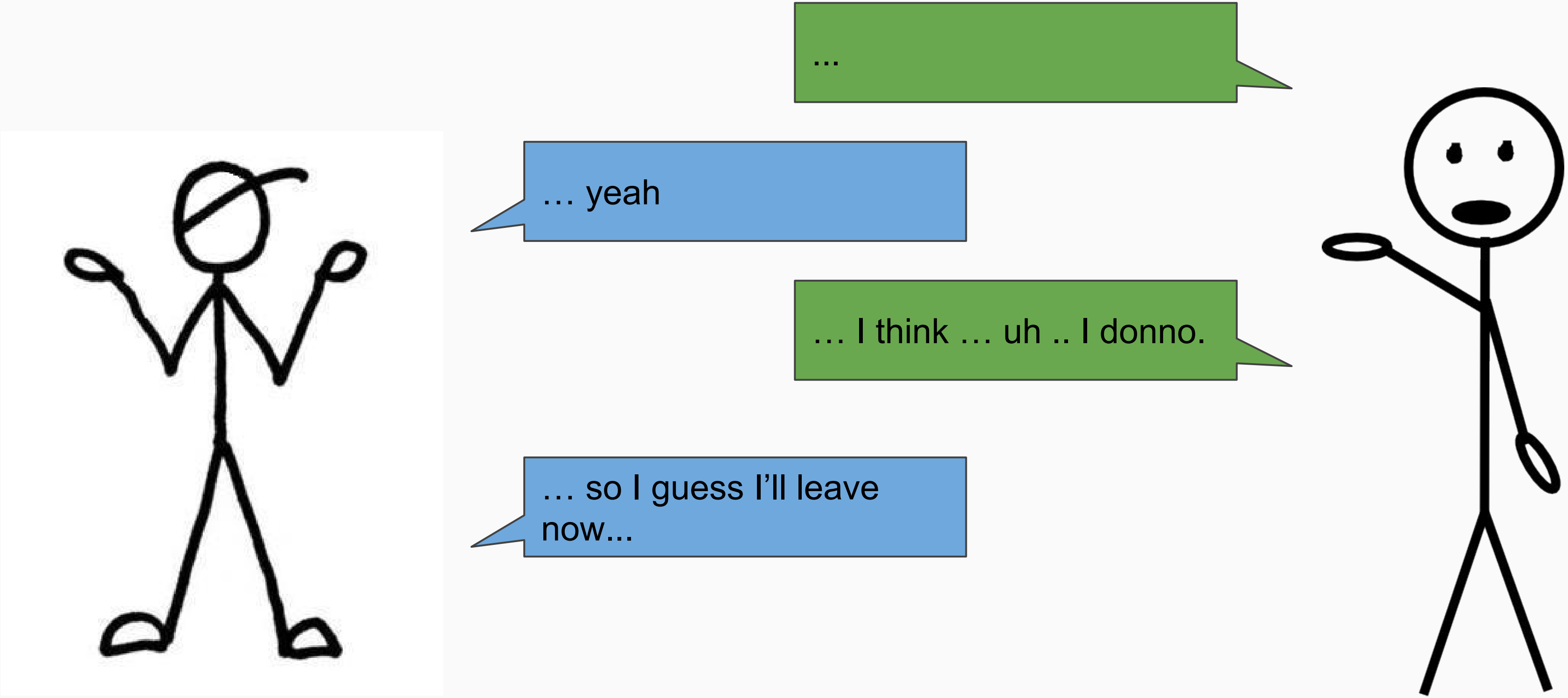
Nope, but all the cool DS stuff is in Python, so we must use Python.

No man, to build front-ends you gotta use JavaScript… so we gotta use JavaScript, man.



DSI Student

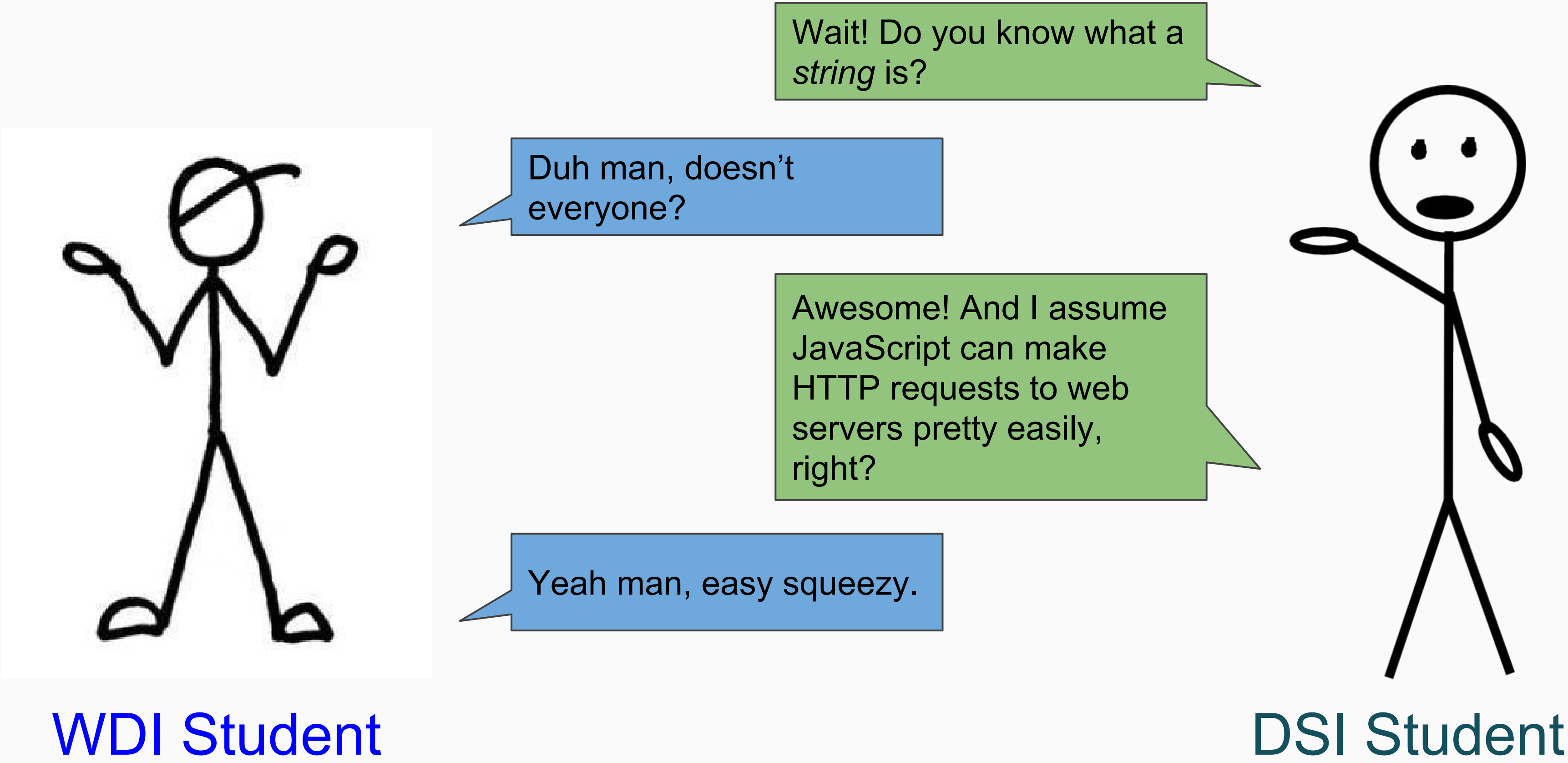
Motivation



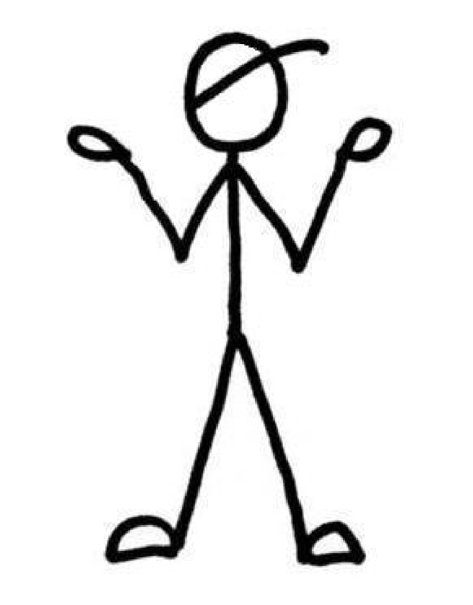
WDI Student

DSI Student

Motivation


Wait! Do you know what a *string* is?
Duh man, doesn’t everyone?
Awesome! And I assume JavaScript can make HTTP requests to web servers pretty easily, right?
Yeah man, easy squeezy.
WDI Student
DSI Student

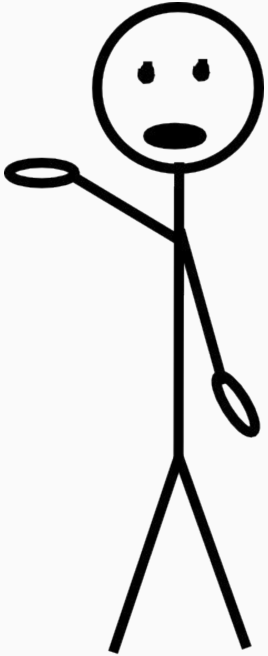
Motivation



WDI Student

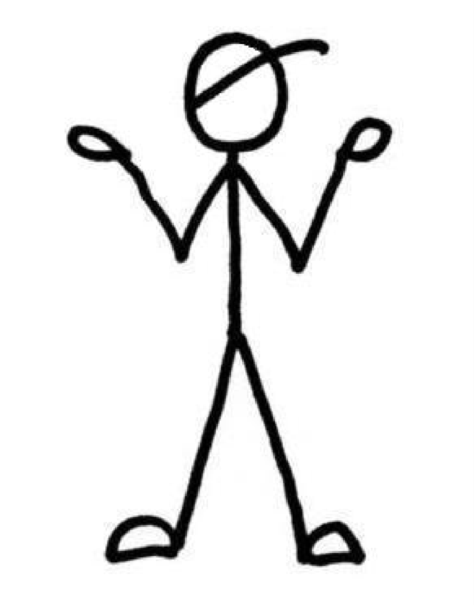
Okay cool. I have an idea. What if your front-end just sends HTTP requests to a web server that I write in Python. You can send me strings and I’ll return strings back to you. Our code can talk that way!

Rad. For those strings we pass back-and-forth, we should pick a format to use so that our code can parse them easily. Have you ever heard of JSON? We use that string format a lot...

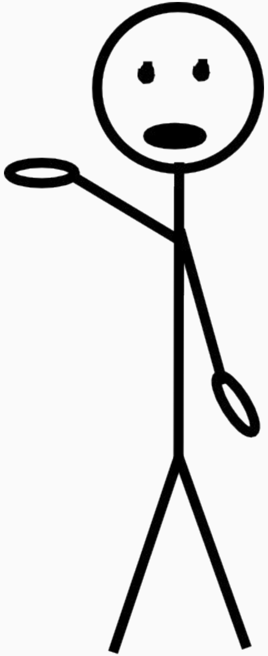


DSI Student

Motivation



WDI Student



DSI Student

Yeah, there's a json module in Python I've used before.

Sweeeeeet.

I bet this will work! Yeah, basically we will have your web app and my python app communicate via JSON strings over HTTP, seems simple enough!

Dude, I think we just invented the REST API.

Define: Interface

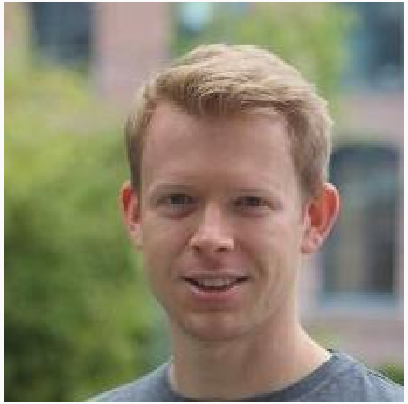
“a point where two systems, subjects, organizations, etc., meet and interact”
 - Oxford Living Dictionary

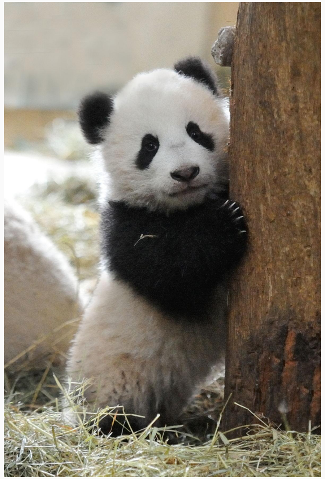
“In computing, an interface is a shared boundary across which two separate components of a computer system exchange information”
 - Wikipedia

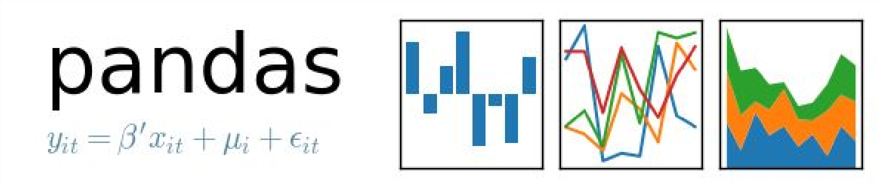
The *interface* is where *your* pile of code touches *their* pile of code.

E.g. You and Wes McKinney (creator of Pandas) both have to understand the *Pandas* interface, like the difference between **.loc**, **.iloc**, and **.ix**, or else it all falls apart.

But! *You* don't need to know how Pandas does its magic, and *Wes* doesn't need to know how Pandas is used in your script.

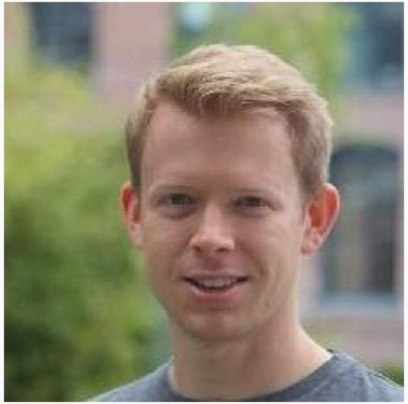


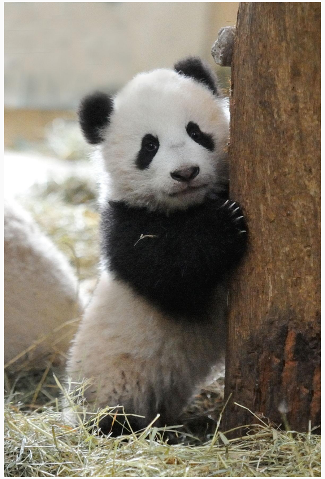


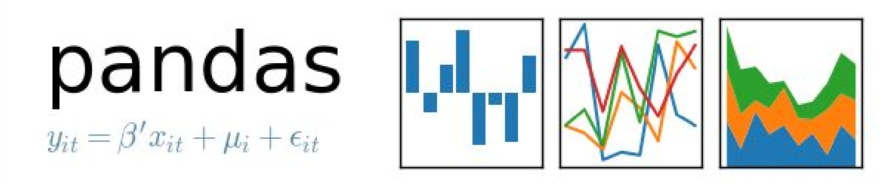


Breaking an Interface, and why it’s bad!

Scenario: You are Wes McKinney (creator of Pandas). You decide that `pd.read_csv` isn’t the best name for that function because it can be used to read SO MANY file formats, not just csv files. So, in the next major release of the library you will change the name of that function to `pd.read_file`.







Now what?

Application Programming Interface (API)

An API is an **interface** between a **programmer** and a **system** (e.g. a piece of computer hardware, an OS, a website, or a database). The **programmer** uses the API as a means for **programming** an **application** atop the **system**.

An API is a **set of subroutines definitions** (e.g. functions and methods) **and data structures definitions** (e.g. structs and classes) which can be used to build **software applications** (“apps”).

The API provides the *building blocks* for an application.

Application Programming Interface (API)

“Just as a graphical user interface makes it easier for people to use programs, application programming interfaces make it easier for developers to use certain technologies in building applications. By abstracting the underlying implementation and only exposing objects or actions the developer needs, an API reduces the cognitive load on a programmer.”

- Wikipedia

What makes a good API?

In general:

- **Logical abstractions**
  e.g. Pandas DataFrames
- **Consistent & strong conventions**
  e.g. polymorphic fit() in sklearn
- **Clear documentation (with example)**
  e.g. sklearn's website; **not** scipy's website
- **Prolific & helpful errors**
  (raised errors are your friend!)
  e.g. Pandas & sklearn; **not** numpy

pandas

$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$

SciPy

scikit learn

NumPy

API vs. Library vs. Framework vs. Package vs. Module

Library: A big chunk of code that you can invoke from your own code.

Framework: A library where you must plug in missing pieces.

Module: (Python specific) A collection of variables, functions, classes, etc.

Package: (Python specific) A collection of modules.

API: The definition for how to interact with a library, e.g. the names of the functions, the parameters each accepts/requires, what is returned by each, etc. Libraries, frameworks, modules, and packages all define APIs.

REST APIs

REST: **Re**presentational **S**tate **T**ransfer

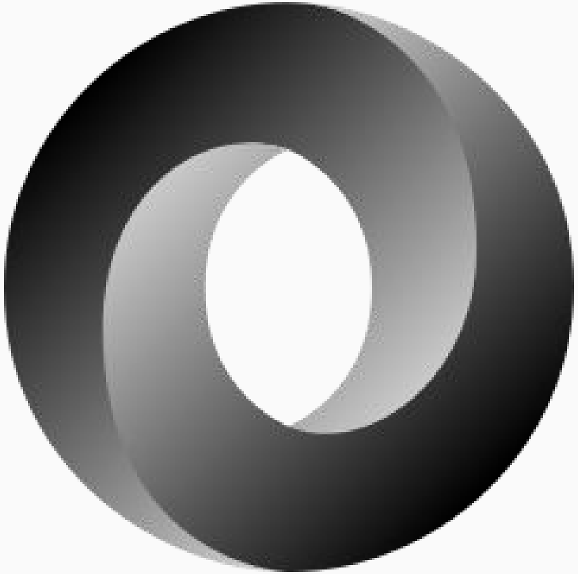
A meta-interface for interoperating with servers over a computer network.

- Client-server (usually HTTP) → Modifiability, Portability
- Stateless → Simplicity, Performant, Scalability, Reliability
- Caches & layers → Performant, Scalability

Define: JSON

JSON: **J**ava**S**cript **O**bject **N**otation

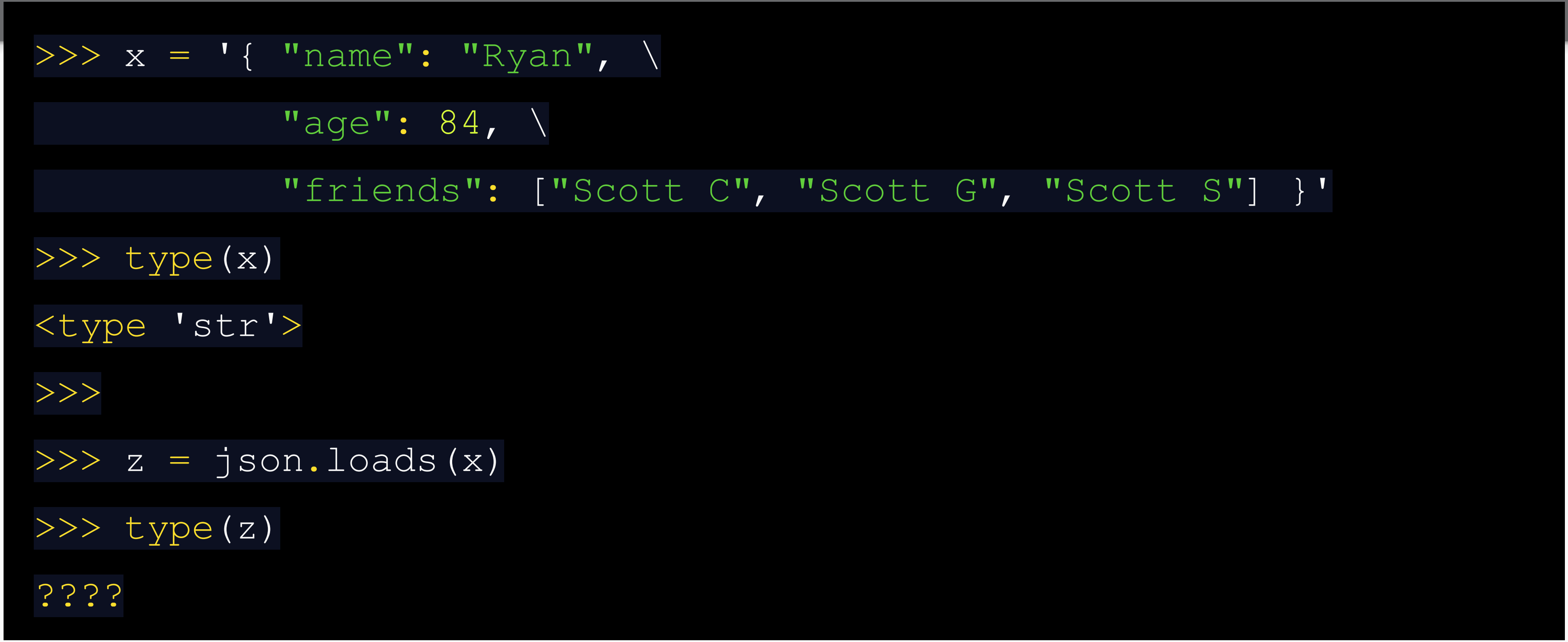
- An open standard
- Human readable
- Language independent (although it’s roots are obviously in JavaScript)
- Defines *objects* in JavaScript (yeah, weird)
- Looks *a lot* like dictionary literals in Python!



JSON Pop Quiz

```
>>> x = '{ "name": "Ryan", \
           "age": 84, \
           "friends": ["Scott C", "Scott G", "Scott S"] }'
>>> type(x)
????
```

JSON Pop Quiz



```
>>> x = '{ "name": "Ryan", \
           "age": 84, \
           "friends": ["Scott C", "Scott G", "Scott S"] }'
>>> type(x)
<type 'str'>
>>>
>>> z = json.loads(x)
>>> type(z)
????
```

Define: Mock

Mock

“not authentic or real, but without the intention to deceive”

- Oxford Living Dictionary

Not this kind

Define: Verification & Validation

Verification

“The assurance that a product, service, or system meets the needs of the customer and other identified stakeholders. It often involves acceptance and suitability with external customers.”

- Project Management Body of Knowledge

Validation

“The evaluation of whether or not a product, service, or system complies with a regulation, requirement, specification, or imposed condition. It is often an internal process.”

- Project Management Body of Knowledge

How to build a REST API

(steps tailored for your capstone project)

1. **Gather requirement:** we will hold an API planning session
2. **Build and deploy a *mock* API:** required to be finished Friday of Week 9
3. **Validate the *mock* API:** hold a validation session with your WDI partner on Monday of Week 10
4. **Build and deploy the *real* API:** required to be finished by Friday of Week 10
5. **Validate & verify the *real* API:** validate & verify the API with your WDI partner on Monday of Week 11

Demos

https://github.com/acu192/text-sentiment-api