Working With Text

Sam Lau

Data 100 Spring 2018 Lecture 10

Who is this guy?

5th Year MS with Josh Hug

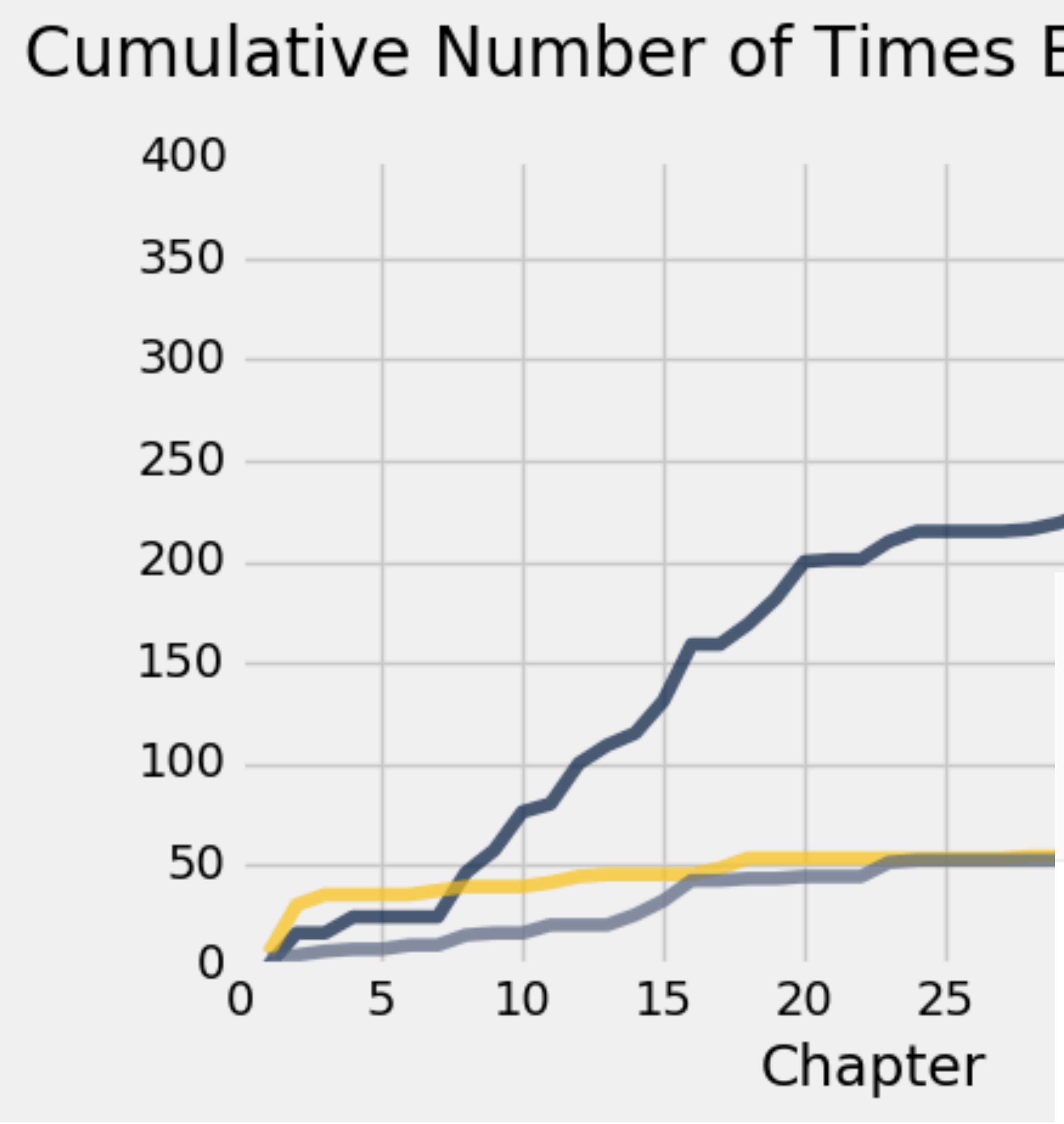
CS and Education

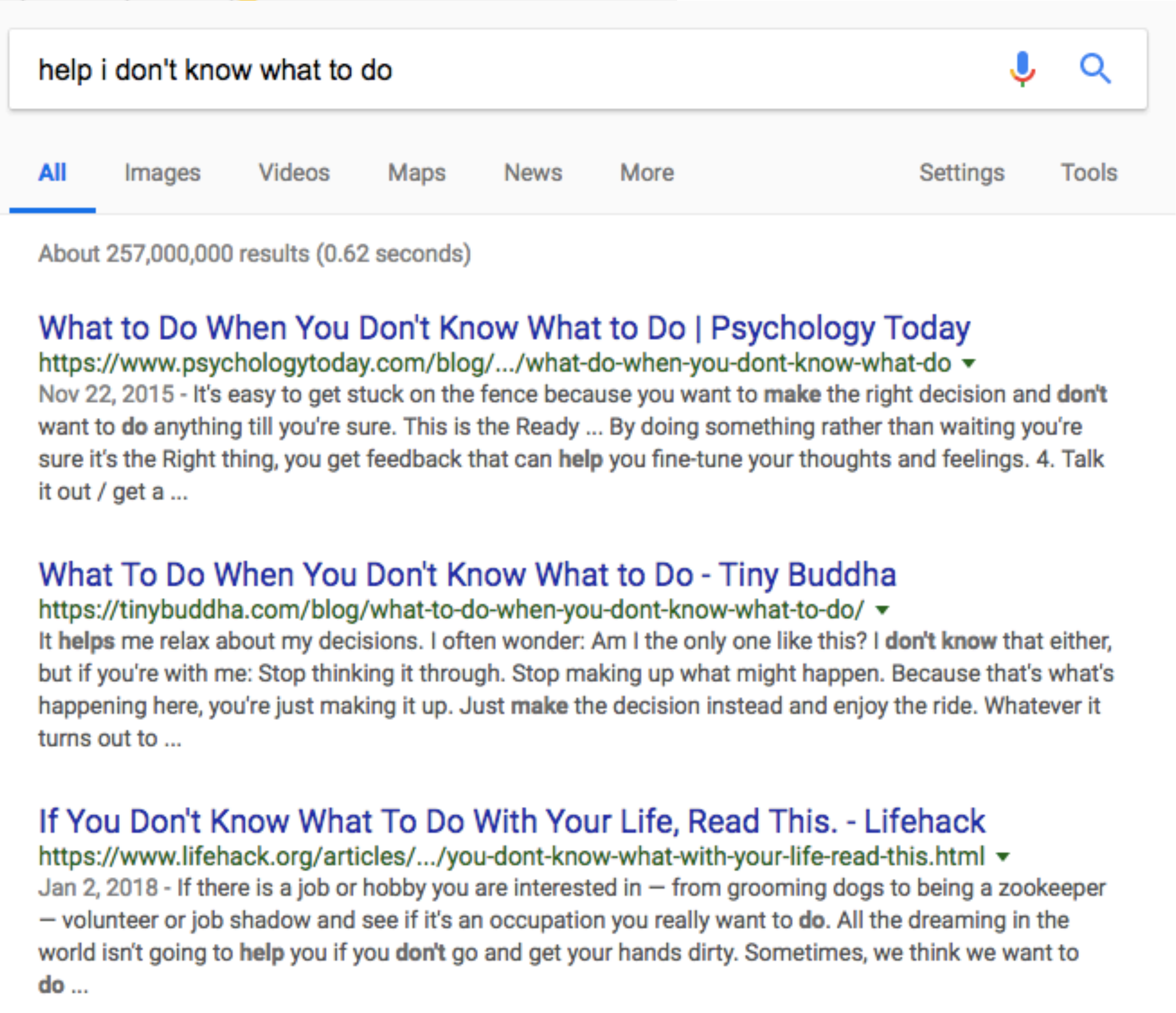
Data 8 for its first 3 offerings

Data 100 for its first 2

Now helping to write textbook for Data 100

Why teach text?



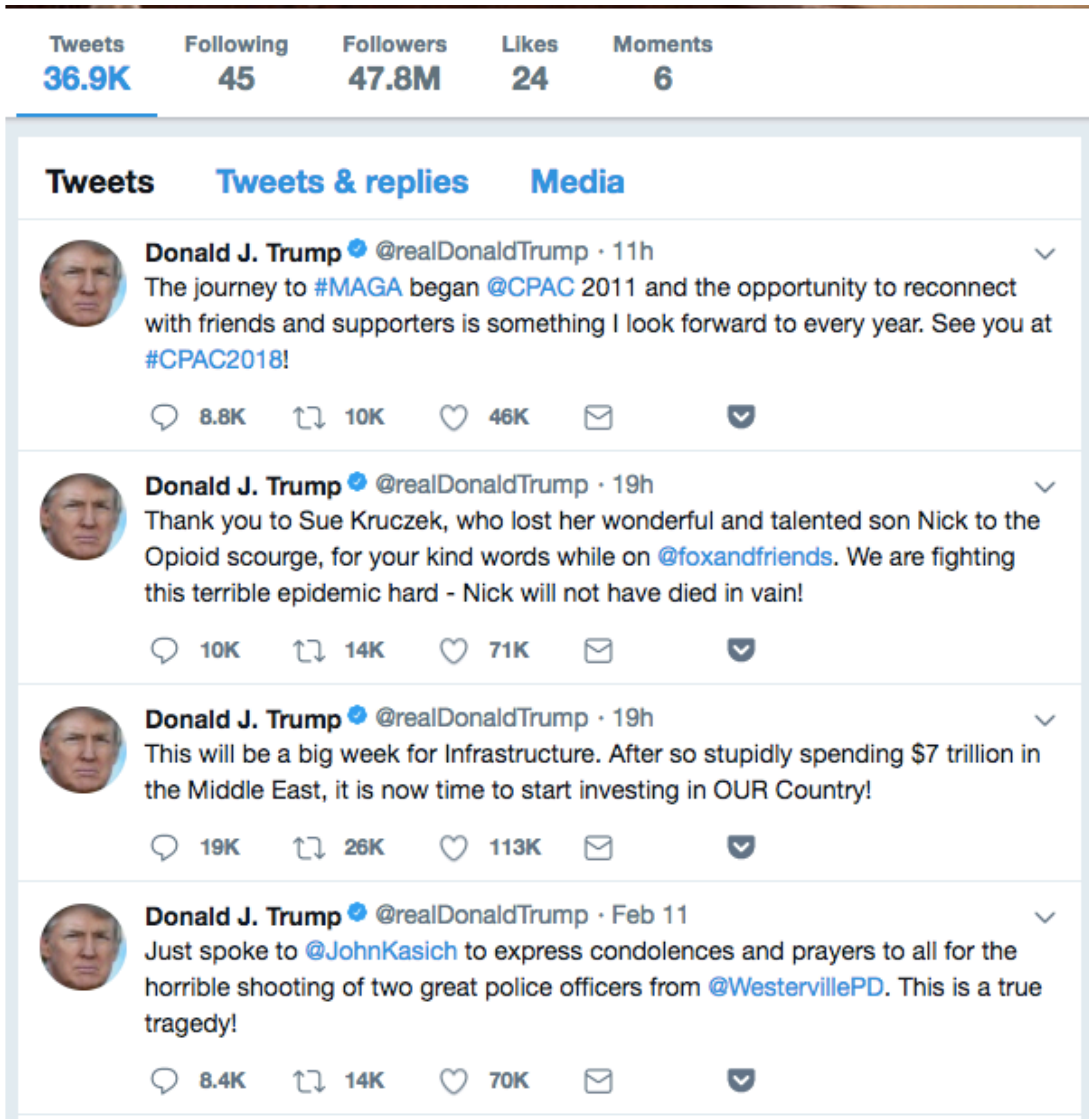


About 257,000,000 results (0.62 seconds)

What to Do When You Don't Know What to Do | Psychology Today
https://www.psychologytoday.com/blog/.../what-do-when-you-dont-know-what-do ▾
Nov 22, 2015 - It's easy to get stuck on the fence because you want to **make** the right decision and **don't** want to **do** anything till you're sure. This is the Ready ... By doing something rather than waiting you're sure it's the Right thing, you get feedback that can **help** you fine-tune your thoughts and feelings. 4. Talk it out / get a ...

What To Do When You Don't Know What to Do - Tiny Buddha
https://tinybuddha.com/blog/what-to-do-when-you-dont-know-what-to-do/ ▾
It **helps** me relax about my decisions. I often wonder: Am I the only one like this? I **don't know** that either, but if you're with me: Stop thinking it through. Stop making up what might happen. Because that's what's happening here, you're just making it up. Just **make** the decision instead and enjoy the ride. Whatever it turns out to ...

If You Don't Know What To Do With Your Life, Read This. - Lifehack
https://www.lifehack.org/articles/.../you-dont-know-what-with-your-life-read-this.html ▾
Jan 2, 2018 - If there is a job or hobby you are interested in — from grooming dogs to being a zookeeper — volunteer or job shadow and see if it's an occupation you really want to **do**. All the dreaming in the world isn't going to **help** you if you **don't** go and get your hands dirty. Sometimes, we think we want to **do** ...



Donald J. Trump @realDonaldTrump · 11h
The journey to #MAGA began @CPAC 2011 and the opportunity to reconnect with friends and supporters is something I look forward to every year. See you at #CPAC2018!
8.8K 10K 46K

Donald J. Trump @realDonaldTrump · 19h
Thank you to Sue Kruczek, who lost her wonderful and talented son Nick to the Opioid scourge, for your kind words while on @foxandfriends. We are fighting this terrible epidemic hard - Nick will not have died in vain!
10K 14K 71K

Donald J. Trump @realDonaldTrump · 19h
This will be a big week for Infrastructure. After so stupidly spending $7 trillion in the Middle East, it is now time to start investing in OUR Country!
19K 26K 113K

Donald J. Trump @realDonaldTrump · Feb 11
Just spoke to @JohnKasich to express condolences and prayers to all for the horrible shooting of two great police officers from @WestervillePD. This is a true tragedy!
8.4K 14K 70K

There's a world of data in text.

Text is hard to work with

"There is no worse way to screw up data than to let a single human type it in, without validation.

I once acquired the complete dog licensing database for Cook County, Illinois…

…this database contained at least 250 spellings of Chihuahua."

— Quartz guide to bad data

https://github.com/Quartz/bad-data-guide

Text is easy to work with

20% of the tools work for
80% of text.

In this lecture

Simple	Complex
Python string methods	Regular expressions
Looping	pandas string functions

Use Case 1: Cleaning Text

New Tool: Python String Methods

```
County                     | State
De Witt County             | IL
Lac qui Parle County       | MN
Lewis and Clark County     | MT
St John the Baptist Parish | LA
```

join

```
County               | Population
DeWitt               | 16798
Lac Qui Parle        | 8067
Lewis & Clark        | 55716
St. John the Baptist | 43044
```

(demo)

Python String Methods

Slicing	`str[:-7]`
Replacements	`str.replace('&', 'and')`
Deletions	`str.replace(' ', '')`
Transformations	`str.lower()`
Splitting	`str.split('/')`

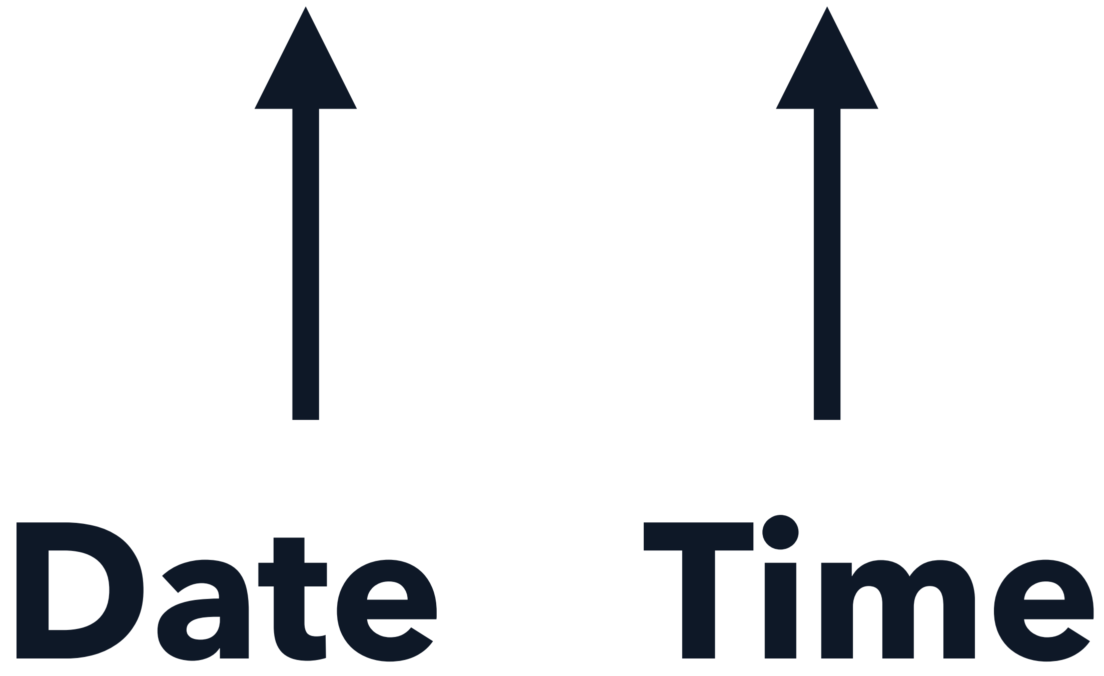
https://docs.python.org/3/library/stdtypes.html#string-methods

Use Case 2: Extracting Fields

New Tool: Regular Expressions

Extracting Fields

```
169.237.46.168 - - [26/Jan/2014:10:47:58 -0800] "GET /stat141/Winter04/ HTTP/1.1"
193.205.203.3 - - [2/Feb/2005:17:23:6 -0800] "GET /stat141/Notes/dim.html HTTP/1.0"
169.237.46.240 - "" [3/Feb/2006:10:18:37 -0800] "GET /stat141/homework/ HTTP/1.1"
```



Date **Time**

(demo)

Regular Expressions

Take a single instance of a string:

```
26/Jan/2014
```

Use regex to generalize the pattern:

```
(..)/(...)/(....)
```

Use parentheses to specify fields to extract.

```
(.+)/(.+)/(.+)

(\d+)/([a-zA-z]+)/(\d+)
```

Meta Characters

	Description	Example	Match	No Match
.	Any character except \n	...	abc	ab abcd
[ ]	Any character inside brackets	[cb.]ar	bar .ar	jar
*	≥0 or more of last symbol	[pb]*ark	bbpark ark	dark
+	≥1 last symbol	[pb]+ark	bbpark bark	dark ark
?	Last symbol optional	s?he	she he	the
|	Before or after	we|us	we us	e s

Meta Characters

	Description	Example	Match	No Match
[ ]	Any character inside brackets	[A-Z.]ar	Bar .ar	jar
[^]	Any character not inside brackets	[^a-z]ar	Bar :ar	car
\	Escapes next character	\[hi\]	[hi]	hi
^	Beginning of line	^ark	ark two	dark
$	End of line	ark$	noahs ark	arkk

Shorthand Characters

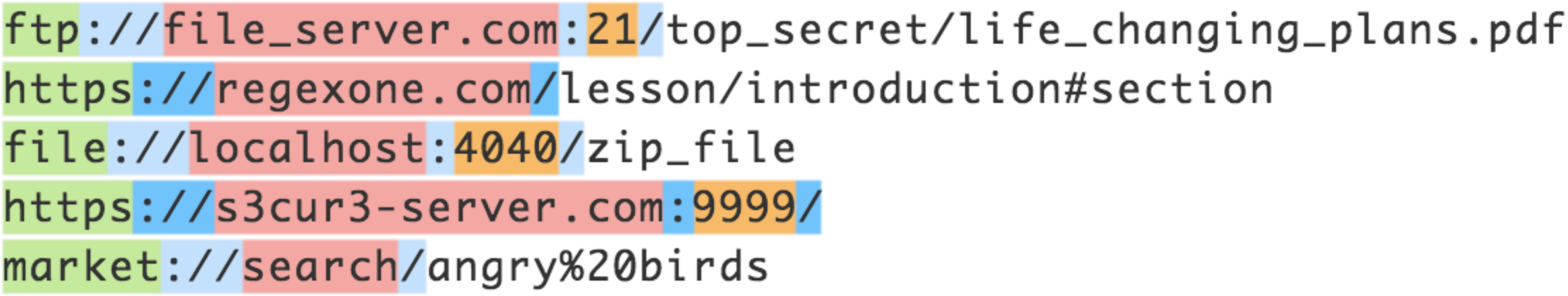
Bracket Form	Shorthand	Description
`[a-zA-Z0-9_]`	`\w`	Alphanumeric character
`[^\w]`	`\W`	Not an alphanumeric char
`[0-9]`	`\d`	Digit
`[^\d]`	`\D`	Not a digit
`[\t\n\f\r\p{Z}]`	`\s`	Whitespace
`[^\s]`	`\S`	Not whitespace

Survey Time

Question 1

```
Today, I was honored to be joined by Republicans and
Democrats from both the House and Senate, as well as
members of my Cabinet – to discuss the urgent need to
rebuild and restore America’s depleted infrastructure.
http://45.wh.gov/UDL9yE&nbsp;pic.twitter.com/BVBRDvHfcC
```

Question 2



```
ftp://file_server.com:21/top_secret/life_changing_plans.pdf
https://regexone.com/lesson/introduction#section
file://localhost:4040/zip_file
https://s3cur3-server.com:9999/
market://search/angry%20birds
```

String vs. Regex

`str`	`re`
	`re.findall(pat, st)`
`str.replace(old, new)`	`re.sub(pat, repl, st)`
`str.split(sep)`	`re.split(pat, st)`
`'ab' in str`	`re.search(pat, st)`

https://docs.python.org/3/library/re.html

(demo)

Use Case 3: Deriving Features

New Tool: `pandas` String Methods

(demo)

String vs. Regex vs. Pandas

str	re	pandas
	re.findall	vio.str.findall
str.replace	re.sub	vio.str.replace
str.split	re.split	vio.str.split
'ab' in str	re.search	vio.str.contains
len(str)		vio.str.len
str[1:4]		vio.str[1:4]

https://pandas.pydata.org/pandas-docs/stable/text.html

Top 20 Violations

unclean or degraded floors walls or ceilings

moderate risk food holding temperature

inadequate and inaccessible handwashing facilities

unapproved or unmaintained equipment or utensils

inadequately cleaned or sanitized food contact surfaces

wiping cloths not clean or properly stored or inadequate sanitizer

improper food storage

foods not protected from contamination

moderate risk vermin infestation

high risk food holding temperature

unclean nonfood contact surfaces

food safety certificate or food handler card not available

unclean or unsanitary food contact surfaces

inadequate food safety knowledge or lack of certified food safety manager

improper storage of equipment utensils or linens

low risk vermin infestation

permit license or inspection report not posted

improper cooling methods

unclean hands or improper use of gloves

improper or defective plumbing

What Kinds of Features?

<table>
<tr><td>Cleanliness</td><td><code>'clean|sanit'</code></td></tr>
<tr><td>High risk</td><td><code>'high risk'</code></td></tr>
<tr><td>Vermin</td><td><code>'vermin'</code></td></tr>
<tr><td>Surfaces</td><td><code>'wall|ceiling|floor|surface'</code></td></tr>
<tr><td>Humans</td><td><code>'hand|glove|hair|nail'</code></td></tr>
<tr><td>Permits and Certification</td><td><code>'permit|certif'</code></td></tr>
</table>

(demo)

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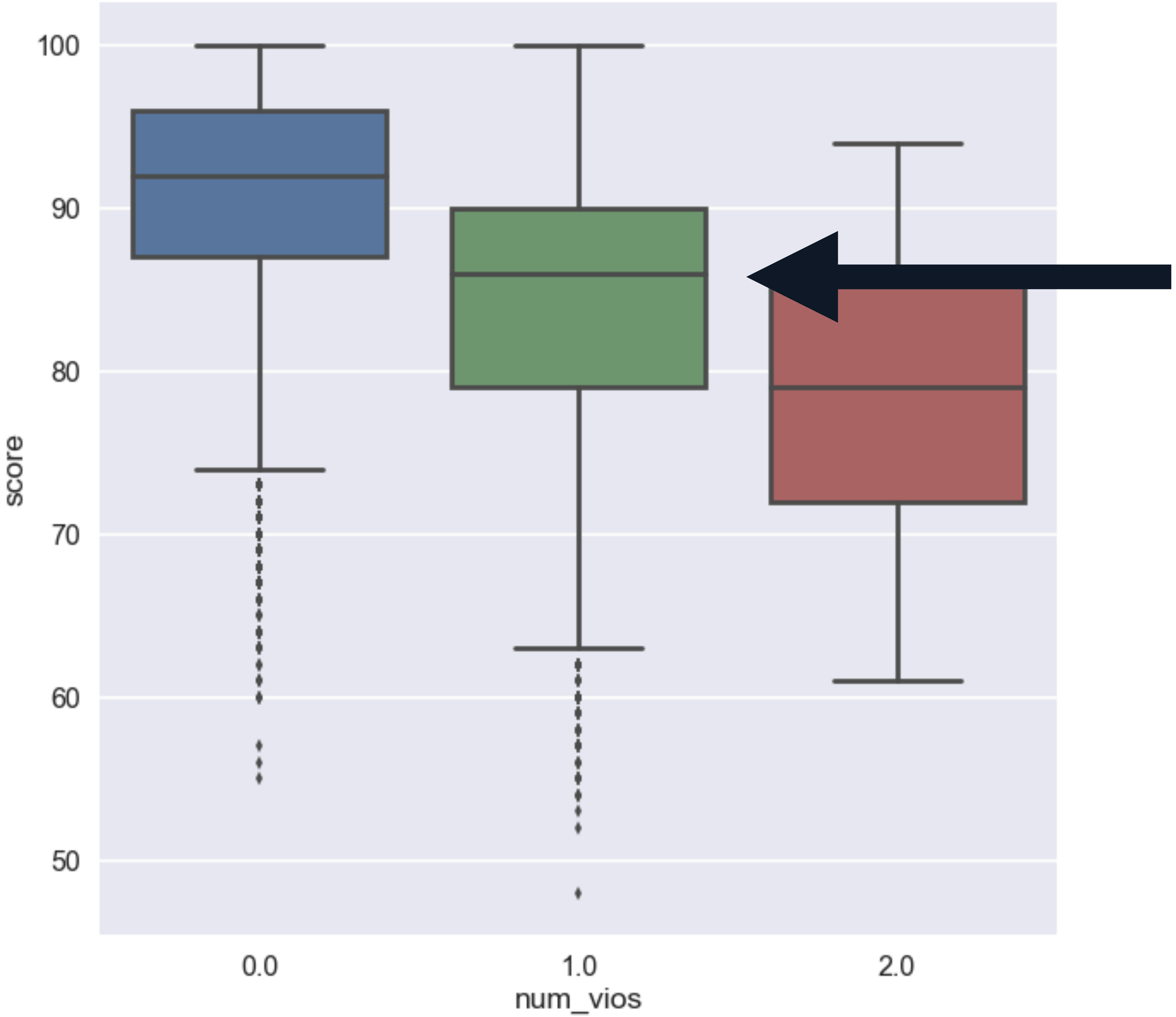

Median score is 86 for restaurants with a vermin infestation violation!