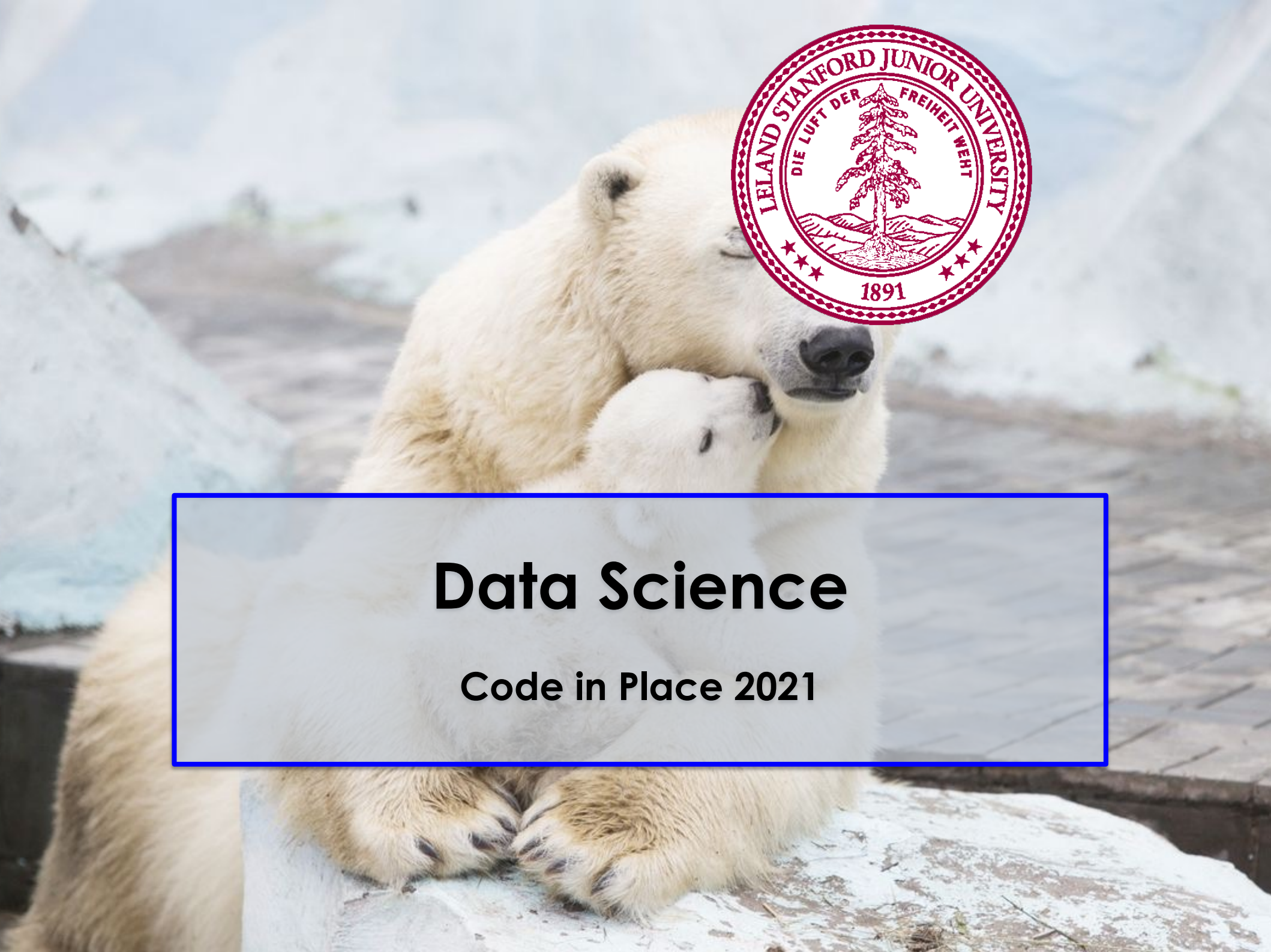


Data Science

Code in Place 2021

Final Project

Why is this so fast?

Google

mantis shrimp colors

All Videos Shopping Images News More Settings Tools

About 1,870,000 results (0.54 seconds)

Humans and many other primates have three; some birds and reptiles have four photoreceptors. Certain butterflies can even have six. But the mantis shrimp has **12** different types of photoreceptors in their eyes – and scientists haven't understood why until now. Jan 27, 2014

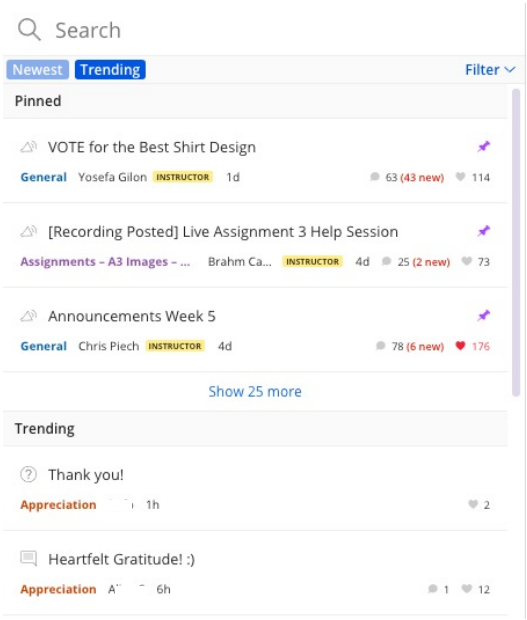
Study Offers Insights into Unique Color Vision of Mantis Shrimp ...
www.sci-news.com/biology/science-**color**-vision-**mantis-shrimp**-01719.html

Today

Review

Ultimate Problem

Data Explore on Code in Place Ed



LELAND STANFORD JUNIOR UNIVERSITY
DIE LUFT DER FREIHEIT WEHT
1891

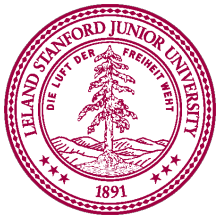
Review

Dict Review

```
# 1. Make a new Dict
animal_sounds = {}

# 2. Put things into the Dict
animal_sounds["dog”] = "woof"
animal_sounds["cat”] = "meow"
animal_sounds["seal”] = "ow ow ow"

# 3. Get things out of the Dict
dog_sound = animal_sounds["dog”] # "woof”
```

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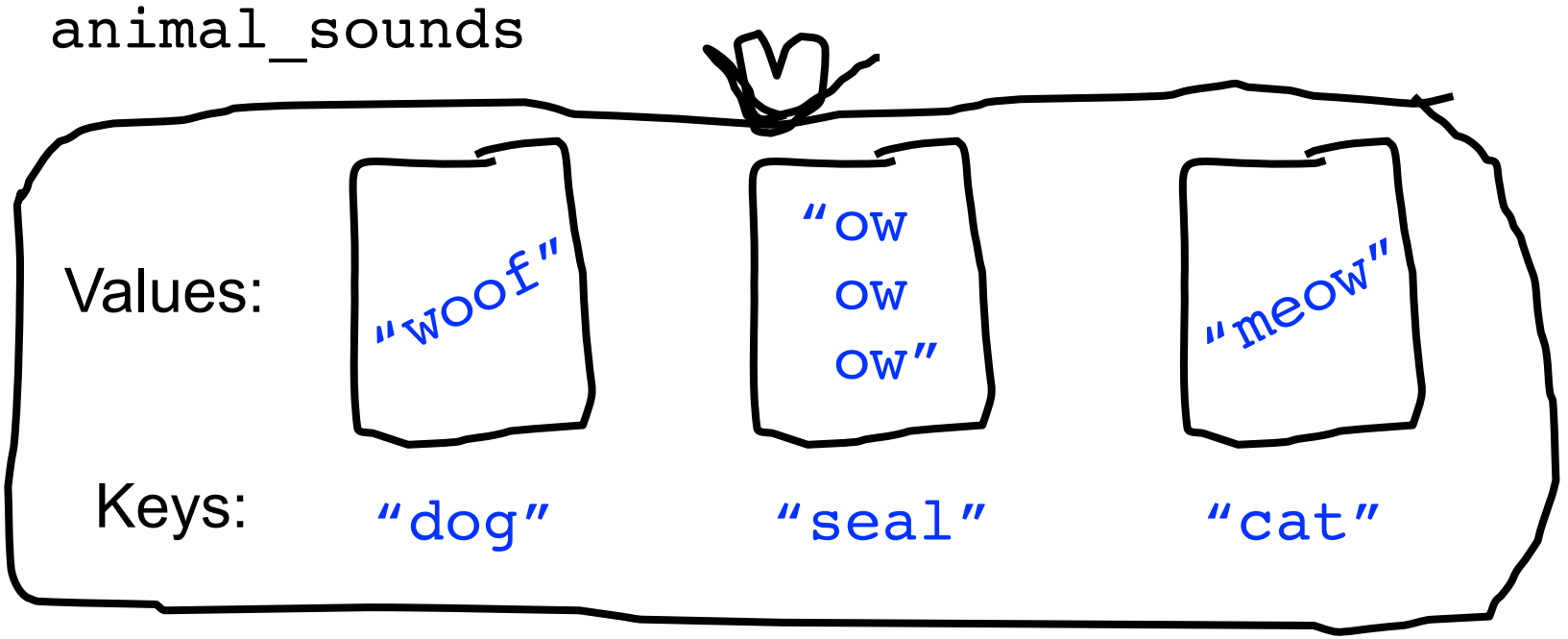


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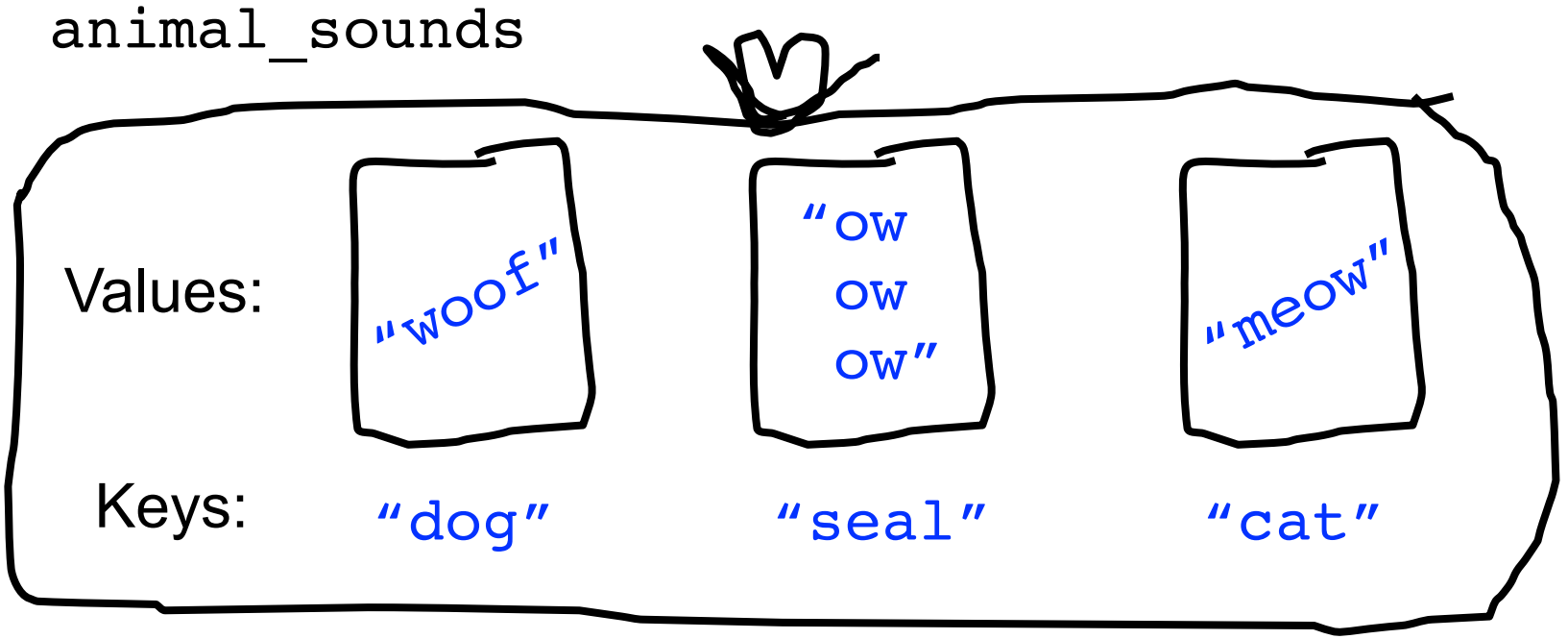
Dict Review

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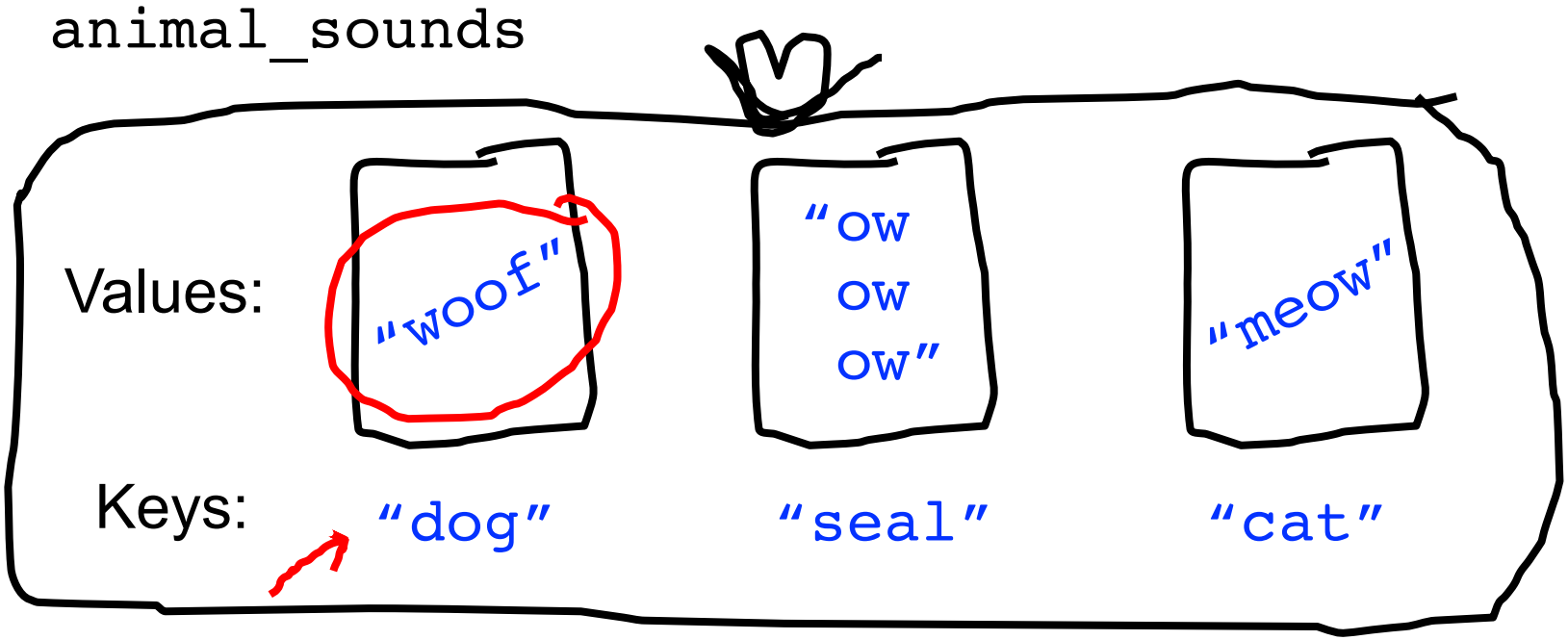
Dict Review

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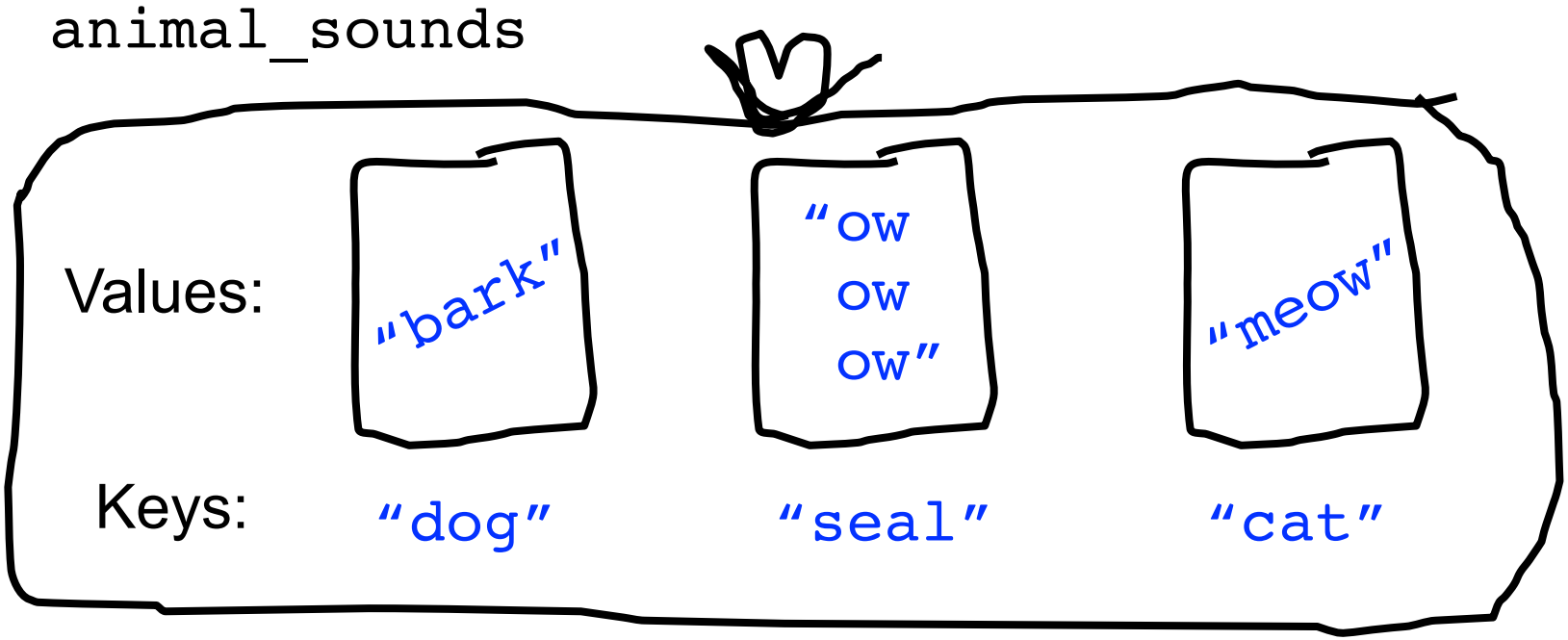
Dict Review

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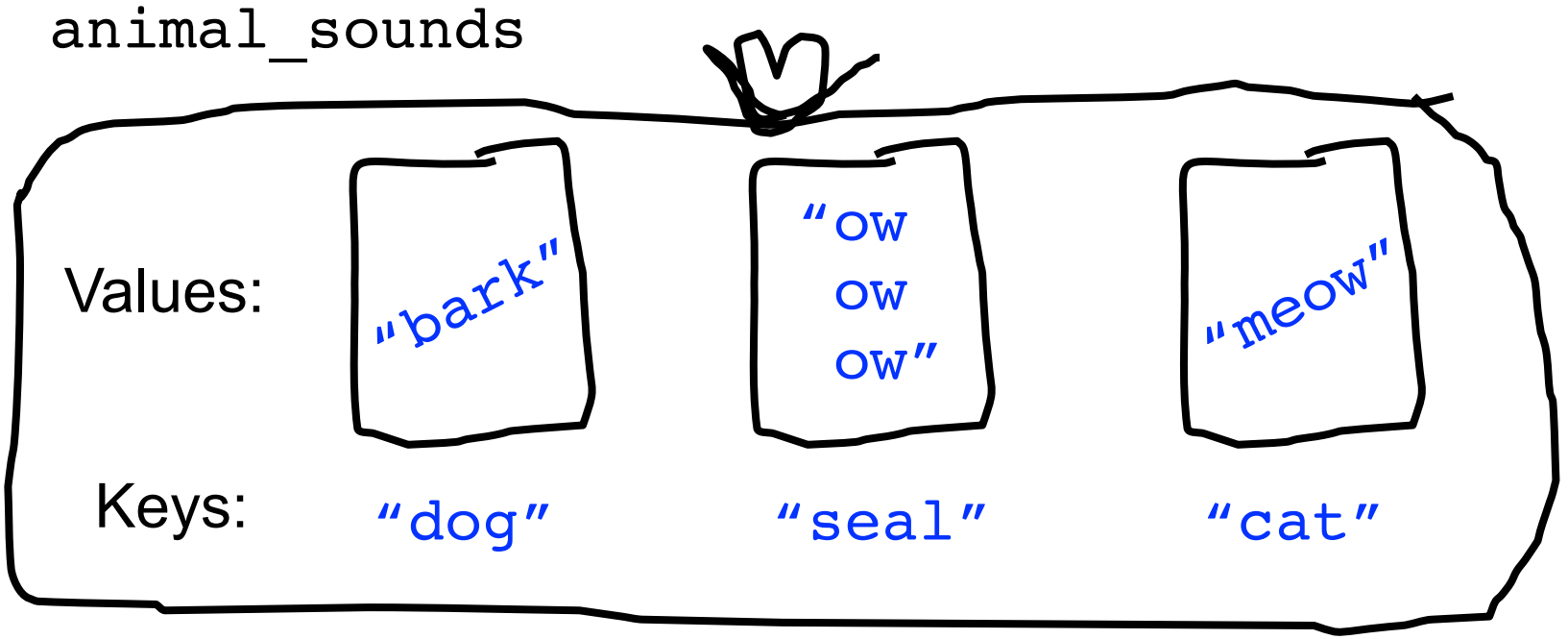
```

Dict Review

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dog_sound = animal_sounds["dog"] # "woof”
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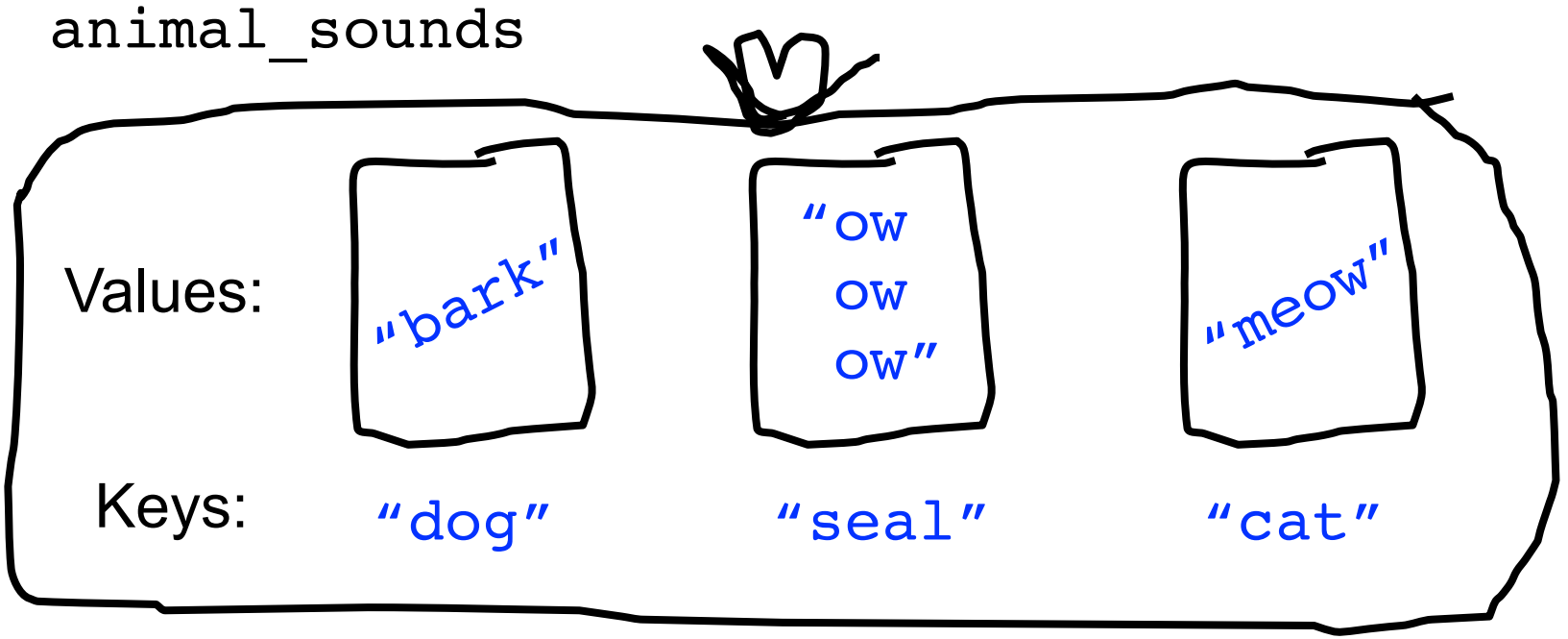
```

brothers Vegard and Bård Ylvisåker

Circa 2013

Ylvis – “The Fox”. Permission asked. Pending.

Dict Review

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```

Dictionary
key -> value

List

index -> value

List

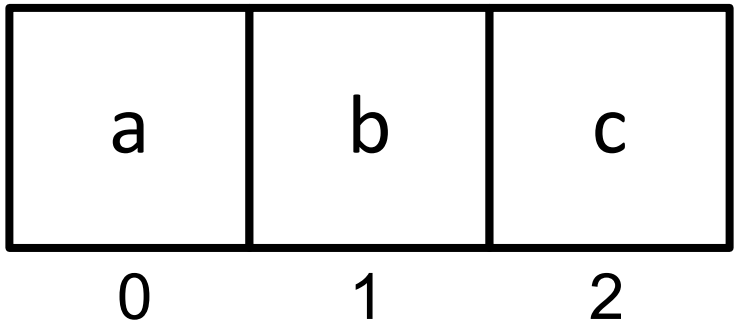
```
my_list = ['a', 'b', 'c']



print(my_list[1])

for i in range(len(my_list)):
    value = my_list[i]
    print(i, value)
```

my_list



indices

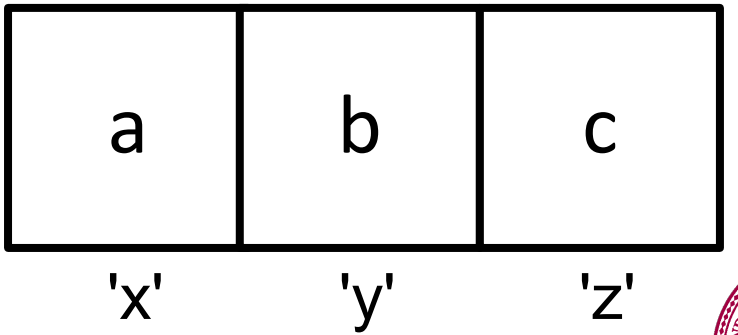
Dictionary

```
my_dict = {
    'x':'a',
    'y':'b',
    'z':'c'
}

print(my_list['y'])

for key in my_dict:
    value = my_dict[key]
    print(key, value)
```

my_dict



keys

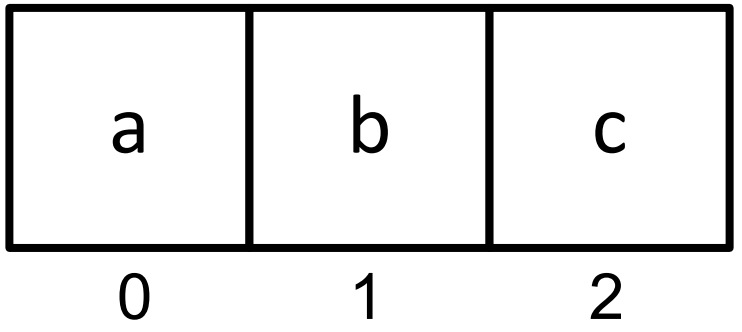
List

```
my_list = [
    'a',
    'b',
    'c'
]

print(my_list[1])

for i in range(len(my_list)):
    value = my_list[i]
    print(i, value)
```

my_list



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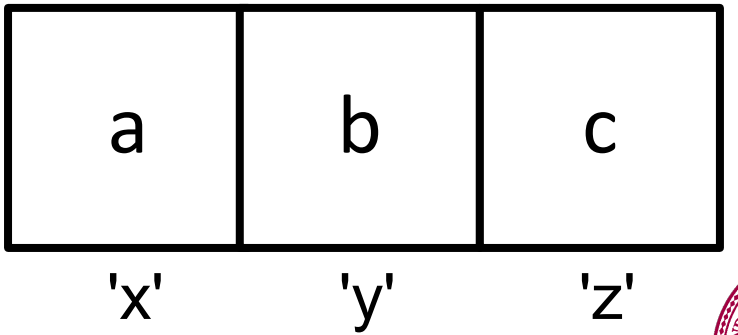

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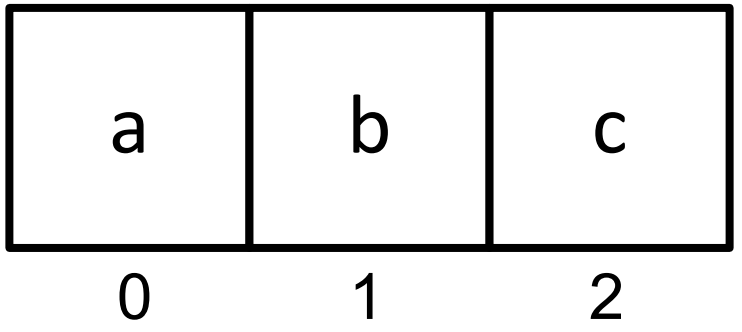

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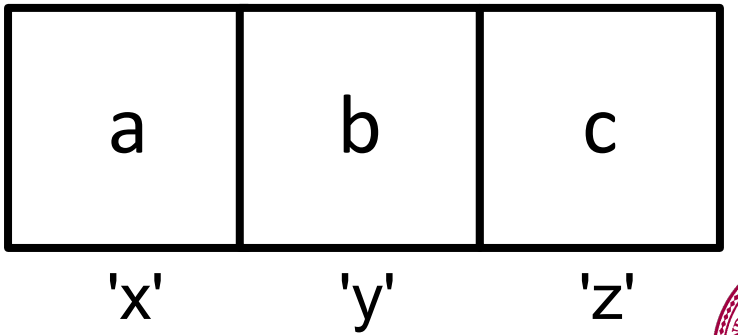

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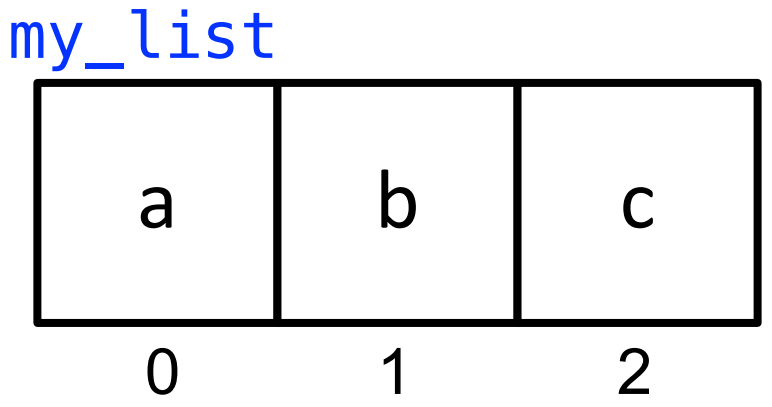

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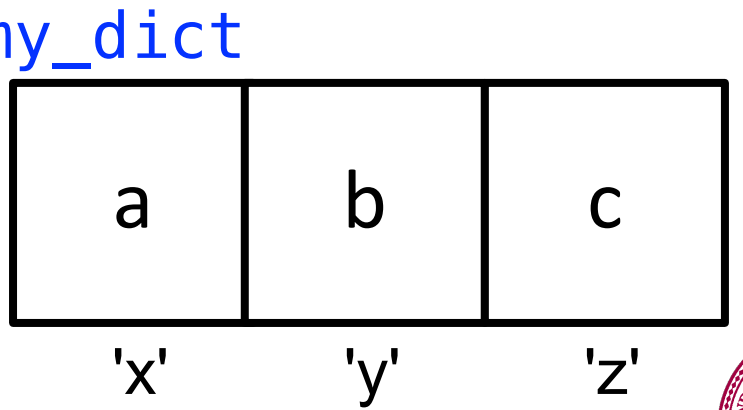

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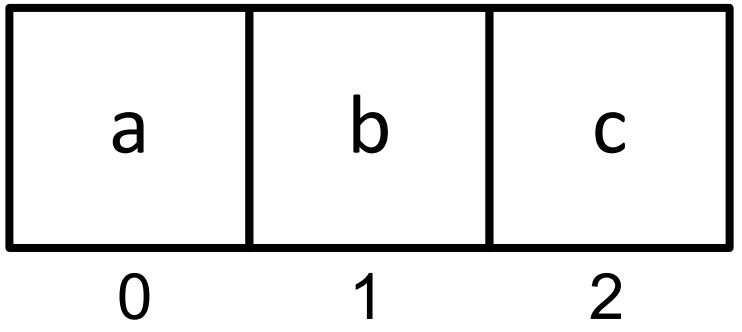

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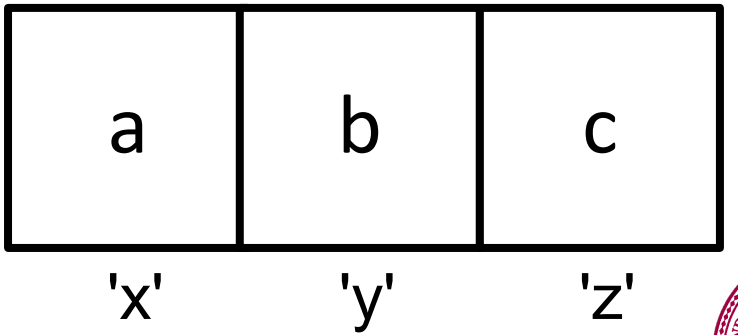
my_dict



keys

Dictionaries are one way!

In dictionaries you can only look up values by keys. You can't look up keys by value.

```
animal_sounds = {
   'dog':'woof',
   'cat':'meow'
}
```

```
animal_sounds['meow']
```

```
KeyError: 'meow'
```

Each key gets has only one value!

If you put a key in the dictionary twice, it will overwrite

```
animal_sounds['dog'] = 'bark'
animal_sounds['dog'] = 'woof'
```

```
animal_sounds = {'dog':'woof'}
```

Common Bug

You can use variables as keys! Becareful of quotes

```
animal_sounds = {
   'dog':'woof',
   'cat':'meow'
}
```

A

```
animal = input('? ')
print(animal_sounds["animal"])
```

B

```
animal = input('? ')
print(animal_sounds[animal])
```

Common Bug

Key lookups can be literals or variables. Don't confuse the two

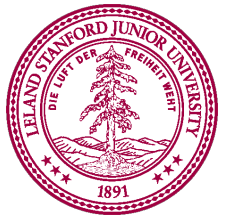
```
animal_sounds = {
   'dog':'woof',
   'cat':'meow'
}
```

A

```
animal = input('? ')
print(animal_sounds["animal"])
```

B

```
animal = input('? ')
print(animal_sounds[animal])
```



Core Datastructures

All datasets can be represented by:

Dictionaries,
Lists,
strings,
floats,
integers
booleans

Example Google Maps Query Result

```
{
    "markers": [
        {
            "name": "Rixos The Palm Dubai",
            "position": [25.1212, 55.1535],
        },
        {
            "name": "Shangri-La Hotel",
            "location": [25.2084, 55.2719]
        },
        {
            "name": "Grand Hyatt",
            "location": [25.2285, 55.3373]
        }
    ]
}
```

Welcome to the wild west of data

JSON

results.json

```
{
  "markers": [
  {
    "name": "The Palm Dubai",
    "position": [25.1212, 55.1535],
  },
  {
    "name": "Shangri-La Hotel",
    "location": [25.2084, 55.2719]
  },
  {
    "name": "Grand Hyatt",
    "location": [25.2285, 55.3373]
  }
  ]
}
```

program.py

```
import json

def main():
    # load data from file
    my_file = open('results.json', 'w')
    data = json.load(my_file)

    print(data)
```

End Review

Are you ready?

For…

The ULTIMATE cs106a question?

Ultimate CS106A: Reverse a Dict

Normal Dict:

Key -> Value

Reversed Dict:

Value -> Keys

Claim: understanding this single example is most indicative of mastery in CS106A

Ultimate CS106A: Reverse a Dict

```
ages = {
    'Mehran':51,
    'Gary':70,
    'Chris':33,
    'Freya':1,
    'Adele':33,
    'Lionel':33,
    'Rihanna':33,
    'Stephen':33
}
```

```
reversed = {
    51: ['Mehran'],
    70: ['Gary'],
    33: ['Chris', 'Adele', 'Lionel', 'Rihanna', 'Stephen'],
    1  : ['Freya']
}
```

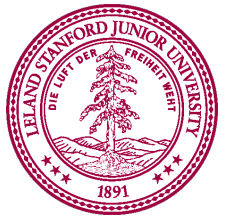
What is the strategy?

Ultimate CS106A: Reverse a Dict

Gary -> 70

```
reversed = {

}
```

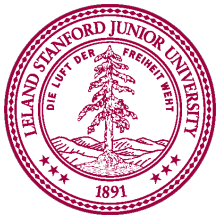
Ultimate CS106A: Reverse a Dict

Gary -> 70

```
reversed = {
        70 : ['Gary'],




}
```

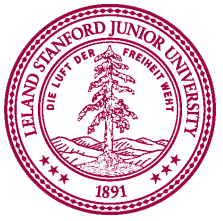
Ultimate CS106A: Reverse a Dict

Chris -> 33

```
reversed = {
        70 : ['Gary'],

        33 : ['Chris'],

 }
```

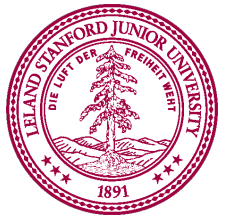
Ultimate CS106A: Reverse a Dict

Mehran -> 51

```
reversed = {
        70 : ['Gary'],


        33 : ['Chris'],


 }
```

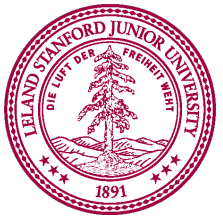



Ultimate CS106A: Reverse a Dict

Mehran -> 51

```
reversed = {
        70 : ['Gary'],
        51 : ['Mehran'],
        33 : ['Chris'],

 }
```

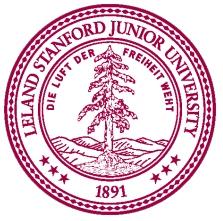



Ultimate CS106A: Reverse a Dict

Rihanna -> 33

```
reversed = {
        70 : ['Gary'],
        51 : ['Mehran'],
        33 : ['Chris'],

}
```

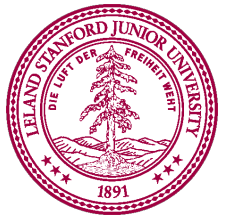



Ultimate CS106A: Reverse a Dict

Rihanna -> 33

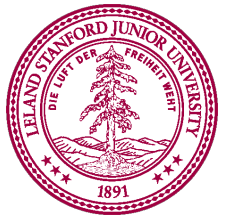
```
reversed = {
        70 : ['Gary'],
        51 : ['Mehran'],
        33 : ['Chris', 'Rihanna'],

 }
```

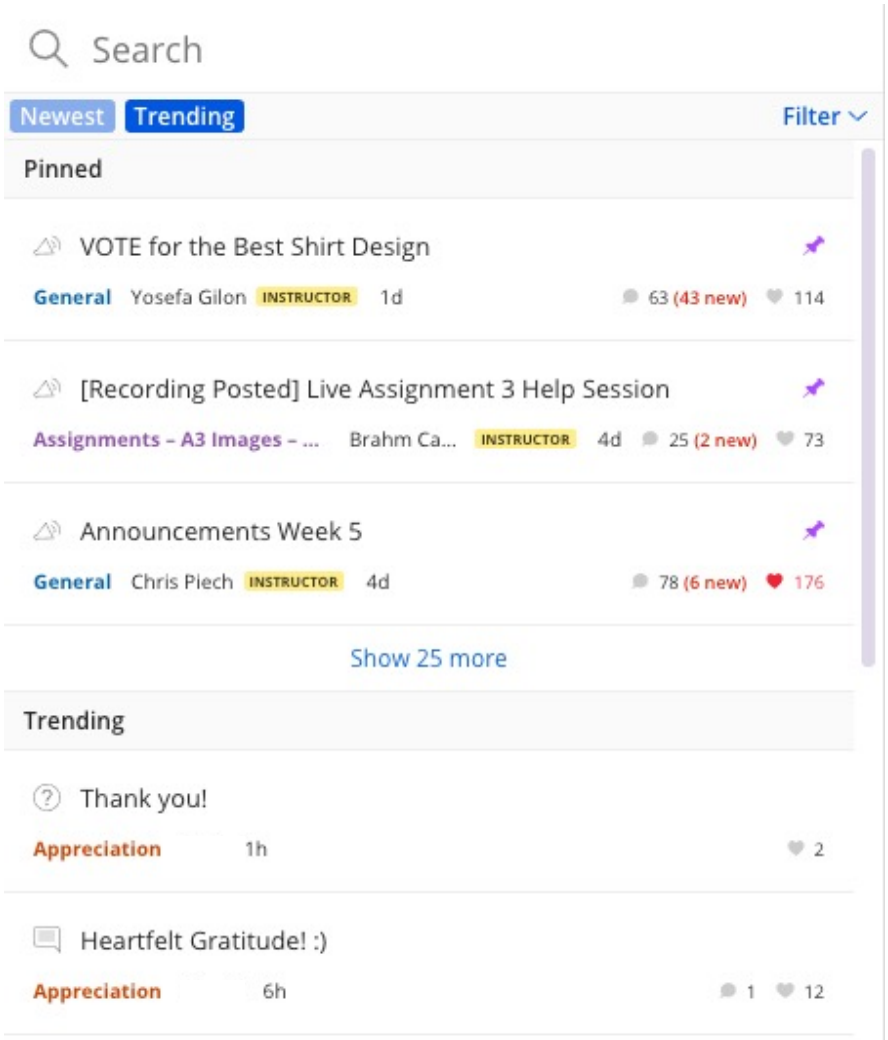
Ultimate CS106A: Reverse a Dict

```
reversed = {
        70 : ['Gary'],
        51 : ['Mehran'],
        33 : ['Chris', 'Rihanna', 'Stephen', … ]
        1 :   ['Freya']
 }
```

something awesome

Data Analysis on our Ed?



Analytics CSV

Threads JSON

Mystery:

What time of day is
Code in Place most active?

The Ed Data

A list of "posts". Each post is a dictionary.

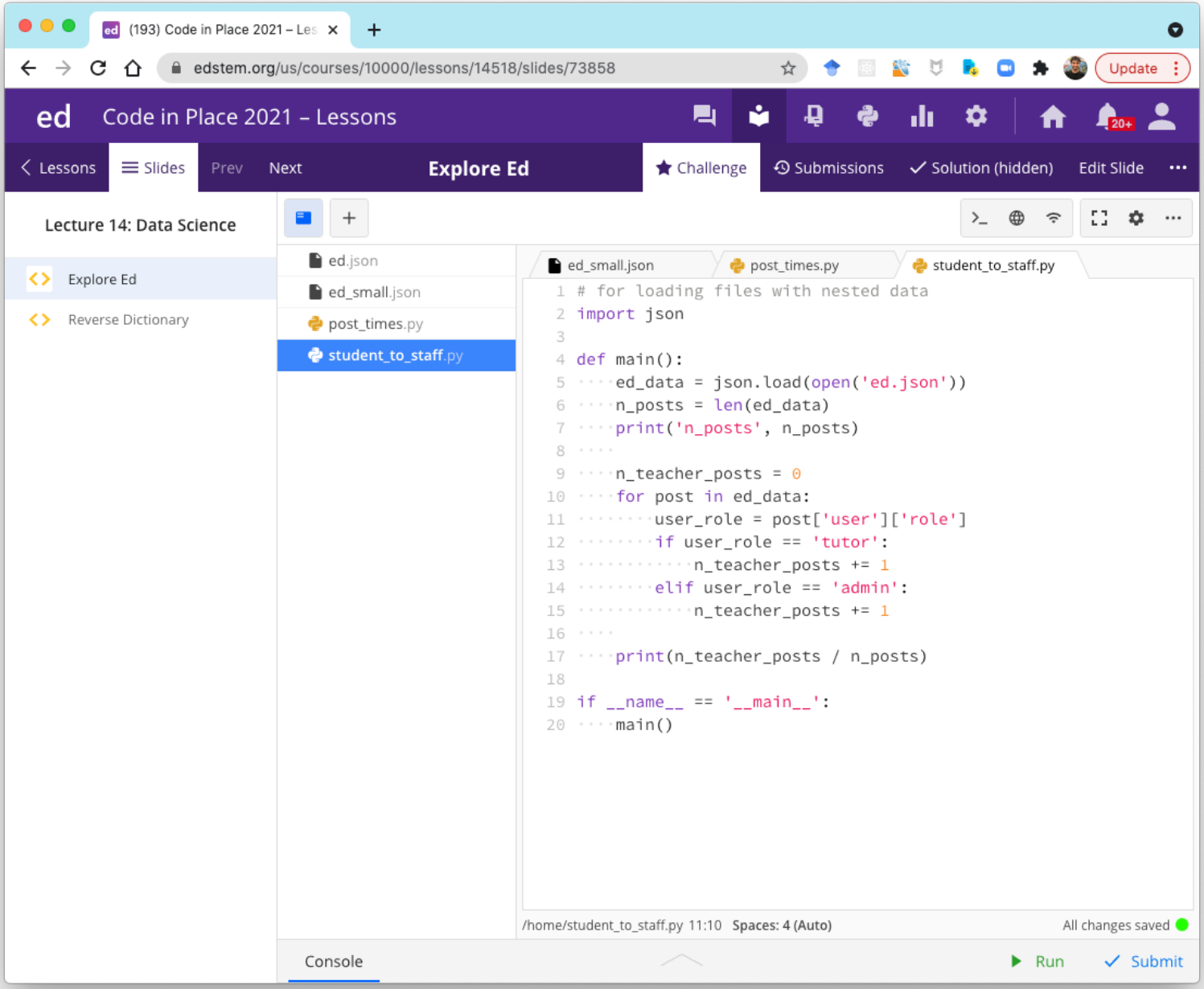

```
[
    {
        "created_at": "2021-05-21T01:20:39.296044+10:00",
        "votes": 0,
        "user": {
            "name": "Anonymous",
            "role": ""
        }
    },
    {
        "created_at": "2021-05-21T01:21:25.225994+10:00",
        "votes": 0,
        "user": {
            "name": "Anonymous",
            "role": "admin"
        }
    },
    …
]
```

How to get the hour of a post

I will give you this function

```
def get_hour(time_string):
    """
    Given a time string, returns the day of the week (in pacific time).
    >>> get_hour('2021-05-21T01:20:39.296044+10:00')
    5
    """
    date_time = parser.parse(time_string)
    # change to my timezone
    date_time = date_time.astimezone(timezone('US/Pacific'))
    # get the hour out of the time object
    return date_time.hour
```

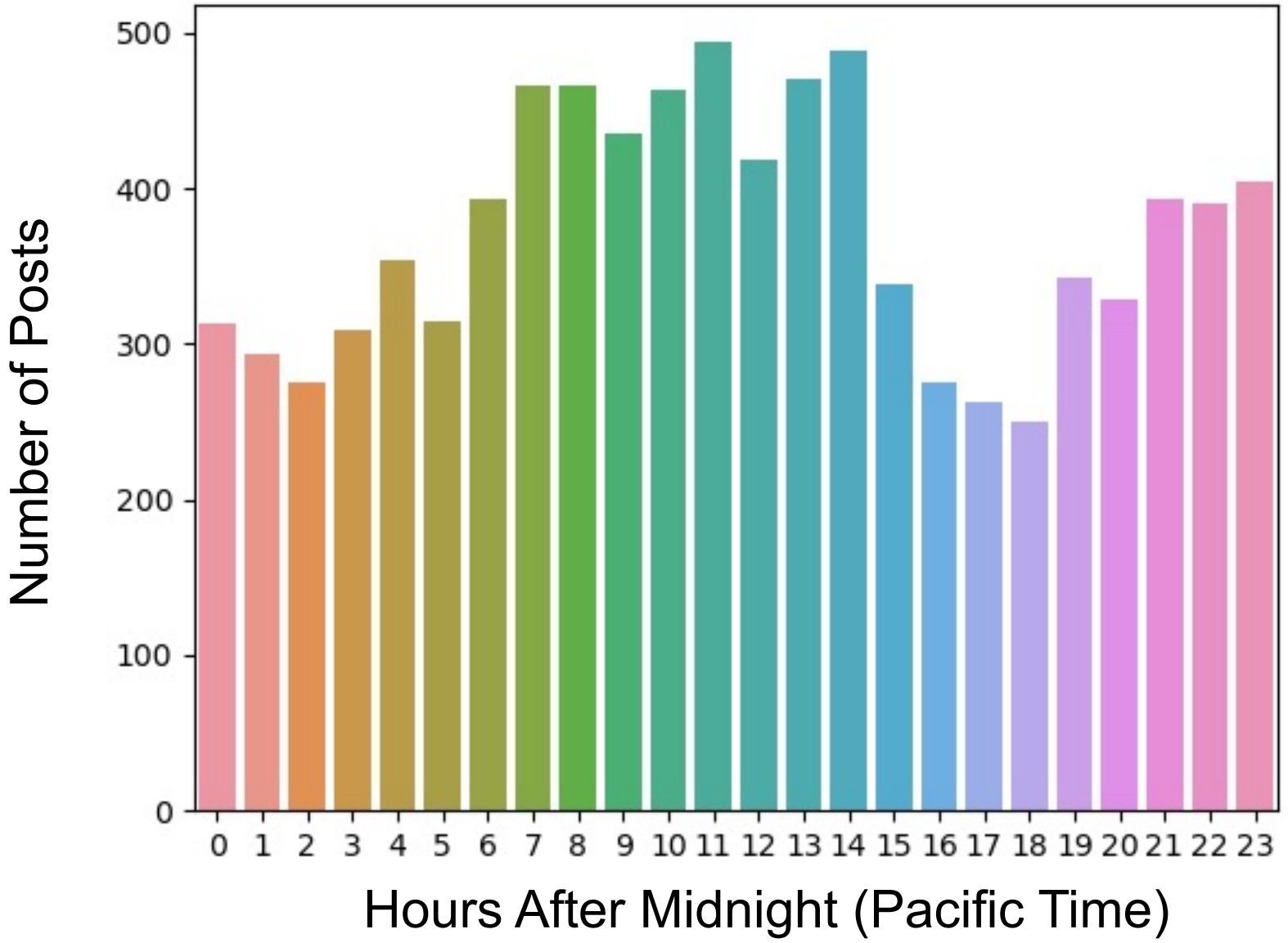
Analyze Ed... From Ed!



Code in Place Teaching Team, 2021, Global

20% of posts on the the Code in Place forum are from Teachers!

Code in Place Activity



Code in Place Teaching Team, 2021, Global

Why is this so fast?

Google

mantis shrimp colors

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About 1,870,000 results (0.54 seconds)

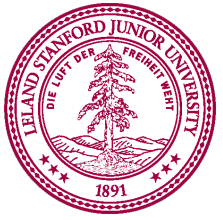
Humans and many other primates have three; some birds and reptiles have four photoreceptors. Certain butterflies can even have six. But the mantis shrimp has **12** different types of photoreceptors in their eyes – and scientists haven't understood why until now. Jan 27, 2014

Study Offers Insights into Unique Color Vision of Mantis Shrimp ...
www.sci-news.com/biology/science-**color**-vision-**mantis-shrimp**-01719.html

Why is this so fast?

```
hash_int = hash(key);
```

* There is always more to learn



Thank You So Much

Coming up: Final week of Code in Place 2021