

Welcome

INTRODUCTION TO MONGODB IN PYTHON



Donny Winston
Instructor

JavaScript Object Notation (JSON)

Objects {}

- String keys & values
`{'key1':value1, 'key2':value2,...}`
- Order of values is not important

```
{  
  'id': 12345,  
  'name': 'Donny Winston',  
  'instructor': true  
},
```

Arrays []

- Series of values `[value1, value2,...]`
- Order of values is important

```
[  
  "instructor_1",  
  "instructor_2",  
  ...  
]
```

JavaScript Object Notation (JSON)

```
{
  'people': [
    { 'id': 12345,
      'name': 'Donny Winston',
      'instructor': true,
      'tags': ['Python', 'MongoDB']
    },
    { 'id': 54321
      'name': 'Guido van Rossum'
      'instructor': false
      'tags': null
    },
  ],
}
```

Values

- Strings `'name': 'Donny Winston'`
- Numbers `'id': 12345`
- `true` / `false`
- `null`
- Another array
`'tags': ['Python', 'MongoDB']`
- Another object
`[{ 'id': 12345, ... }, ...]`

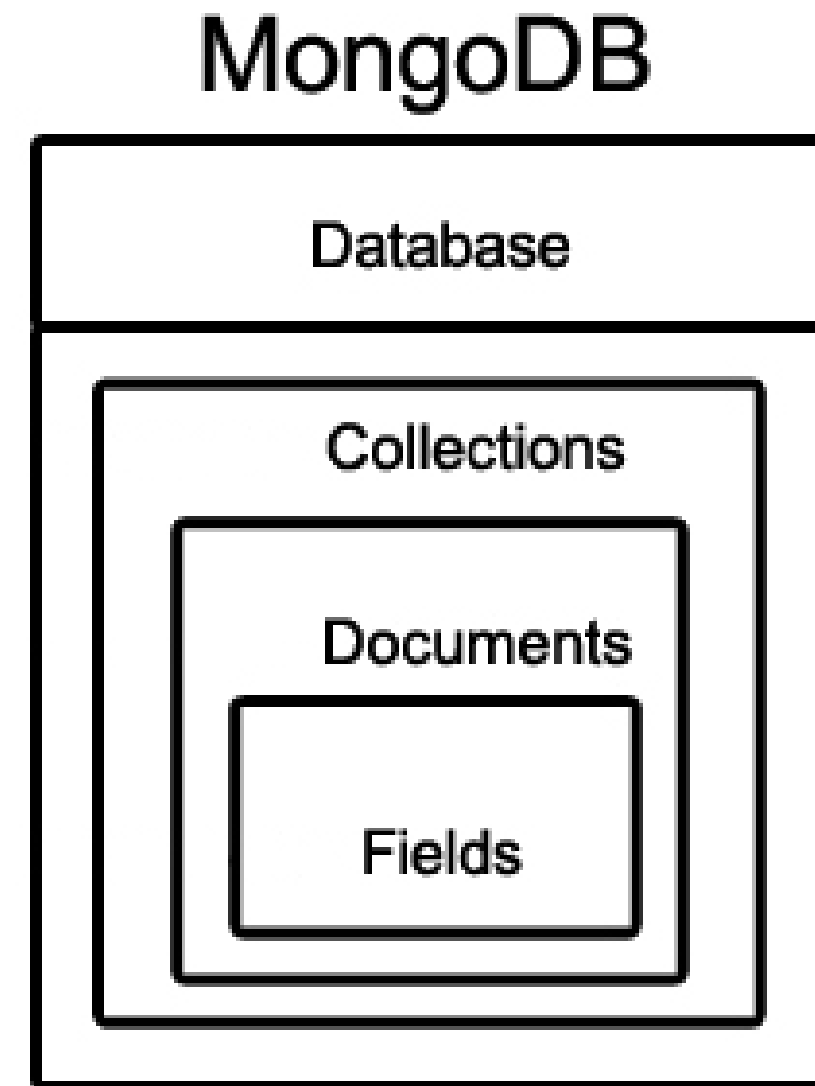
JSON <> Python

JSON	Python
Objects	Dictionaries <code>dict</code>
Arrays	Lists <code>list</code>
Values:	
• <i>strings</i>	<code>str</code>
• <i>_numbers_</i>	<code>int</code> , <code>float</code>
• <code>true</code> / <code>false</code>	<code>True</code> / <code>False</code>
• <code>null</code>	<code>None</code>
• <i>other objects/arrays</i>	other <code>dict</code> / <code>list</code>

--

JSON <> Python <> MongoDB

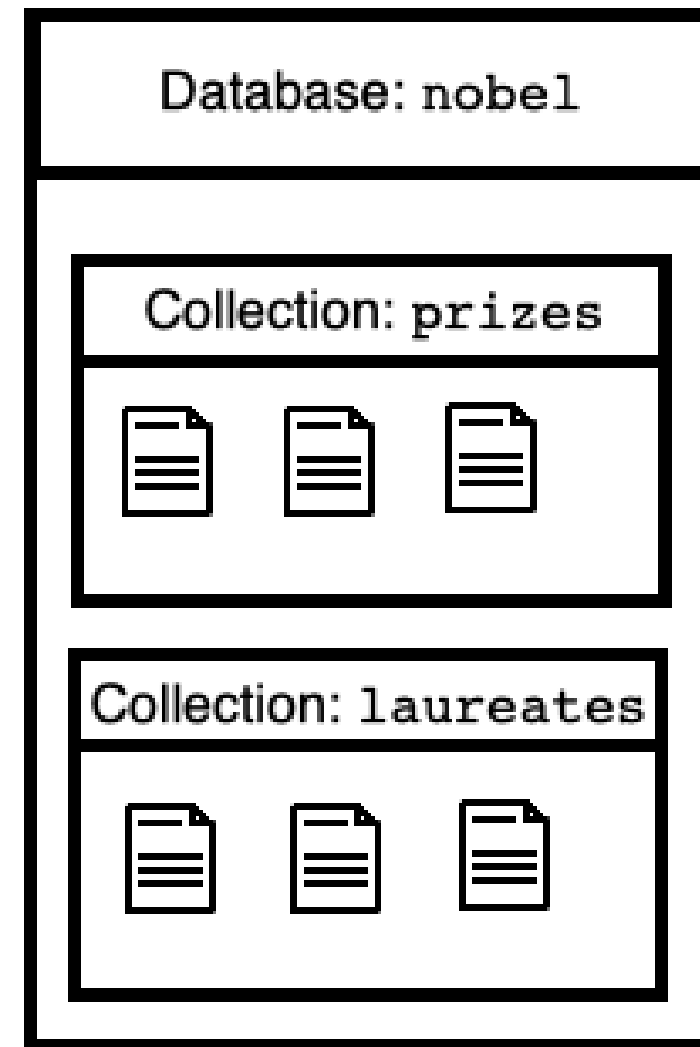
MongoDB	JSON	Python
Databases	Objects	Dictionaries
↳ Collections	Arrays	Lists
↳ ↳ Documents	Objects	Dictionaries
↳ ↳ ↳ Subdocuments	Objects	Dictionaries
↳ ↳ ↳ Values	Value types	Value types + <code>datetime</code> , <code>regex</code> ...



The Nobel Prize API data(base)

```
import requests
from pymongo import MongoClient
# Client connects to "localhost" by default
client = MongoClient()
# Create local "nobel" database on the fly
db = client["nobel"]

for collection_name in ["prizes", "laureates"]:
    # collect the data from the API
    response = requests.get(
        "http://api.nobelprize.org/v1/{}.json".\
        format(collection_name[:-1] ))
    # convert the data to json
    documents = response.json()[collection_name]
    # Create collections on the fly
    db[collection_name].insert_many(documents)
```



Accessing databases and collections

- Using `[]`

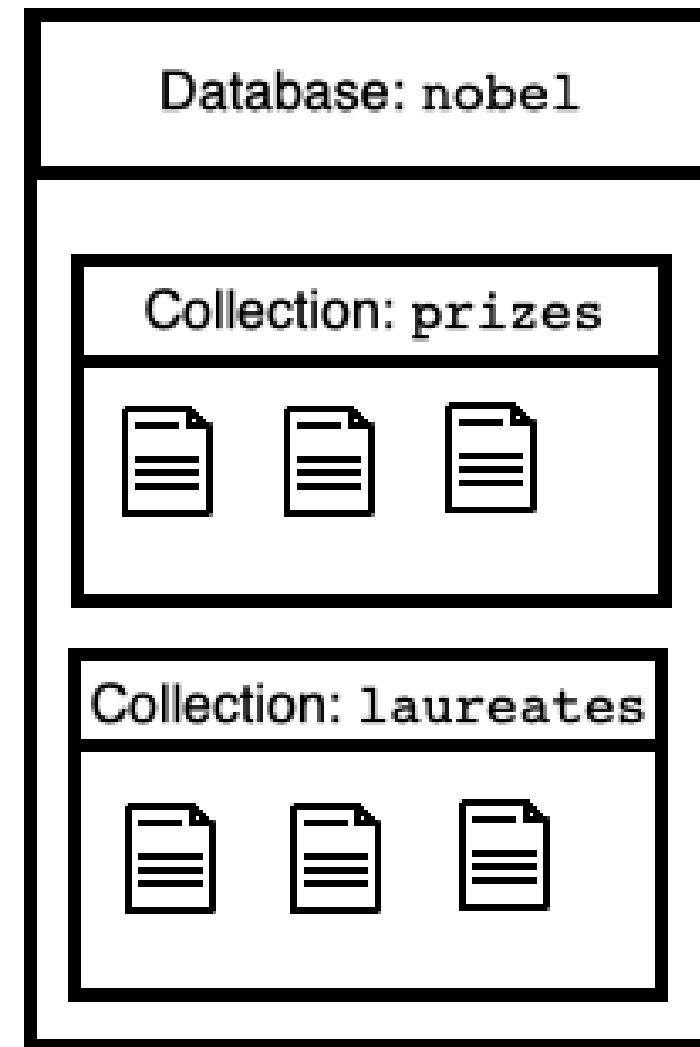
```
# client is a dictionary of databases
db = client["nobel"]

# database is a dictionary of collections
prizes_collection = db["prizes"]
```

- Using `.`

```
# databases are attributes of a client
db = client.nobel

# collections are attributes of databases
prizes_collection = db.prizes
```



Count documents in a collection

```
# Use empty document {} as a filter
```

```
filter = {}
```

```
# Count documents in a collection
```

```
n_prizes = db.prizes.count_documents(filter)
```

```
n_laureates = db.laureates.count_documents(filter)
```

```
590
```

```
934
```

```
# Find one document to inspect
```

```
doc = db.prizes.find_one(filter)
```

```
{'_id': ObjectId('5bc56145f35b634065ba1996'),  
  'category': 'physics',  
  'laureates': [{'firstname': 'Arthur',  
                  'id': '960',  
                  'motivation': '"for the optical tweezers and their  
application to biological systems"',  
                  'share': '2',  
                  'surname': 'Ashkin'}],  
  {'firstname': 'Gérard',  
    'id': '961',  
    'motivation': '"for their method of generating  
high-intensity, ultra-short optical pulses"',  
    ...
```


Let's practice!

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Finding documents

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An example "laureates" document

```
{'_id': ObjectId('5b9ac94ff35b63cf5231ccb1'),
  'born': '1845-03-27',
  'bornCity': 'Lennep (now Remscheid)',
  'bornCountry': 'Prussia (now Germany)',
  'bornCountryCode': 'DE',
  'died': '1923-02-10',
  'diedCity': 'Munich',
  'diedCountry': 'Germany',
  'diedCountryCode': 'DE',
  'firstname': 'Wilhelm Conrad',
  'gender': 'male',
  'id': '1',
  'prizes': [{'affiliations': [{'city': 'Munich',
                                'country': 'Germany',
                                'name': 'Munich University'}],
              'category': 'physics',
              'motivation': '"in recognition of the extraordinary services '
                            'he has rendered by the discovery of the '
                            'remarkable rays subsequently named after him"',
              'share': '1',
              'year': '1901'}],
  'surname': 'Röntgen'}
```

Filters as (sub)documents

Count documents by providing a filter document to match.

```
filter_doc = {  
    'born': '1845-03-27',  
    'diedCountry': 'Germany',  
    'gender': 'male',  
    'surname': 'Röntgen'  
}  
  
db.laureates.count_documents(filter_doc)
```

1



Jimi



Amelia



Charlie



Wally



Levi



Simple filters

```
db.laureates.count_documents({'gender': 'female'})
```

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```
db.laureates.count_documents({'diedCountry': 'France'})
```

50

```
db.laureates.count_documents({'bornCity': 'Warsaw'})
```

2

Composing filters

```
filter_doc = {'gender': 'female',  
             'diedCountry': 'France',  
             'bornCity': 'Warsaw'}  
db.laureates.count_documents(filter_doc)
```

1

```
db.laureates.find_one(filter_doc)
```

```
{'_id': ObjectId('5bc56154f35b634065ba1be9'),  
 'born': '1867-11-07',  
 'bornCity': 'Warsaw',  
 'bornCountry': 'Russian Empire (now Poland)',  
 'bornCountryCode': 'PL',  
 'died': '1934-07-04',  
 'diedCity': 'Sallanches',  
 'diedCountry': 'France',  
 'diedCountryCode': 'FR',  
 'firstname': 'Marie',  
 ...}
```



Query operators

First Name

Country of Residence

Value in a Range

0 10

Submit

Query operators

- Value in a range `$in: <list>`

```
db.laureates.count_documents({
  'diedCountry': {
    '$in': ['France', 'USA']})})
```

258

- Not equal `$ne : <value>`

```
db.laureates.count_documents({
  'diedCountry': {
    '$ne': 'France'})})
```

872

Query syntax:

```
{
  # Match a single value exactly:
  'field_name1': value1,

  # Use operators:
  'field_name2': {
    $operator1: value1,
    $operator2: value2,
    ... # more operators
  },
  ... # more fields
}
```

Query operators

- Comparison:
 - `>` : `$gt` , `≥` : `$gte`
 - `<` : `$lt` , `≤` : `$lte`

```
db.laureates.count_documents({  
  'diedCountry': {  
    '$gt': 'Belgium',  
    '$lte': 'USA'}})
```

453

453

(Strings are compared lexicographically)

Query syntax:

```
{  
  # Match a single value exactly:  
  'field_name1': value1,  
  
  # Use operators:  
  'field_name2': {  
    $operator1: value1,  
    $operator2: value2,  
    ... # more operators  
  },  
  ... # more fields  
}
```

Let's Practice!

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Dot notation: reach into substructure

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A functional density

```
db.laureates.find_one({
  "firstname": "Walter",
  "surname": "Kohn"})
```

```
{'born': '1923-03-09',
 'bornCity': 'Vienna',
 'bornCountry': 'Austria',
 'firstname': 'Walter',
 'prizes': [
  {'affiliations': [
    {'city': 'Santa Barbara, CA',
     'country': 'USA',
     'name': ('University of '
             'California')
    }],
   'category': 'chemistry',
   'motivation': (
    '"for his development of the '
    'density-functional theory"'),
   'share': '2',
   'year': '1998'
  }],
 'surname': 'Kohn',
 ...} # showing partial document
```

```
db.laureates.count_documents({
  "prizes.affiliations.name": (
    "University of California"))})
```

34

```
db.laureates.count_documents({
  "prizes.affiliations.city": (
    "Berkeley, CA"))})
```

19



No Country for Naipaul

```
db.laureates.find_one({'surname': 'Naipaul'})
```

```
{'_id': ObjectId('5b9ec791f35b63093c3d98b7'),  
  'born': '1932-08-17',  
  'died': '2018-08-11',  
  'diedCity': 'London',  
  'diedCountry': 'United Kingdom',  
  'diedCountryCode': 'GB',  
  'firstname': 'Sir Vidiadhar Surajprasad',  
  'gender': 'male',  
  'id': '747',  
  'prizes': [{'affiliations': [],  
              'category': 'literature',  
              'motivation': ('"for having united perceptive narrative and '  
                           'incorruptible scrutiny in works that compel us '  
                           'to see the presence of suppressed histories"'),  
              'share': '1',  
              'year': '2001'}],  
  'surname': 'Naipaul'}
```

```
db.laureates.count_documents({"bornCountry": {"$exists": False}})
```

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Multiple prizes

```
db.laureates.count_documents({})
```

```
922
```

```
db.laureates.count_documents({"prizes": {"$exists": True}})
```

```
922
```

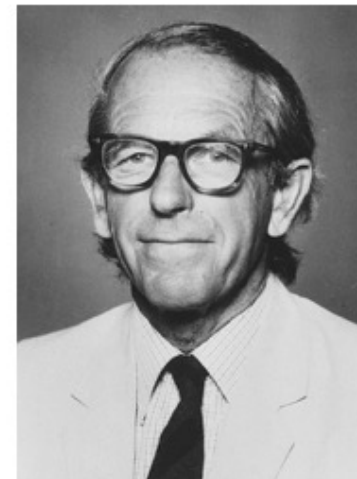
```
db.laureates.count_documents({"prizes.0": {"$exists": True}})
```

```
922
```

```
db.laureates.count_documents({"prizes.1": {"$exists": True}})
```

```
6
```

Multiple-prize winners



On to exercises!

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