



Introduction
to Database
Systems:
CS305
Intro to
MongoDB

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Bonham-
Carter
Hang Zhao

ForgetMeNots

Modifying
Documents

The Coolest
Thing

Comparing
Values

Booleans

Consider This

...

Introduction to Database Systems: CS305 Intro to MongoDB

Oliver Bonham-Carter
Hang Zhao

14 November 2023

Database Language Guide

Remember From Last Time ...

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Consider This

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RDBMS		MongoDB
Database	➡	Database
Table, View	➡	Collection
Row	➡	Document (BSON)
Column	➡	Field
Index	➡	Index
Join	➡	Embedded Document
Foreign Key	➡	Reference
Partition	➡	Shard

- The terms are different but their meanings are similar
- *Schema-less*, collections (like tables) are populated by any data
- *Documents* are similar to the *tuples* of Sqlite3 programming



Let's code

Schools Data

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Consider This

Populate the MongoDB database

```
db.schools.insertMany([
  { 'school': "Washington", name: 'Ryan', gender: 'M', 'Job':'Teacher' },
  { 'school': "Edison", name: 'Joanna', gender: 'F', 'Job':'Professor'},
  { 'school': "Eaton", name: 'Roger', gender: 'M', 'Job':'Instructor'},
  { 'school': "Lewis", name: 'Presilla', gender: 'F', 'Job':'Instructor'}
]);
```

General Syntax

```
db.schools.find({ SEARCH-SPACE }, {CONSTRAINTS} )
```

- SEARCH-SPACE → Scan this search space
- CONSTRAINTS → Find constraint(s) within the search space

Querying “Jobs” == “Instructor”, show *name*, *gender* and *school*

```
db.schools.find(['Job':'Instructor'],
  {'name': 1, 'gender': 1, 'school':1}).pretty()
```



Let's code

Schools Data

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Consider This

...

Back to mycompiler.io ...



MongoDB ▾



```
1 db.school.insertMany([  
2   { 'school': "Washington", name: 'Ryan', gender: 'M', 'Job':'Teacher' },  
3   { 'school': "Edison", name: 'Joanna', gender: 'F', 'Job':'Professor'},  
4   { 'school': "Eaton", name: 'Roger', gender: 'M', 'Job':'Instructor'},  
5   { 'school': "Lewis", name: 'Presilla', gender: 'F', 'Job':'Instructor'}  
6 ]);  
7  
8  
9 db.school.find({'Job':'Instructor'},{'name': 1, 'gender': 1, 'school':1 }).pretty()
```

<https://www.mycompiler.io/new/mongodb>



Let's code

Output

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Consider This

...

```
mycompiler_mongodb> [
  {
    _id: ObjectId("65518d8f6197f22acb5920d6"),
    school: 'Eaton',
    name: 'Roger',
    gender: 'M'
  },
  {
    _id: ObjectId("65518d8f6197f22acb5920d7"),
    school: 'Lewis',
    name: 'Presilla',
    gender: 'F'
  }
]
```

Query Challenge

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Consider This

What do these commands do?

- `db.school.find({'school':'Washington'},{})`
- `db.school.find({'school':'Eaton'}, {_id:0, 'name':1})`
- `db.school.find({'school':'Washington'}, {'Job':1, _id:0})`
- `db.school.find({}, {'name':1, 'Job':1, _id:0})`

THINK

Query Challenge

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Consider This

Gimme the Query for ...

- What Job does *Presilla* have?
- What Job does *Presilla* have **AND** where does she work?
- Who works at *Eaton*?
- List the schools for all *Instructor* positions.



THINK

Restaurant data

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Consider This

Populate the MongoDB database

```
db.restaurants.insertMany( [  
  { "_id" : 1, "name": "Central Perk Cafe", "Borough": "Manhattan", "avgCost": 100},  
  { "_id" : 2, "name": "Rock A Feller Bar and Grill", "Borough": "Queens", "violations": 2,  
   "avgCost": 250},  
  { "_id" : 3, "name": "Empire State Pub", "Borough": "Brooklyn", "violations": 0,  
   "avgCost": 300},  
  { "_id" : 4, "name": "The Captain's Cafe", "Borough": "London", "avgCost": 80 },  
  { "_id" : 5, "name": "The Resto in a Cave", "Borough": "Paris", "violations": 0,  
   "avgCost": 1 },  
  { "_id" : 6, "name": "The Crow Bar", "Borough": "Paris", "violations": 98, "note": "gross",  
   "avgCost": 40}]);
```

- Note: we are able to override the `_id` settings from Mongo and implement our own values.

Inserting New Data Using \$set{}

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Consider This

...

Check document

```
db.restaurants.find({"name": "Empire State Pub"}, {})
```

Add to document

```
db.restaurants.updateOne(  
  {"name": "Empire State Pub"},  
  { $set: {  
    rating: "Thumbs-Up",  
    status: "Loved it!" },  
    $currentDate: { lastModified: true }  
});
```

```
{  
  "_id" : 3,  
  "name" : "Empire State Pub",  
  "Borough" : "Brooklyn",  
  "violations" : 0,  
  "lastModified" : ISODate("2019-04-03T01:06:48.584Z"),  
  "rating" : "Thumbs-Up",  
  "status" : "Love it!"  
}
```

Inserting New Data Using \$set{}

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Consider This

Check document

```
db.restaurants.find({"name": "Empire State Pub"}, {})
```

Add to document

```
db.restaurants.updateOne(  
  {"name": "Empire State Pub"},  
  { $set: {  
    chef: "The Swedish Chef",  
    status: "Dum-Di-Dum!" },  
    $currentDate: { lastModified: true }  
});
```

Check document, again to see updates!

```
db.restaurants.find({"name": "Empire State Pub"}, {})
```

Inserting New Data Using \$set{}

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Consider This

...

Check document

```
db.restaurants.find({"name": "Central Perk Cafe"}, {})
```

```
db.restaurants.updateOne(  
  {"name": "Central Perk Cafe"},  
  { $set: {  
    rating: "Good",  
    status: "Loved it!",  
    kitchenQuality: "ok" },  
    $currentDate: { lastModified: true }  
});
```

Check document to see updates

```
db.restaurants.find({"name": "Central Perk Cafe"}, {})
```

Inserting New Data Using \$set{}

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Consider This

Check document

```
db.restaurants.find({"name": "The Resto in a Cave"}, {})
```

```
db.restaurants.updateOne(  
  {"name": "The Resto in a Cave"},  
  {  
    $set: {  
      rating: "Musty",  
      status: "Dirty and full of rocks!!!",  
      kitchenQuality: "A fire in the floor",  
      Note: "The waiter was a bear who chased me."},  
      $currentDate: { lastModified: true }  
  });
```

Check document to see updates

```
db.restaurants.find({"name": "The Resto in a Cave"}, {})
```

MongoDB Is, “*The Coolest Thing*”!!

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Consider This



BTW: This graphic was *also* found as a result of searching, “The Coolest Thing” on the Internet. Apologies.

How Do I Compare Values?

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Consider This

...

Operation	MongoDB	RDBMS
Equality	db.employees.find({"salary": "5000"})	where 'salary' = '5000'
Less Than	db.employees.find({"age": {\$lt: 30}})	where age < 30
Less Than Equals	db.employees.find({"age": {\$lte: 30}})	where age <= 30
Greater Than	db.employees.find({"age": {\$gt: 30}})	where age > 30
Greater Than Equals	db.employees.find({"age": {\$gte: 30}})	where age >= 30
Not Equals	db.employees.find({"age": {\$ne: 30}})	where age != 30

How Do I Compare Values?

Commands for the `restaurant` database

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Consider This

...

RestaurantsDB: Details where `avgCost` is less than 200

```
db.restaurants.find(  
  {"avgCost":{$lt:200}},  
  {"_id": 0, "name":1, "avgCost":1}  
)
```

```
> db.restaurants.find({"avgCost":{$lt:200}}, {"_id": 0, "name":1, "avgCost":1})  
{ "name" : "Central Perk Cafe", "avgCost" : 100 }  
{ "name" : "The Captain's Cafe", "avgCost" : 80 }  
{ "name" : "The Resto in a Cave", "avgCost" : 1 }  
{ "name" : "The Crow Bar", "avgCost" : 40 }
```



ALLEGHENY
COLLEGE

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Consider This

...

How Do I Compare Values?

Commands for the `restaurant` database

RestaurantsDB: Details where `avgCost` is greater than 20 and less than 80 and

```
db.restaurants.find(  
  {"avgCost":{$gt:20}, "avgCost":{$lt:80}},  
  {}  
)
```

```
> db.restaurants.find({"avgCost":{$gt:20}, "avgCost":{$lt:100}}),  
... {"_id":0, "name" : 1, "avgCost":1} )  
{ "name" : "The Captain's Cafe", "avgCost" : 80 }  
{ "name" : "The Resto in a Cave", "avgCost" : 1 }  
{ "name" : "The Crow Bar", "avgCost" : 40 }
```

Advanced Data and Queries

File: sandbox/syntheticData_small.json

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Consider This

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Let's horse around with different data ...

Synthetic data available from:
<https://json-generator.com/>



More Comparing Values. Yey!!

Commands for the employee database

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Consider This

...

age == 27

```
db.employee.find({"age":27}, {"age":1, "name.first":1})
```

age > 28

```
db.employee.find({"age":{$gt:28}}, {"age":1, "name.first":1})
```

age < 28

```
db.employee.find({"age":{$lt:28}}, {"age":1, "name.first":1})
```

26 < age < 40

```
db.employee.find({"age":{$gt:26}, "age":{$lt:32}}, {"age":1, "name":1, "_id":0})
```

Query Challenge

Commands for the employee database

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Consider This



THINK

What do the following queries do?

```
db.employee.find({}, {"name.last":1, "name.first":1})  
db.employee.find({}, {company:1})  
db.employee.find({}, {"name.last":1, address:1})  
db.employee.find({}, {company:1, registered:1, _id:0})  
db.employee.find({}, {company:1, "friends.name":1, _id:0})  
db.employee.find({company: "RADIANTIX"},  
 {"friends.name":1, _id:0})
```

Query Challenge

Commands for the employee database

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Consider This
...



Gimme the following queries

- List the *lat* and *long* for all *company* entries
- List all *firstname* entries assoc with each *company* entry
- List the friends of each *first name* entry
- Give the company for which **Nadia Soto** is one of the *friends*

New Data: Cats and Dogs

File: sandbox/catsdogs.json

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Consider This
...

Syntax: OR

```
db.catsdogs.find({$or:[{expr},{expr}]} )
```

Syntax: AND

```
db.catsdogs.find({$and:[{expr},{expr}]} )
```

What do the following queries do?

```
db.catsdogs.find({$or:[{'age':4}, {age:5}]} )
```

```
db.catsdogs.find({$and:[{'owner.name':'Charlie'}, {'type':'Cat'}]} )
```

```
db.catsdogs.find({$and:[{'owner.name':'Charlie'}, {'type':'dog'}]} )
```

Query Challenge

File: sandbox/catsdogs.json

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Consider This

...



Gimme the following queries?

- Give a list *breed* information for only dogs
- Give a list *characteristics* information for only cats
- Give the addresses of all *owners* of dogs
- Give all dogs who are at least age 2
- Give all cats who are at least a year old

Query Challenge

File: sandbox/catsdogs.json

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Consider This

...



Gimme the following queries

- What kind of dog does *Charlie* have?
- What are the *characteristics* of *Labrador Retrievers*?
- What cats have color s of *Seal Point* and *Black and Tan*?

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...



THINK

- Can you create and populate a completely new MongoDB database?
- Can you edit your data in your database?
- Can you write sophisticated queries in your database to isolate meaningful information from the data?