Victoria Delacruz, Lydia Hefel, Sadie Piianaia, Ashley Holen
CS200 Final Project

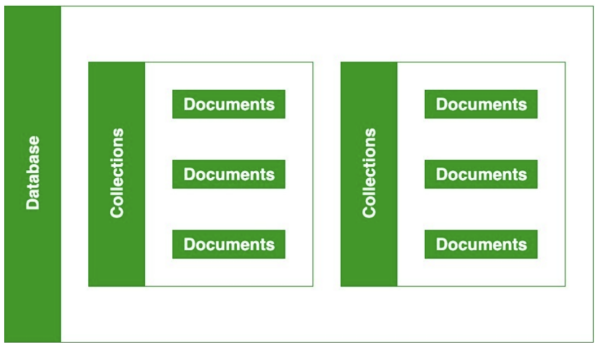
Description of MongoDB

MongoDB is a database management system that is very popular in industry. MongoDB is an open-source NoSQL (non-relational) system that is designed to handle large volumes of unstructured or semi-structured data. It is a document-oriented database and is part of the broader family of NoSQL databases, which are known for their flexibility, scalability, and performance.

Key Features Compared to SQL

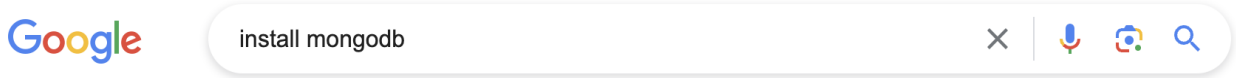
- The primary difference between MongoDB and SQL is the structure. SQL databases are used to store structured data while NoSQL databases like MongoDB are used to save unstructured data.
- MongoDB is used to save unstructured data in JSON format, while SQL does not
- MongoDB does not support advanced analytics such as filters, joins, merge, and aggregation
- In SQL, data is saved in a row-column format known as a *Table* and can be retrieved using queries formatted in the Structured Query Language (SQL). In MongoDB, data is stored in *collections* that are analogous to MySQL tables. A collection can consist of many documents in which data is stored in JSON format.
- The SQL databases have a relational property where different tables are related to each other with foreign keys and primary keys. In MongoDB, we cannot create a relationship between collections.
- SQL requires a predefined schema (structure), while in MongoDB there is not.

MongoDB Data Structure:

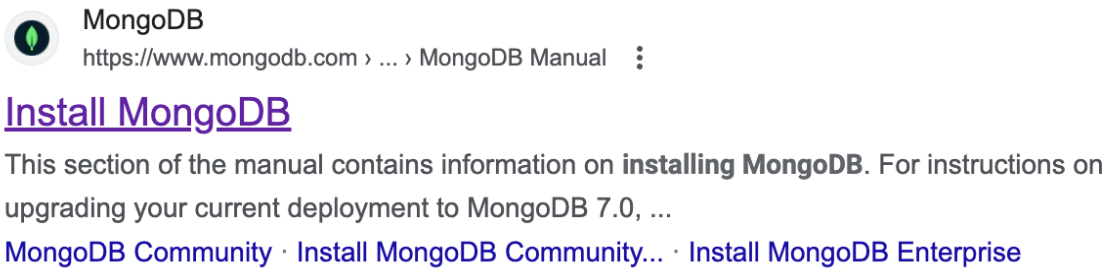


Installation and Setup

1) In your primary search engine, search “install mongodb”



2) Go to the official MongoDB website



Link :(https://www.mongodb.com/docs/manual/installation/**)**

3) Tutorials are available for Linux, macOS, Windows, and Docker platforms. Also, for both the Community Edition and Enterprise Edition of MongoDB.

MongoDB Installation Tutorials

MongoDB installation tutorials are available for the following platforms, for both the Community Edition and the Enterprise Edition:

Platform	Community Edition	Enterprise Edition
Linux	Install MongoDB Community Edition on Red Hat or CentOS Install MongoDB Community Edition on Ubuntu Install MongoDB Community Edition on Debian Install MongoDB Community Edition on SUSE Install MongoDB Community Edition on Amazon Linux	Install MongoDB Enterprise Edition on Red Hat or CentOS Install MongoDB Enterprise Edition on Ubuntu Install MongoDB Enterprise Edition on Debian Install MongoDB Enterprise Edition on SUSE Install MongoDB Enterprise Edition on Amazon Linux
macOS	Install MongoDB Community Edition on macOS	Install MongoDB Enterprise on macOS
Windows	Install MongoDB Community Edition on Windows	Install MongoDB Enterprise Edition on Windows
Docker	Install MongoDB Community with Docker	Install MongoDB Enterprise with Docker

4) Click on the version of MongoDB compatible with your system. For this tutorial, we will be demonstrating how to install and use MongoDB on a Mac.

macOS	Install MongoDB Community Edition on macOS	Install MongoDB Enterprise on macOS

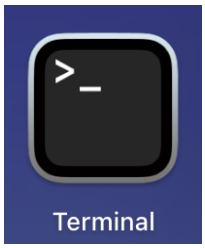
5) Select to download the Community edition on macOS. You will also need to select the Community edition that supports the version of your operating system. In this case, we are installing an edition that supports macOS 11 or later.

Install MongoDB Community Edition on macOS

Platform Support

MongoDB 7.0 Community Edition supports macOS 11 or later.

6) To start the download, you will need the app "Xcode" on your mac. You can download this application through the App Store, but we will show you how to download through your computer's terminal. Below is what the application for Terminal looks like. If you cannot find the application, look in the Launchpad of your computer.



Install Xcode Command-Line Tools

Homebrew requires the Xcode command-line tools from Apple's Xcode.

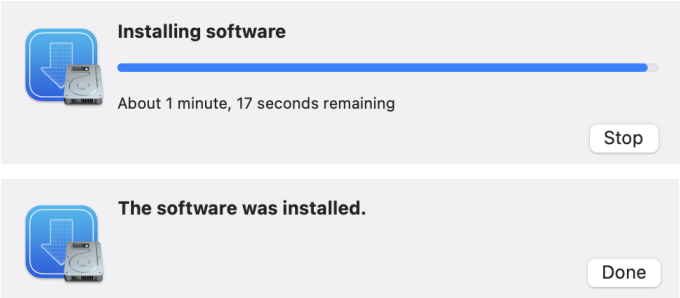
- Install the Xcode command-line tools by running the following command in your macOS Terminal:

```
xcode-select --install
```

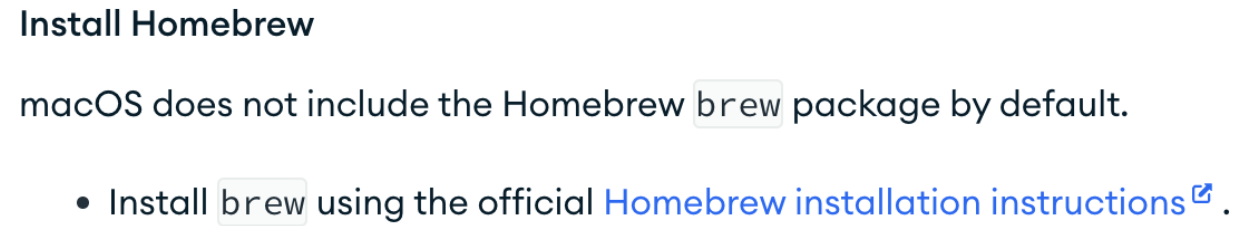
7) Once you open Terminal, type "xcode-select -- install"

```
Last login: Fri Nov  3 09:29:47 on ttys002
(base) lydiahefel@Lydias-MacBook-Air ~ % xcode-select --install
xcode-select: note: install requested for command line developer tools
(base) lydiahefel@Lydias-MacBook-Air ~ %
```

8) As shown above, there are no errors and the installation code ran through. A pop-up should appear to demonstrate that the application is installed.



9) We will now need to install “Homebrew”, which along with Xcode, is another prerequisite that you will need to have downloaded before MongoDB. There are instructions on the official MongoDB website. We will also be installing this application through the Terminal.



Enter in the code shown above into your Terminal.

10) After entering in your code, you will be asked to enter the password to your computer into the Terminal. As you type, the password will not appear, but once you have typed it, press the enter key to run the code.

```
Last login: Fri Nov  3 09:29:47 on ttys002
(base) lydiahefel@Lydias-MacBook-Air ~ % xcode-select --install
xcode-select: note: install requested for command line developer tools
(base) lydiahefel@Lydias-MacBook-Air ~ % /bin/bash -c "$(curl -fsSL https://raw.
githubusercontent.com/Homebrew/install/HEAD/install.sh)"
==> Checking for `sudo` access (which may request your password)...
Password:
```

11) Once you have entered your password, you have granted access for Homebrew to be installed. The image below will appear to show which scripts and directories will be installed.

```
==> Checking for `sudo` access (which may request your password)...
Password:
==> This script will install:
/opt/homebrew/bin/brew
/opt/homebrew/share/doc/homebrew
/opt/homebrew/share/man/man1/brew.1
/opt/homebrew/share/zsh/site-functions/_brew
/opt/homebrew/etc/bash_completion.d/brew
/opt/homebrew
==> The following new directories will be created:
/opt/homebrew/bin
/opt/homebrew/etc
/opt/homebrew/include
/opt/homebrew/lib
/opt/homebrew/sbin
/opt/homebrew/share
/opt/homebrew/var
/opt/homebrew/opt
/opt/homebrew/share/zsh
/opt/homebrew/share/zsh/site-functions
/opt/homebrew/var/homebrew
/opt/homebrew/var/homebrew/linked
/opt/homebrew/Cellar
/opt/homebrew/Caskroom
/opt/homebrew/Frameworks
```

12) Next, we need to run the official Homebrew formula in the Terminal. “brew tap mongodb/brew”

Tap the MongoDB Homebrew Tap to download the official Homebrew formula for MongoDB and the Database Tools, by running the following command in your macOS Terminal:

```
brew tap mongodb/brew
```

13) Next, we need to update Homebrew. Type “brew update” into the terminal.

To update Homebrew and all existing formulae:

```
brew update
```

14) Now, we can run MongoDB as a macOS service by typing the command below into your terminal.

- To run MongoDB (i.e. the `mongod` process) **as a macOS service**, run:

```
brew services start mongodb-community@7.0
```

15) Install MongoDB by running the following command into the Terminal.

To install MongoDB, run the following command in your macOS Terminal application:

```
brew install mongodb-community@7.0
```

16) To connect and use MongoDB, run the following command in your Terminal, “mongosh”

Connect and Use MongoDB

To begin using MongoDB, connect `mongosh` to the running instance. From a new terminal, issue the following:

```
mongosh
```

17) This will prompt an installation process, which can be seen below.

```
Press RETURN/ENTER to continue or any other key to abort:
==> /usr/bin/sudo /usr/bin/install -d -o root -g wheel -m 0755 /opt/homebrew
==> /usr/bin/sudo /bin/mkdir -p /opt/homebrew/bin /opt/homebrew/etc /opt/homebrew/include /opt/homebrew/lib /opt/homebrew/sbin /opt/homebrew/share /opt/homebrew/var /opt/homebrew/opt /opt/homebrew/share/zsh /opt/homebrew/share/zsh/site-functions /opt/homebrew/var/homebrew /opt/homebrew/var/homebrew/linked /opt/homebrew/Cellar /opt/homebrew/Caskroom /opt/homebrew/Frameworks
==> /usr/bin/sudo /bin/chmod ug=rwx /opt/homebrew/bin /opt/homebrew/etc /opt/homebrew/include /opt/homebrew/lib /opt/homebrew/sbin /opt/homebrew/share /opt/homebrew/var /opt/homebrew/opt /opt/homebrew/share/zsh /opt/homebrew/share/zsh/site-functions /opt/homebrew/var/homebrew /opt/homebrew/var/homebrew/linked /opt/homebrew/Cellar /opt/homebrew/Caskroom /opt/homebrew/Frameworks
==> /usr/bin/sudo /bin/chmod go-w /opt/homebrew/share/zsh /opt/homebrew/share/zsh/site-functions
==> /usr/bin/sudo /usr/sbin/chown lydiahefel /opt/homebrew/bin /opt/homebrew/etc /opt/homebrew/include /opt/homebrew/lib /opt/homebrew/sbin /opt/homebrew/share /opt/homebrew/var /opt/homebrew/opt /opt/homebrew/share/zsh /opt/homebrew/share/zsh/site-functions /opt/homebrew/var/homebrew /opt/homebrew/var/homebrew/linked /opt/homebrew/Cellar /opt/homebrew/Caskroom /opt/homebrew/Frameworks
==> /usr/bin/sudo /usr/bin/chgrp admin /opt/homebrew/bin /opt/homebrew/etc /opt/homebrew/include /opt/homebrew/lib /opt/homebrew/sbin /opt/homebrew/share /opt/homebrew/var /opt/homebrew/opt /opt/homebrew/share/zsh /opt/homebrew/share/zsh/site-functions /opt/homebrew/var/homebrew /opt/homebrew/var/homebrew/linked /opt/homebrew/Cellar /opt/homebrew/Caskroom /opt/homebrew/Frameworks
==> /usr/bin/sudo /usr/sbin/chown -R lydiahefel:admin /opt/homebrew
==> /usr/bin/sudo /bin/mkdir -p /Users/lydiahefel/Library/Caches/Homebrew
==> /usr/bin/sudo /bin/chmod g+rwx /Users/lydiahefel/Library/Caches/Homebrew
==> /usr/bin/sudo /usr/sbin/chown -R lydiahefel /Users/lydiahefel/Library/Caches/Homebrew
==> Downloading and installing Homebrew...
remote: Enumerating objects: 249442, done.
remote: Counting objects: 100% (934/934), done.
remote: Compressing objects: 100% (549/549), done.
Receiving objects:  22% (55589/249442), 26.92 MiB | 186.00 KiB/s
```

```
remote: Total 249442 (delta 414), reused 850 (delta 358), pack-reused 248508
Receiving objects: 100% (249442/249442), 73.30 MiB | 164.00 KiB/s, done.
Resolving deltas: 100% (181997/181997), done.
From https://github.com/Homebrew/brew
 * [new branch]          master     -> origin/master
 * [new tag]             0.1        -> 0.1
```

```
remote: Enumerating objects: 18, done.
remote: Counting objects: 100% (11/11), done.
remote: Total 18 (delta 11), reused 11 (delta 11), pack-reused 7
Unpacking objects: 100% (18/18), 3.38 KiB | 173.00 KiB/s, done.
From https://github.com/Homebrew/brew
 * [new tag]             4.0.29     -> 4.0.29
 * [new tag]             4.1.9      -> 4.1.9
HEAD is now at d72ee37f6 Merge pull request #16207 from Rylan12/api-tap-migrations
Warning: /opt/homebrew/bin is not in your PATH.
  Instructions on how to configure your shell for Homebrew
  can be found in the 'Next steps' section below.
==> Installation successful!

==> Homebrew has enabled anonymous aggregate formulae and cask analytics.
Read the analytics documentation (and how to opt-out) here:
  https://docs.brew.sh/Analytics
No analytics data has been sent yet (nor will any be during this install run).

==> Homebrew is run entirely by unpaid volunteers. Please consider donating:
  https://github.com/Homebrew/brew#donations

==> Next steps:
- Run these two commands in your terminal to add Homebrew to your PATH:
    (echo; echo 'eval "$(/opt/homebrew/bin/brew shellenv)"') >> /Users/lydiahefel/.zprofile
    eval "$(/opt/homebrew/bin/brew shellenv)"
- Run brew help to get started
- Further documentation:
    https://docs.brew.sh
```

18) Once you see "**Installation Successful**" MongoDB should be installed! Under "**Next Steps**" in the above photo, we need to run two commands in our Terminal to add Homebrew to our Path. The name of the user for your computer should automatically appear, and you should simply be able to copy and paste the two commands.

```
(base) lydiahefel@Lydias-MacBook-Air ~ % (echo; echo 'eval "$(/opt/homebrew/bin/brew shellenv)"') >> /Users/lydiahefel/.zprofile
    eval "$(/opt/homebrew/bin/brew shellenv)"
(base) lydiahefel@Lydias-MacBook-Air ~ %
```

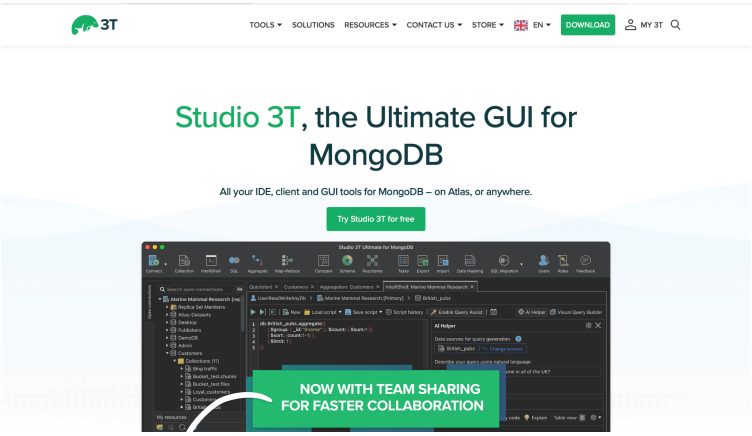
19) Your path should now appear, showing the name of the MongoDB you installed, the status should show "Started" in green, your computer user, and the File which the software is stored in your computer.

```
(base) lydiahefel@Lydias-MacBook-Air ~ % brew services
Name              Status  User       File
mongodb-community started lydiahefel ~/Library/LaunchAgents/homebrew.mxcl.mongodb-community.plist
```

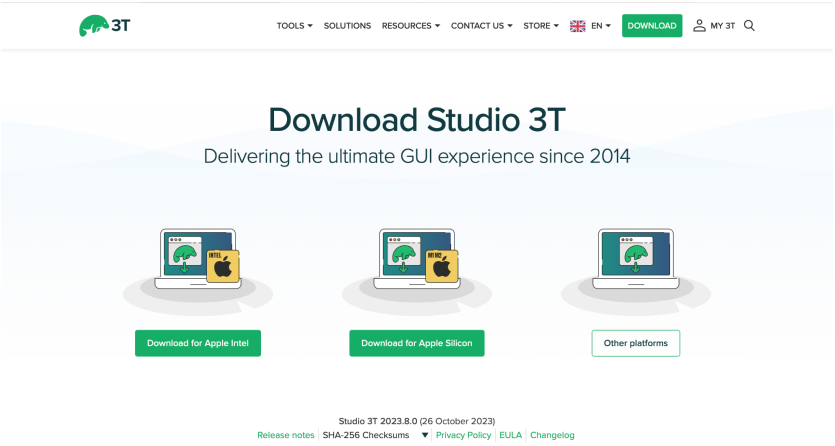
20) One last command that we will need to run in our Terminal will be "mongod". The installation is shown below.

```
(base) lydiahefel@Lydias-MacBook-Air ~ % mongod
{"t":{"$date":"2023-11-13T10:14:06.576-10:00"},"s":"I",  "c":"NETWORK",  "id":4915701, "ctx":"thread1","msg":"Initialized wire specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":21},"incomingInternalClient":{"minWireVersion":0,"maxWireVersion":21},"outgoing":{"minWireVersion":6,"maxWireVersion":21},"isInternalClient":true}}}
{"t":{"$date":"2023-11-13T10:14:06.578-10:00"},"s":"I",  "c":"CONTROL",  "id":23285,   "ctx":"thread1","msg":"Automatically disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2023-11-13T10:14:06.578-10:00"},"s":"I",  "c":"NETWORK",  "id":4648602, "ctx":"thread1","msg":"Implicit TCP FastOpen in use."}
{"t":{"$date":"2023-11-13T10:14:06.578-10:00"},"s":"I",  "c":"REPL",     "id":5123008, "ctx":"thread1","msg":"Successfully registered PrimaryOnlyService","attr":{"service":"TenantMigrationDonorService","namespace":"config.tenantMigrationDonors"}}
{"t":{"$date":"2023-11-13T10:14:06.578-10:00"},"s":"I",  "c":"REPL",     "id":5123008, "ctx":"thread1","msg":"Successfully registered PrimaryOnlyService","attr":{"service":"TenantMigrationRecipientService","namespace":"config.tenantMigrationRecipients"}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":5945603, "ctx":"thread1","msg":"Multi threading initialized"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"TENANT_M", "id":7091600, "ctx":"thread1","msg":"Starting TenantMigrationAccessBlockerRegistry"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":4615611, "ctx":"initandlisten","msg":"MongoDB starting","attr":{"pid":67458,"port":27017,"dbPath":"/data/db","architecture":"64-bit","host":"Lydias-MacBook-Air.local"}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":23403,   "ctx":"initandlisten","msg":"Build Info","attr":{"buildInfo":{"version":"7.0.2","gitVersion":"02b3c655e1302209ef046da6ba3ef6749dd0b62a","modules":[],"allocator":"system","environment":{"distarch":"aarch64","target_arch":"aarch64"}}}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":51765,   "ctx":"initandlisten","msg":"Operating System","attr":{"os":{"name":"Mac OS X","version":"22.6.0"}}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":21951,   "ctx":"initandlisten","msg":"Options set by command line","attr":{"options":{}}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"NETWORK",  "id":5693100, "ctx":"initandlisten","msg":"Asio socket.set_option failed with std::system_error","attr":{"note":"acceptor TCP fast open","option":{"level":6,"name":261,"data":"00 04 00 00"},"error":{"what":"set_option: Invalid argument","message":"Invalid argument","category":"asio.system","value":22}}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"E",  "c":"CONTROL",  "id":20568,   "ctx":"initandlisten","msg":"Error setting up listener","attr":{"error":{"code":9001,"codeName":"SocketException","errmsg":"setup bind :: caused by :: Address already in use"}}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"REPL",     "id":4784900, "ctx":"initandlisten","msg":"Stepping down the ReplicationCoordinator for shutdown","attr":{"waitTimeMillis":15000}}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"REPL",     "id":4794602, "ctx":"initandlisten","msg":"Attempting to enter quiesce mode"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"-",        "id":6371601, "ctx":"initandlisten","msg":"Shutting down the FLE Crud thread pool"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"COMMAND",  "id":4784901, "ctx":"initandlisten","msg":"Shutting down the MirrorMaestro"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"SHARDING", "id":4784902, "ctx":"initandlisten","msg":"Shutting down the WaitForMajorityService"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"NETWORK",  "id":4784905, "ctx":"initandlisten","msg":"Shutting down the global connection pool"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"NETWORK",  "id":4784918, "ctx":"initandlisten","msg":"Shutting down the ReplicaSetMonitor"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"SHARDING", "id":4784921, "ctx":"initandlisten","msg":"Shutting down the MigrationUtilExecutor"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"ASIO",     "id":22582,   "ctx":"MigrationUtil-TaskExecutor","msg":"Killing all outstanding egress activity."}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"COMMAND",  "id":4784923, "ctx":"initandlisten","msg":"Shutting down the ServiceEntryPoint"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":4784928, "ctx":"initandlisten","msg":"Shutting down the TTL monitor"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":6278511, "ctx":"initandlisten","msg":"Shutting down the Change Stream Expired Pre-images Remover"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":4784929, "ctx":"initandlisten","msg":"Acquiring the global lock for shutdown"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"-",        "id":4784931, "ctx":"initandlisten","msg":"Dropping the scope cache for shutdown"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":20565,   "ctx":"initandlisten","msg":"Now exiting"}
{"t":{"$date":"2023-11-13T10:14:06.579-10:00"},"s":"I",  "c":"CONTROL",  "id":23138,   "ctx":"initandlisten","msg":"Shutting down","attr":{"exitCode":48}}
```

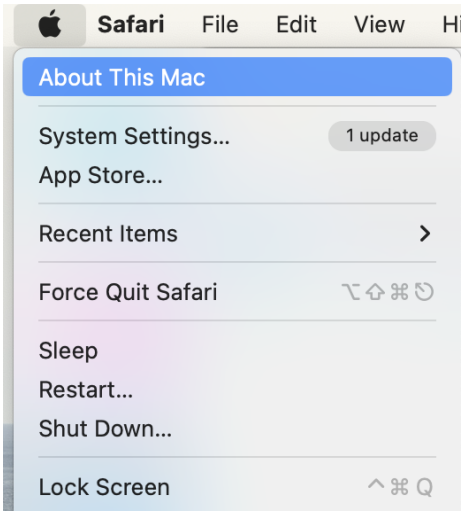

21) Now that the software is installed on our computer, we will need to install a user interface to actually use MongoDB. We found that the best interface to do so on Mac is called “Studio 3T”. First, go to https://studio3t.com/



22) Click on the green “Download” button on the top right side of the screen. You will have the option to download versions of Studio 3T based on your system.

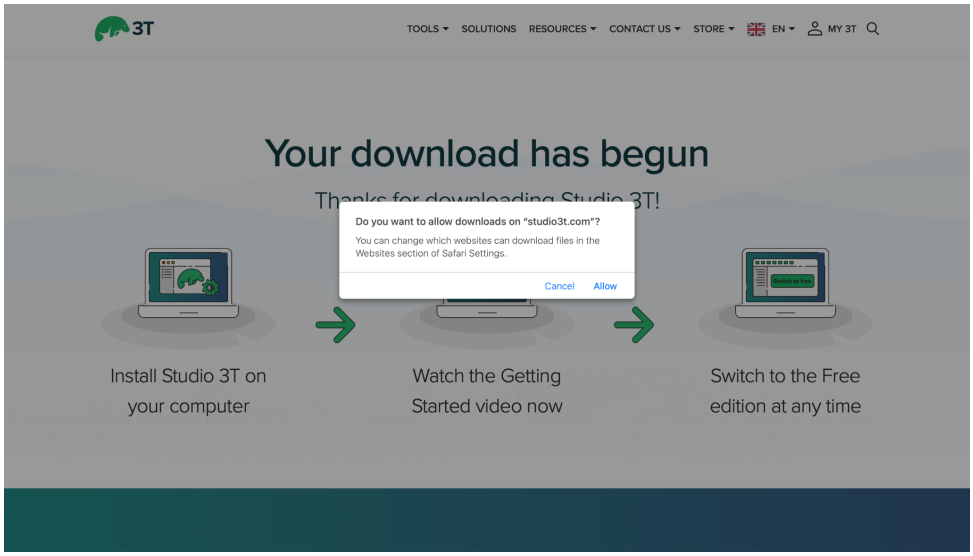


23) To check which system that you have, click the Apple logo on the top left of the screen, and “About This Mac”.

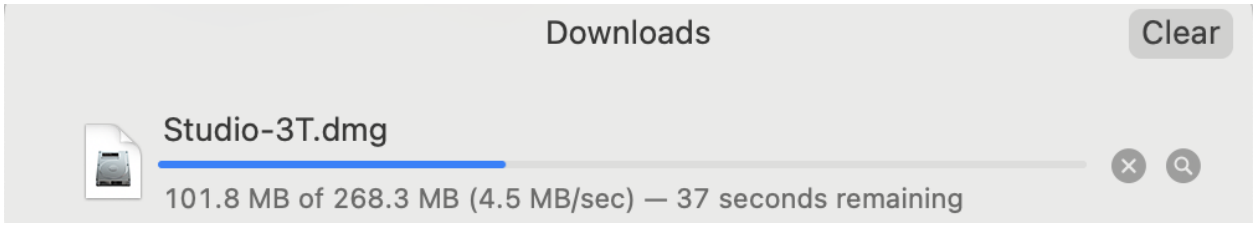


24) In this example, we can see that we have a M1 chip, so we will install the Apple Silicon version of Studio 3T.

25) Click Download for the Studio 3T which corresponds to your system, and press allow downloads.

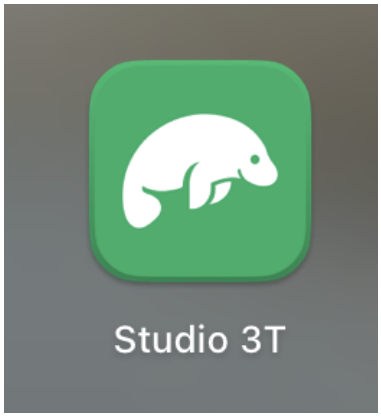


26) Once you press Allow, a pop-up should appear in the top right corner of your screen.

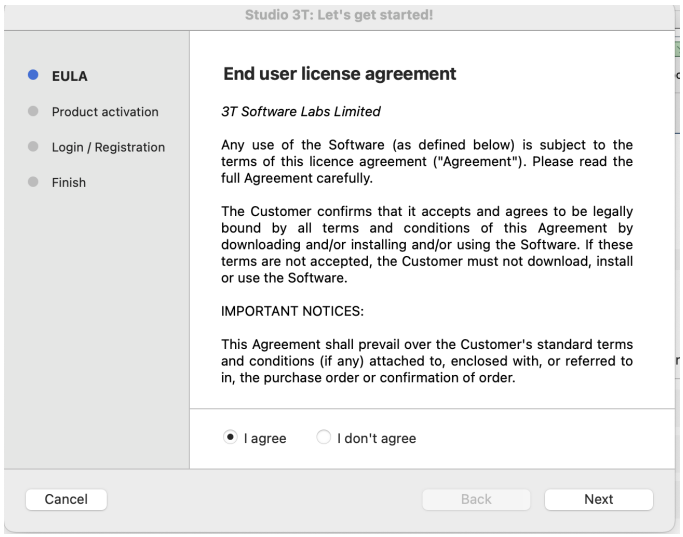


27) Once this download is completed, double click on the downloaded file. The image below should appear. Drag and drop the Studio 3T logo into your Applications folder.

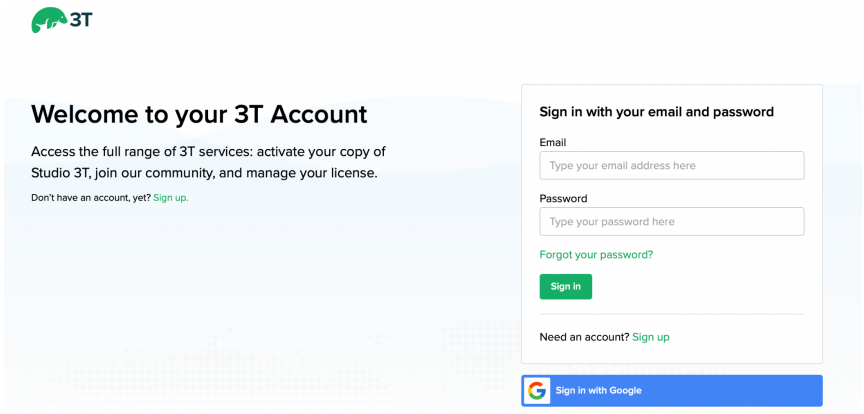
28) Studio 3T should now be available in your Applications on your computer. Open the app.



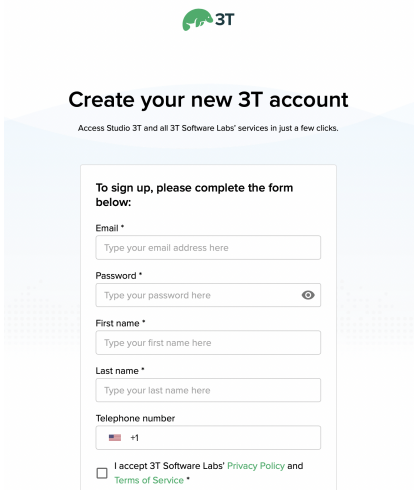
29) Accept the user agreement which pops up once you first open the application.



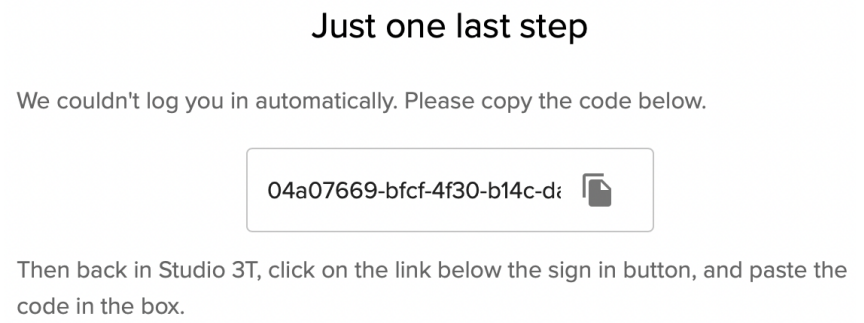
30) Now it is time to activate your account. Since we are new to MongoDB, we will need to click “Sign Up”.



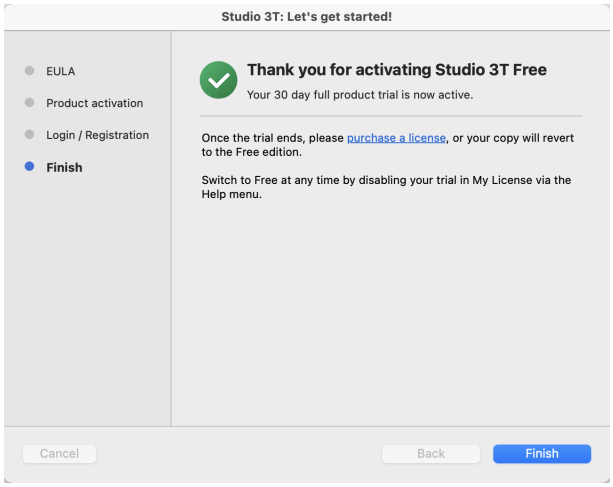
31) Create your account using your email, password, first name and last name, with your phone number being optional. Accept the 3T terms and conditions.



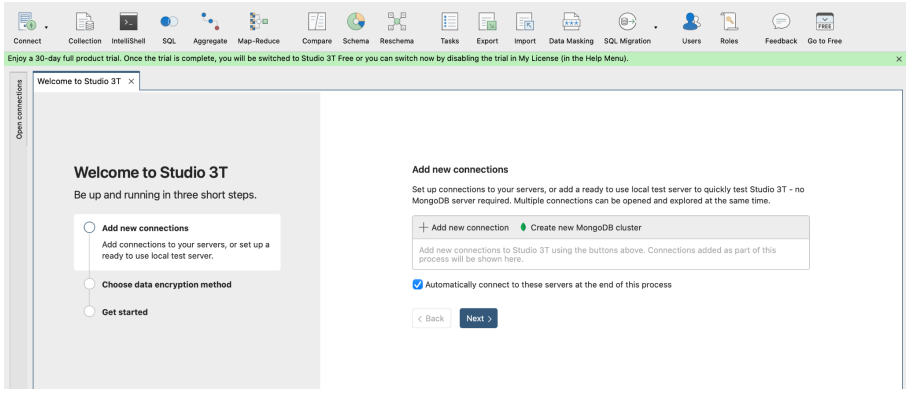
32) A personalized code should appear on your screen once your account is created. Copy the code by pressing the paper icon on the right of the code, and navigate back to the pop-up on your screen where you accepted the license agreement.



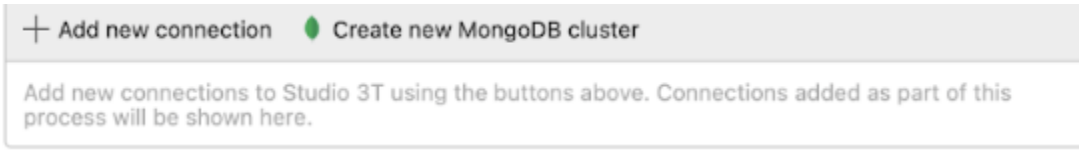
33) Copy the code and press enter in the Login/Registration screen. You should then be moved to the Finish screen, where you can begin your 30 day Free Trial. Press Finish.



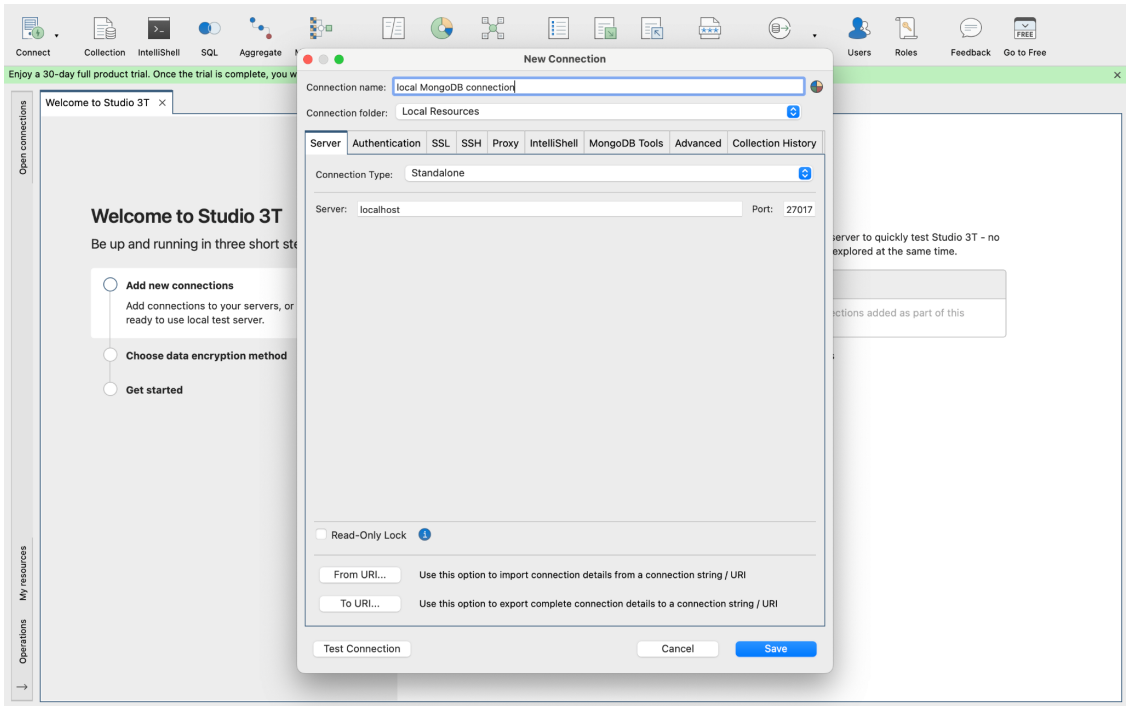
34) Studio 3T will now open and show a welcome page!



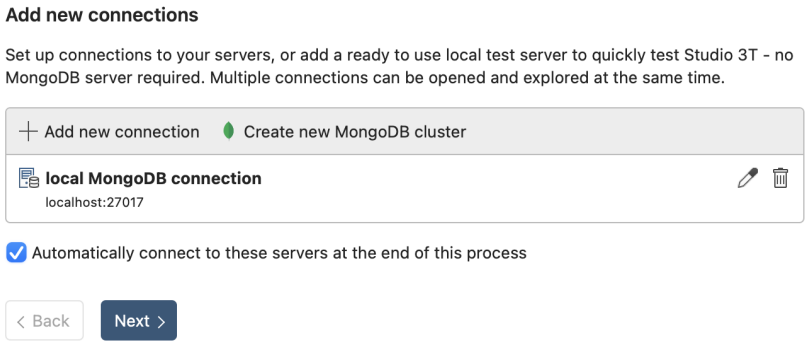
35) Click on “Add new connection”



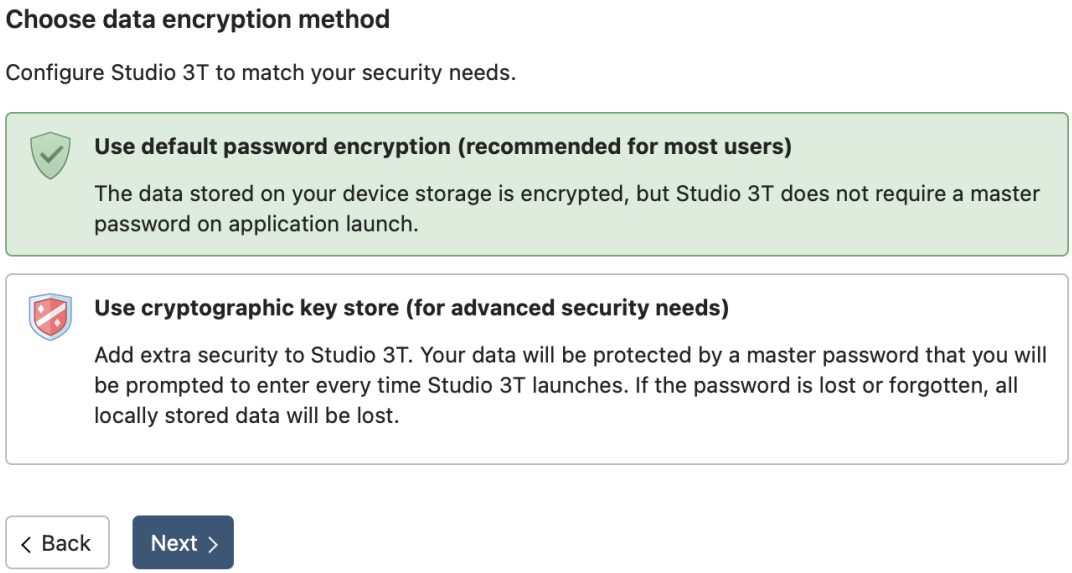
36) This should open a new window. Under “Connection name:” enter “local MongoDB connection”. Do not change any other settings! Press Save.



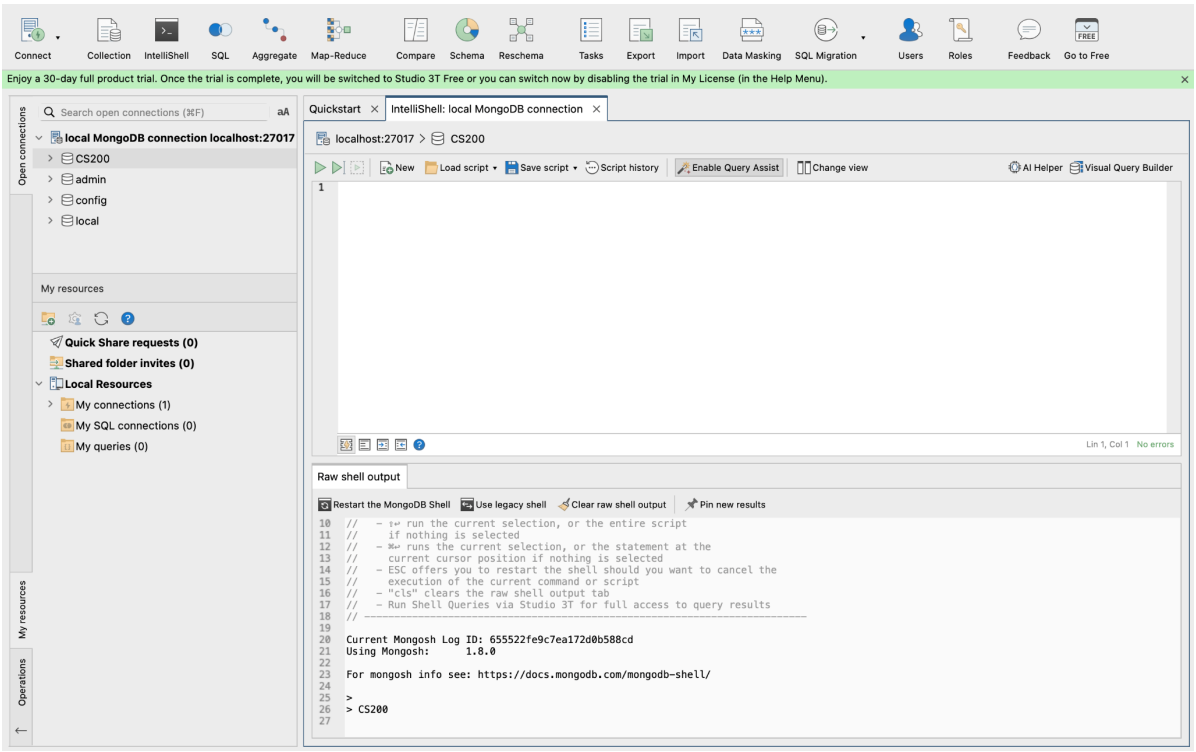
37) After clicking Save, a screen will appear showing the connection, which should be a local connection, meaning one for your computer individually. Press the Next button.



38) Now we have to select our data encryption method. We are going to select “Use default password encryption” and then the Next button.



39) MongoDB should start. Click “IntelliShell” on the top ribbon, and your local host connection should appear bolded on the left of your screen. In this photo, I have a database already created called “CS200”, but no databases should be shown until you create one in the next section of our tutorial.



40) MongoDB is ready to use! For any troubleshooting with the software installation, visit the official MongoDB website, https://www.mongodb.com/

Code Cases

Case One:

1. Create a database, for example, called **database_cs200finalproject** with the following code:
    a. **use database_cs200finalproject;**
2. Create a collection, known as a table in SQL, of students.
    a. Students will have *5* different fields, known as columns in SQL:
        i. Name
        ii. Age
        iii. Major
        iv. Year
        v. ID
    b. Run the following code. // this example is ran individually
        i. **db.Students.insertOne({name: "Lydia", age: 18, major: "CS/DS", year: 01, id: 111})** // db stands for database
        ii. **db.Students.insertOne({name: "Ashley", age: 21, major: "CS/DS", year: 03, id: 222})** // Students is the title of the collection
        iii. **db.Students.insertOne({name: "Victoria", age: 19, major: "CS", year: 02, id: 333})** // insertOne method allows one document to be inserted into the Students collection
        iv. **db.Students.insertOne({name: "Sadie", age: 18, major: "DS", year: 01, id: 444})** // periods are used to separate the command into the specific database, collection, and method
        v. **db.Students.insertOne({name: "Sasha", age: 22, major: "ENV", year: 04, id: *555*})** // parentheses are used to hold the documents that the method is applied to
        vi. **db.Students.find()** // this will show our results, the parentheses are empty because the find method is used across the whole database and not a few specific documents

Code Input:

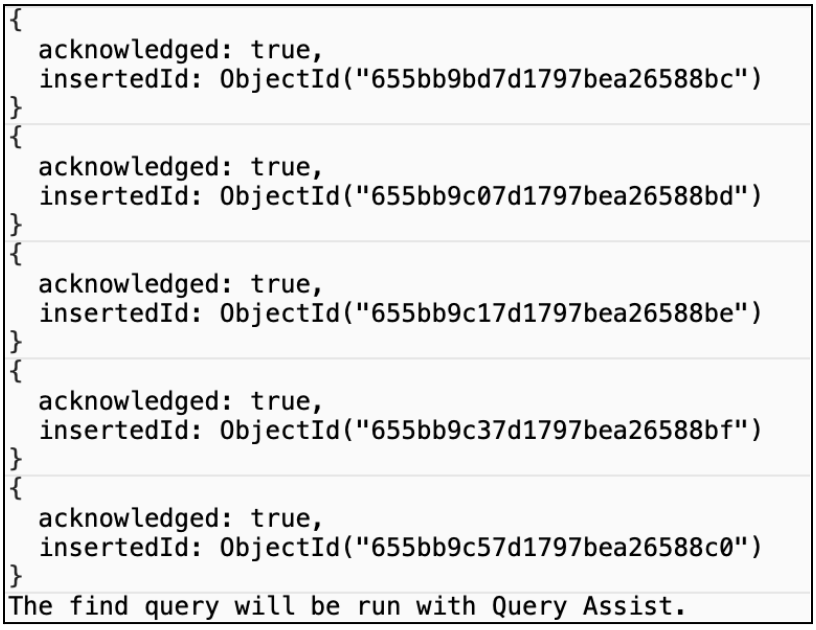
```
show dbs

use database_cs200finalproject

db.Students.insertOne({name: "Lydia", age: 18, major: "CS/DS", year: 01, id: 111})
db.Students.insertOne({name: "Ashley", age: 21, major: "CS/DS", year: 03, id: 222})
db.Students.insertOne({name: "Victoria", age: 19, major: "CS", year: 02, id: 333})
db.Students.insertOne({name: "Sadie", age: 18, major: "DS", year: 01, id: 444})
db.Students.insertOne({name: "Sasha", age: 22, major: "ENV", year: 04, id: 555})

db.Students.find({})
```

Result Output:



```
{
  acknowledged: true,
  insertedId: ObjectId("655bb9bd7d1797bea26588bc")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bb9c07d1797bea26588bd")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bb9c17d1797bea26588be")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bb9c37d1797bea26588bf")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bb9c57d1797bea26588c0")
}
The find query will be run with Query Assist.
```

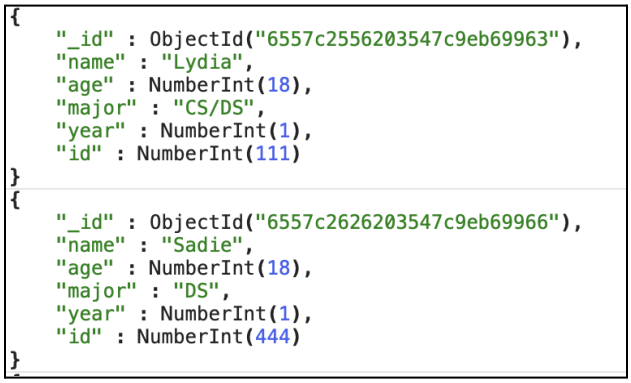
```
{
    "_id" : ObjectId("6557c2556203547c9eb69963"),
    "name" : "Lydia",
    "age" : NumberInt(18),
    "major" : "CS/DS",
    "year" : NumberInt(1),
    "id" : NumberInt(111)
}
{
    "_id" : ObjectId("6557c25c6203547c9eb69964"),
    "name" : "Ashley",
    "age" : NumberInt(21),
    "major" : "CS/DS",
    "year" : NumberInt(3),
    "id" : NumberInt(222)
}
{
    "_id" : ObjectId("6557c25f6203547c9eb69965"),
    "name" : "Victoria",
    "age" : NumberInt(19),
    "major" : "CS",
    "year" : NumberInt(2),
    "id" : NumberInt(333)
}
{
    "_id" : ObjectId("6557c2626203547c9eb69966"),
    "name" : "Sadie",
    "age" : NumberInt(18),
    "major" : "DS",
    "year" : NumberInt(1),
    "id" : NumberInt(444)
}
{
    "_id" : ObjectId("6557c2646203547c9eb69967"),
    "name" : "Sasha",
    "age" : NumberInt(22),
    "major" : "ENV",
    "year" : NumberInt(4),
    "id" : NumberInt(555)
}
```

3. Querying
    a. For example, run the code **db.Students.find({year: 01})** to find which students are first year students.

Code Input:

```
db.Students.find({year: 01})
```

Result Output:



```
{
    "_id" : ObjectId("6557c2556203547c9eb69963"),
    "name" : "Lydia",
    "age" : NumberInt(18),
    "major" : "CS/DS",
    "year" : NumberInt(1),
    "id" : NumberInt(111)
}
{
    "_id" : ObjectId("6557c2626203547c9eb69966"),
    "name" : "Sadie",
    "age" : NumberInt(18),
    "major" : "DS",
    "year" : NumberInt(1),
    "id" : NumberInt(444)
}
```

4. Create a collection of courses.
    a. Courses will have 5 different fields as well.
        i. ID
        ii. Name
        iii. Credit
        iv. Prerequisites

v. Category

b. Run the following code.

i. **db.Courses.insertOne({id: "EN100", name: "Intro to Expository Writing" , credit: 3, preq: "None", category: "Pre-Major"})** // the brackets are used to contain the specific documents that apply to the collection

ii. **db.Courses.insertOne({id: "EN102", name: "Expository Writing" , credit: 3, preq: "EN100", category: "Pre-Major"})** // colons are used to separate the title of the documents and what is inside the documents

iii. **db.Courses.insertOne({id: "EN310", name: "Types of Literature" , credit: 3, preq: "EN102", category: "Major"})** // quotation marks are used for words (known as strings) so they are not confused for code

iv. **db.Courses.insertOne({id: "BU200", name: "Intro to Business" , credit: 3, preq: "None", category: "Pre-Major"})** // commas are used to separate each document, and what it contains, from the other documents in the collection

v. **db.Courses.insertOne({id: "CS100", name: "Computers and Applications Software" , credit: 3, preq: "None", category: "Pre-Major"})**

vi. **db.Courses.find()**

Code Input:

```
db.Courses.insertOne({id: "EN100", name: "Intro to Expository Writing" , credit: 3, preq: "None", category: "Pre-Major"})
db.Courses.insertOne({id: "EN102", name: "Expository Writing" , credit: 3, preq: "EN100", category: "Pre-Major"})
db.Courses.insertOne({id: "EN310", name: "Types of Literature" , credit: 3, preq: "EN102", category: "Major"})
db.Courses.insertOne({id: "BU200", name: "Intro to Business" , credit: 3, preq: "None", category: "Pre-Major"})
db.Courses.insertOne({id: "CS100", name: "Computers and Applications Software" , credit: 3, preq: "None", category: "Pre-Major"})

db.Courses.find({})
```

Result Output:

```
{
  acknowledged: true,
  insertedId: ObjectId("655bbd497d1797bea26588c1")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbd4a7d1797bea26588c2")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbd4c7d1797bea26588c3")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbd4e7d1797bea26588c4")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbd507d1797bea26588c5")
}
The find query will be run with Query Assist.
```

```
{
    "_id" : ObjectId("6557c60e6203547c9eb69968"),
    "id" : "EN100",
    "name" : "Intro to Expository Writing",
    "credit" : NumberInt(3),
    "preq" : "None",
    "category" : "Pre-Major"
}
{
    "_id" : ObjectId("6557c6106203547c9eb69969"),
    "id" : "EN102",
    "name" : "Expository Writing",
    "credit" : NumberInt(3),
    "preq" : "EN100",
    "category" : "Pre-Major"
}
{
    "_id" : ObjectId("6557c6126203547c9eb6996a"),
    "id" : "EN310",
    "name" : "Types of Literature",
    "credit" : NumberInt(3),
    "preq" : "EN102",
    "category" : "Major"
}
{
    "_id" : ObjectId("6557c6146203547c9eb6996b"),
    "id" : "BU200",
    "name" : "Intro to Business",
    "credit" : NumberInt(3),
    "preq" : "None",
    "category" : "Pre-Major"
}
{
    "_id" : ObjectId("6557c6176203547c9eb6996c"),
    "id" : "CS100",
    "name" : "Computers and Applications Software",
    "credit" : NumberInt(3),
    "preq" : "None",
    "category" : "Pre-Major"
}
```

5. Querying
    a. For example, run the code **db.Courses.find({preq: "None"})** to find which courses have no prerequisites.

Code Input:

```
db.Courses.find({preq: "None"})
```

Result Output:


```
{
    "_id" : ObjectId("6557c60e6203547c9eb69968"),
    "id" : "EN100",
    "name" : "Intro to Expository Writing",
    "credit" : NumberInt(3),
    "preq" : "None",
    "category" : "Pre-Major"
}
{
    "_id" : ObjectId("6557c6146203547c9eb6996b"),
    "id" : "BU200",
    "name" : "Intro to Business",
    "credit" : NumberInt(3),
    "preq" : "None",
    "category" : "Pre-Major"
}
{
    "_id" : ObjectId("6557c6176203547c9eb6996c"),
    "id" : "CS100",
    "name" : "Computers and Applications Software",
    "credit" : NumberInt(3),
    "preq" : "None",
    "category" : "Pre-Major"
}
```


6. Create a table of advisors.
    a. Again, advisors will have *5* different fields.
        i. ID
        ii. First Name
        iii. Last Name
        iv. Phone Number
        v. Department
    b. Run the following code to create the collection
        i. **db.Advisors.insertOne({id: 10, firstname: "Justin", lastname: "Wyble" , phone: "*555*-1111", department:"EN"})**
        ii. **db.Advisors.insertOne({id: 11, firstname: "Rylan", lastname: "Chong" , phone: "*555*-2222", department:"DSAV"})**
        iii. **db.Advisors.insertOne({id: 12, firstname: "Robert", lastname: "Maruyama" , phone: "*555*-3333", department:"CIS"})**
        iv. **db.Advisors.insertOne({id: 13, firstname: "Laura", lastname: "Tipton" , phone: "*555*-4444", department:"CIS" })**
        v. **db.Advisors.insertOne({id: 14, firstname: "Mark", lastname: "Speck" , phone: "*555-5555*", department:"DSAV" })**
        vi. **db.Advisors.find({})**

Code Input:

```
db.Advisors.insertOne({id: 10, firstname: "Justin", lastname: "Wyble" , phone: "555-1111", department:"EN"})
db.Advisors.insertOne({id: 11, firstname: "Rylan", lastname: "Chong" , phone: "555-2222", department:"DSAV"})
db.Advisors.insertOne({id: 12, firstname: "Robert", lastname: "Maruyama" , phone: "555-3333", department:"CIS"})
db.Advisors.insertOne({id: 13, firstname: "Laura", lastname: "Tipton" , phone: "555-4444", department:"CIS" })
db.Advisors.insertOne({id: 14, firstname: "Mark", lastname: "Speck" , phone: "555-5555", department:"DSAV" })

db.Advisors.find({})
```

Results Output:

```
{
  acknowledged: true,
  insertedId: ObjectId("655bbf957d1797bea26588c6")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbf967d1797bea26588c7")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbf987d1797bea26588c8")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbf997d1797bea26588c9")
}
{
  acknowledged: true,
  insertedId: ObjectId("655bbf9a7d1797bea26588ca")
}
The find query will be run with Query Assist.
```

```
{
    "_id" : ObjectId("6557c8936203547c9eb6996d"),
    "id" : NumberInt(10),
    "firstname" : "Justin",
    "lastname" : "Wyble",
    "phone" : "555-1111",
    "department" : "EN"
}
{
    "_id" : ObjectId("6557c8956203547c9eb6996e"),
    "id" : NumberInt(11),
    "firstname" : "Rylan",
    "lastname" : "Chong",
    "phone" : "555-2222",
    "department" : "DSAV"
}
{
    "_id" : ObjectId("6557c8966203547c9eb6996f"),
    "id" : NumberInt(12),
    "firstname" : "Robert",
    "lastname" : "Maruyama",
    "phone" : "555-3333",
    "department" : "CIS"
}
{
    "_id" : ObjectId("6557c8986203547c9eb69970"),
    "id" : NumberInt(13),
    "firstname" : "Laura",
    "lastname" : "Tipton",
    "phone" : "555-4444",
    "department" : "CIS"
}
{
    "_id" : ObjectId("6557c89a6203547c9eb69971"),
    "id" : NumberInt(14),
    "firstname" : "Mark",
    "lastname" : "Speck",
    "phone" : "555-5555",
    "department" : "DSAV"
}
```

7. Querying
    a. For example, run the code **db.Advisors.find({department: "CIS"})** to find which advisors are in the CIS department.

Code Input:

```
db.Advisors.find({department: "CIS"})
```

Result Output:

```
{
    "_id" : ObjectId("6557c8966203547c9eb6996f"),
    "id" : NumberInt(12),
    "firstname" : "Robert",
    "lastname" : "Maruyama",
    "phone" : "555-3333",
    "department" : "CIS"
}
{
    "_id" : ObjectId("6557c8986203547c9eb69970"),
    "id" : NumberInt(13),
    "firstname" : "Laura",
    "lastname" : "Tipton",
    "phone" : "555-4444",
    "department" : "CIS"
}
```

Case Two:

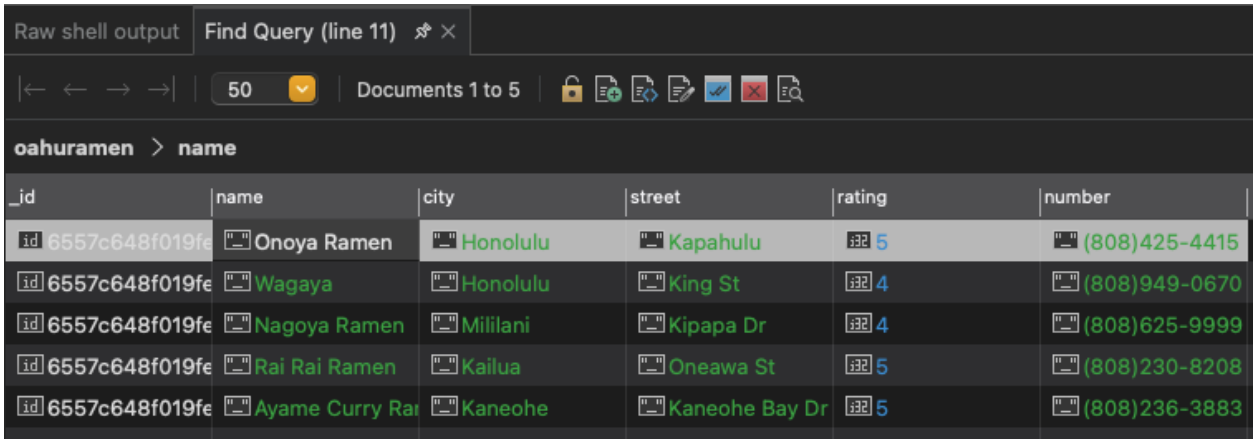
1. First, we are going to create our database called **db1** with the following code:
    a. **use db1;**
2. Let's create our collection (in SQL, you know this as table) on different ramen spots on Oahu.
    a. In our collection, we want to show the following *5* different fields (in SQL, you know this as columns):
        i. Name
        ii. City
        iii. Street
        iv. Rating
        v. Number
    b. Run this code to create the collection // in this code we are inserting *5* different restaurants with the function *insertMany*.
        i. **db.oahuramen.insertMany([**
        { name: "Onoya Ramen", city: "Honolulu", street: "Kapahulu", rating: *5*, number: "(808)425-4415" }, // character strings are in "quotes"
        { name: "Wagaya", city: "Honolulu", street: "King St", rating: 4, number: "(808)949-0670" }, // numeric integers are numbers ONLY, no need for quotes
        { name: "Nagoya Ramen", city: "Mililani", street: "Kipapa Dr", rating: 4, number: "(808)625-9999" }, // phone number requires quotes as we're using character strings such as the parentheses and dash
        { name: "Rai Rai Ramen", city: "Kailua", street: "Oneawa St", rating: *5*, number: "(808)230-8208" },
        { name: "Ayame Curry Ramen House", city: "Kaneohe", street: "Kaneohe Bay Dr", rating: *5*, number: "(808)236-3883"}
        ]) //db stands for database, oahuramen is the name of the collection, insertMany is the function, periods are used to separate the command into specific database, collection, and method, parentheses are used to hold the documents that method is applied to
        ii. Results
            1. **db.oahuramen.find()** // this code shows us our results, parentheses is empty because the find method is used across the whole database and not specific documents

```
use db1;

db.oahuramen.insertMany([
    { name: "Onoya Ramen", city: "Honolulu", street: "Kapahulu", rating: 5, number: "(808)425-4415" },
    { name: "Wagaya", city: "Honolulu", street: "King St", rating: 4, number: "(808)949-0670" },
    { name: "Nagoya Ramen", city: "Mililani", street: "Kipapa Dr", rating: 4, number: "(808)625-9999" },
    { name: "Rai Rai Ramen", city: "Kailua", street: "Oneawa St", rating: 5, number: "(808)230-8208" },
    { name: "Ayame Curry Ramen House", city: "Kaneohe", street: "Kaneohe Bay Dr", rating: 5, number: "(808)236-3883"}
])

db.oahuramen.find()
```

3. Great job! We've created our oahuramen collection with valuable information. Let's run the code **db.oahuramen.find()** (in SQL, this is like SELECT * FROM <table name>) to see what our collection looks like.

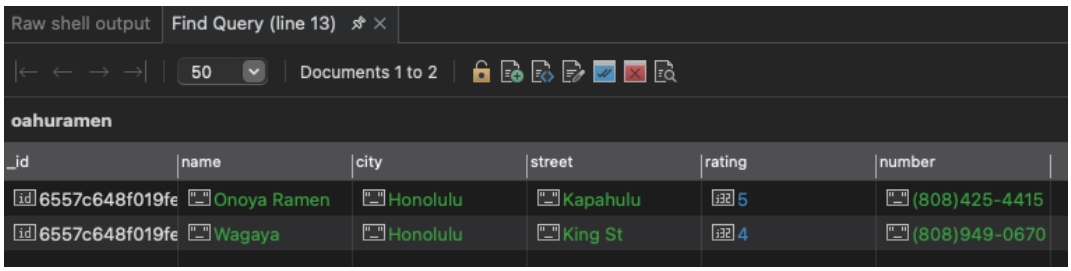


_id	name	city	street	rating	number
6557c648f019fe	Onoya Ramen	Honolulu	Kapahulu	5	(808)425-4415
6557c648f019fe	Wagaya	Honolulu	King St	4	(808)949-0670
6557c648f019fe	Nagoya Ramen	Mililani	Kipapa Dr	4	(808)625-9999
6557c648f019fe	Rai Rai Ramen	Kailua	Oneawa St	5	(808)230-8208
6557c648f019fe	Ayame Curry Rai	Kaneohe	Kaneohe Bay Dr	5	(808)236-3883

4. Querying
    a. Let's start with some simple queries with our oahuramen collection. Querying is what we call finding specific pieces of information with our data.
        i. I want to find out which ramen spots are located in Honolulu. To do this, we're going to run the following query code
            1. **db.oahuramen.find(**
                { city: "Honolulu"} //similarly as we did in the previous code, we are using the find function, but including city: "Honolulu" to look specifically for those in Honolulu

```
db.oahuramen.find(
    { city: "Honolulu"}
)
```

            2. Results:



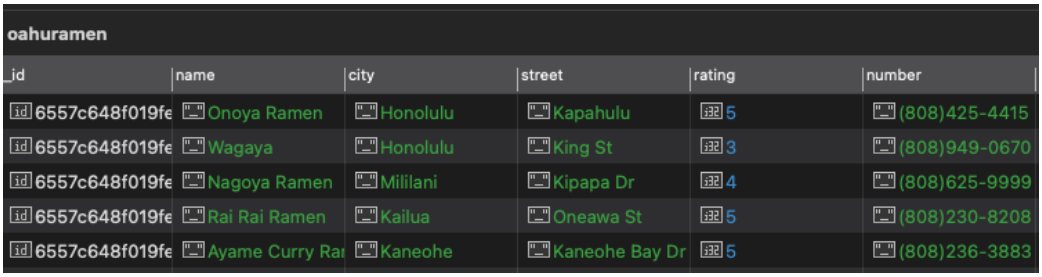
_id	name	city	street	rating	number
6557c648f019fe	Onoya Ramen	Honolulu	Kapahulu	5	(808)425-4415
6557c648f019fe	Wagaya	Honolulu	King St	4	(808)949-0670

        ii. Now, for example, I realized that I made an error and Wagaya actually has a rating of 3. Let's use the following code to update this document (in SQL, you know this as row)
            1. **db.oahuramen.updateOne(**

{ name: "Wagaya"},
{ $set: {rating: 3}}) //function is updateOne, meaning we're only updating the specific document with the name "Wagaya"; // the $set operator replaces the value of a field with what we set it to (in this case, setting the value of the *rating* field to 3

```
db.oahuramen.updateOne(
    { name: "Wagaya"},
    { $set: {rating: 3}}
)
```

2. Results (to view the results, run **db.oahuramen.find()**)



oahuramen

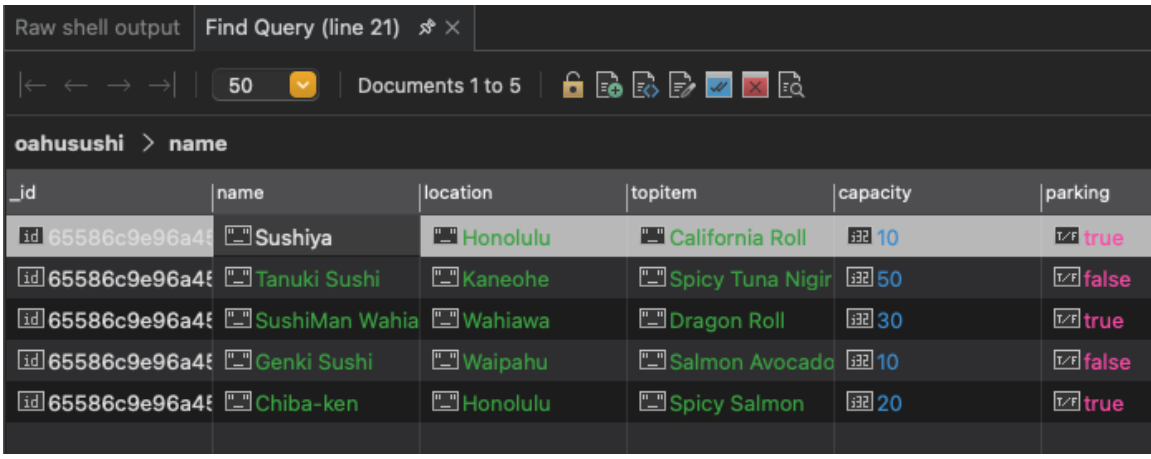
_id	name	city	street	rating	number
6557c648f019fe	Onoya Ramen	Honolulu	Kapahulu	5	(808)425-4415
6557c648f019fe	Wagaya	Honolulu	King St	3	(808)949-0670
6557c648f019fe	Nagoya Ramen	Mililani	Kipapa Dr	4	(808)625-9999
6557c648f019fe	Rai Rai Ramen	Kailua	Oneawa St	5	(808)230-8208
6557c648f019fe	Ayame Curry Rai	Kaneohe	Kaneohe Bay Dr	5	(808)236-3883

5. Tired of looking at ramen data? Let's create a collection of sushi places on Oahu.
   a. In our collection, we want to show the following 5 different fields (in SQL, you know this as columns):
      i. Name
      ii. Location
      iii. Top Item
      iv. Capacity
      v. Parking
   b. Run this code to create the collection
      i. **db.oahusushi.insertMany([**
      { name: "Sushiya", location: "Honolulu", topitem: "California Roll", capacity: 10, parking: true }, // this collection is similar to *oahuramen*;
      { name: "Tanuki Sushi", location: "Kaneohe", topitem: "Spicy Tuna Nigiri", capacity: 50, parking: false},
      { name: "SushiMan Wahiawa", location: "Wahiawa", topitem: "Dragon Roll", capacity: 30, parking: true },
      { name: "Genki Sushi", location: "Waipahu", topitem: "Salmon Avocado Roll", capacity: 10, parking: false },
      { name: "Chiba-ken", location: "Honolulu", topitem: "Spicy Salmon", capacity: 20, parking: true }
      ]) // the datatype for parking is *boolean*, meaning it can either be true or false (true meaning yes there is parking, false meaning there is no parking)

```
db.oahusushi.insertMany([
    { name: "Sushiya", location: "Honolulu", topitem: "California Roll", capacity: 10, parking: true },
    { name: "Tanuki Sushi", location: "Kaneohe", topitem: "Spicy Tuna Nigiri", capacity: 50, parking: false},
    { name: "SushiMan Wahiawa", location: "Wahiawa", topitem: "Dragon Roll", capacity:  30, parking: true },
    { name: "Genki Sushi", location: "Waipahu", topitem: "Salmon Avocado Roll", capacity: 10, parking: false },
    { name: "Chiba-ken", location: "Honolulu", topitem: "Spicy Salmon", capacity:  20, parking: true }
])

db.oahusushi.find()
```

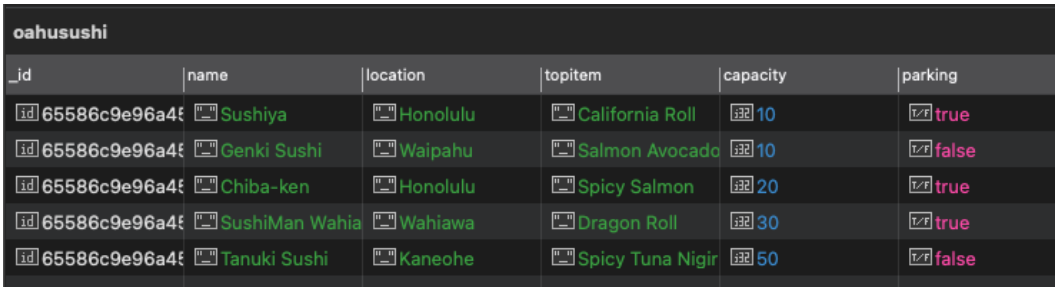
ii. Results:



6. Querying
    a. Awesome! Let's do a couple of queries with our new collection on sushi spots on Oahu.
        i. I want to see all the sushi spots based on capacity, from least to greatest. Run this code to find out:
            1. **db.oahusushi.find().sort({capacity: 1})** // find() is the method used to search all documents in this collection; // .sort({capacity:1}) is a function telling MongoDB to sort the values of *capacity* in ascending order (least to greatest)

```
db.oahusushi.find().sort({capacity: 1})
```

            2. Results



        ii. We're trying to find out which restaurants have parking. Run this code to find out:
            1. **db.oahusushi.find({parking:{$eq: true}}).pretty()** // *find* searches the collection for the conditions we put in the parentheses; // *parking* is the field we are querying, and the setting {$eq: true} is the condition we are setting - meaning we want all documents with parking that equals *true*; // pretty() is an optional method

to make the output more readable and user-friendly

```
db.oahusushi.find({parking:{$eq: true}}).pretty()
```

2. Results

oahusushi > name

id	name	location	topitem	capacity	parking
65586c9e96a4	Sushiya	Honolulu	California Roll	10	true
65586c9e96a4	SushiMan Wahia	Wahiawa	Dragon Roll	30	true
65586c9e96a4	Chiba-ken	Honolulu	Spicy Salmon	20	true

7. We're kind of hungry and want to know about the different AYCE (all you can eat) place on Oahu! Let's create a collection with this information.
    a. In our collection, we want to show the following 5 different fields (in SQL, you know this as columns):
        i. Name
        ii. Grade (food sanitation)
        iii. freshProduce
        iv. foodWarmers
        v. Timelimit
    b. Run this code to create the collection
        i. **db.oahuayce.insertMany([**
        { name: "McCully Buffet", grade: "A", freshProduce: true , foodWarmers: true, timelimit: "2 hours"},
        { name: "Pot Pot Shabu Buffet", grade: "B", freshProduce: false, foodWarmers: true, timelimit: "3 hours"},
        { name: "Kats Sushi", grade: "A", freshProduce: true, foodWarmers: false, timelimit: "2 hours"},
        { name: "Shabuya", grade: "B", freshProduce: false, foodWarmers: true, timelimit: "2.5 hours"},
        { name: "Gyu-Kaku Japanese BBQ", grade: "A", freshProduce: true, foodWarmers: false, timelimit: "3 hours"}

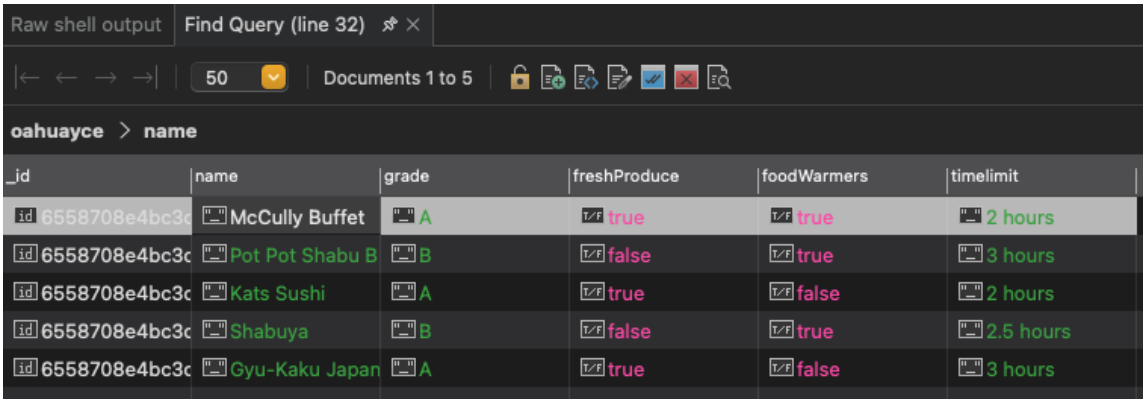
        ])

```
db.oahuayce.insertMany([
    { name: "McCully Buffet", grade: "A", freshProduce: true , foodWarmers: true, timelimit: "2 hours"},
    { name: "Pot Pot Shabu Buffet", grade: "B", freshProduce: false, foodWarmers: true, timelimit: "3 hours"},
    { name: "Kats Sushi", grade: "A", freshProduce: true, foodWarmers: false, timelimit: "2 hours"},
    { name: "Shabuya", grade: "B", freshProduce: false, foodWarmers: true, timelimit: "2.5 hours"},
    { name: "Gyu-Kaku Japanese BBQ", grade: "A", freshProduce: true, foodWarmers: false, timelimit: "3 hours"}

])

db.oahuayce.find()
```

ii. Results

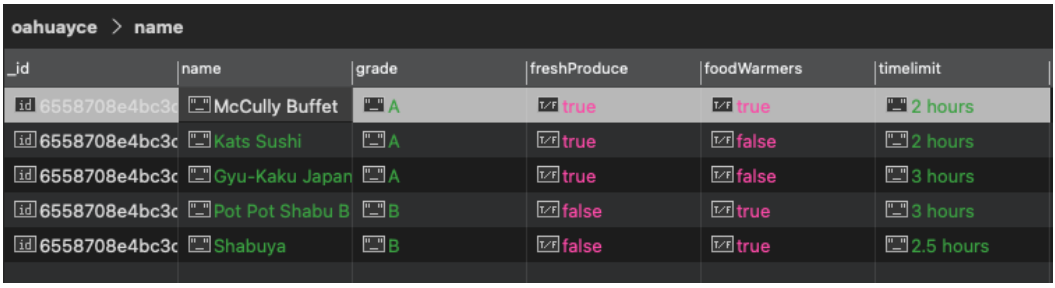


8. Querying
    a. Let's run the following query codes to view some interesting information!
        i. I want to see the first document (row) of the collection. Run the following code to find out
            1. **db.oahuayce.findOne()** `db.oahuayce.findOne()` // *findOne* is a function that searches for the first document of the collection
            2. Results

        ii. Now, let's sort our collection by Grade, starting with A so we can see it in order
            1. **db.oahuayce.find().sort({grade :1}).pretty()** //db is the current database; // oahuayce is the current collection; //find() retrieves all documents in collection; //.sort({grade: 1}) sorts the documents based on the *grade* field in ascending order; //.pretty() formats the output for readability

```
db.oahuayce.find().sort({grade :1}).pretty()
```

            2. Results



Useful Links

- What is MongoDB?: https://www.mongodb.com/docs/manual/?_ga=2.106770563.1294327503.1699472694-109957512.1699472694

- Download/Install MongoDB and connect to Studio 3t: https://studio3t.com/knowledge-base/articles/how-to-install-a-local-mongodb-on-macos/
- Explanation/Walkthrough Youtube Video: https://www.youtube.com/watch?v=MPGmnpoUEdI&list=PLRTey0Iqj9jh3WTvoupGK0aizk-Rmbz7u&index=3
- SQL to MongoDB Concept and Terminology Conversion: https://www.mongodb.com/docs/manual/reference/sql-comparison/
- How to Query using MongoDB: https://www.knowledgehut.com/blog/web-development/mongodb-query-document-using-find-with-example

Summary

The MongoDB language differs largely in comparison to MySQL, as it is a non-relational database. MongoDB uses collections of documents within its databases rather than tables with rows and columns like MySQL. Writing out code is also different among the two, MongoDB is a little less critical. For example, ";" aren't necessary. Ultimately, MongoDB is more flexible, whereas MySQL is a more structured, tabular database.

References

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MongoDB. (2023). *SQL to MongoDB Mapping Chart.* MongoDB. https://www.mongodb.com/docs/manual/reference/sql-comparison/

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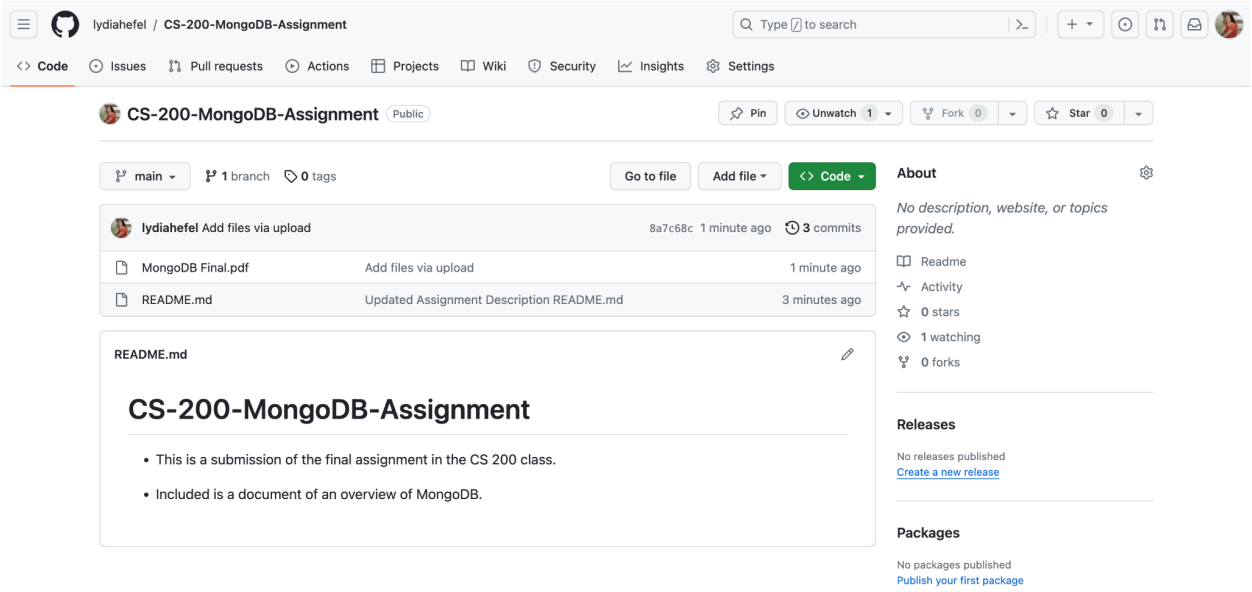
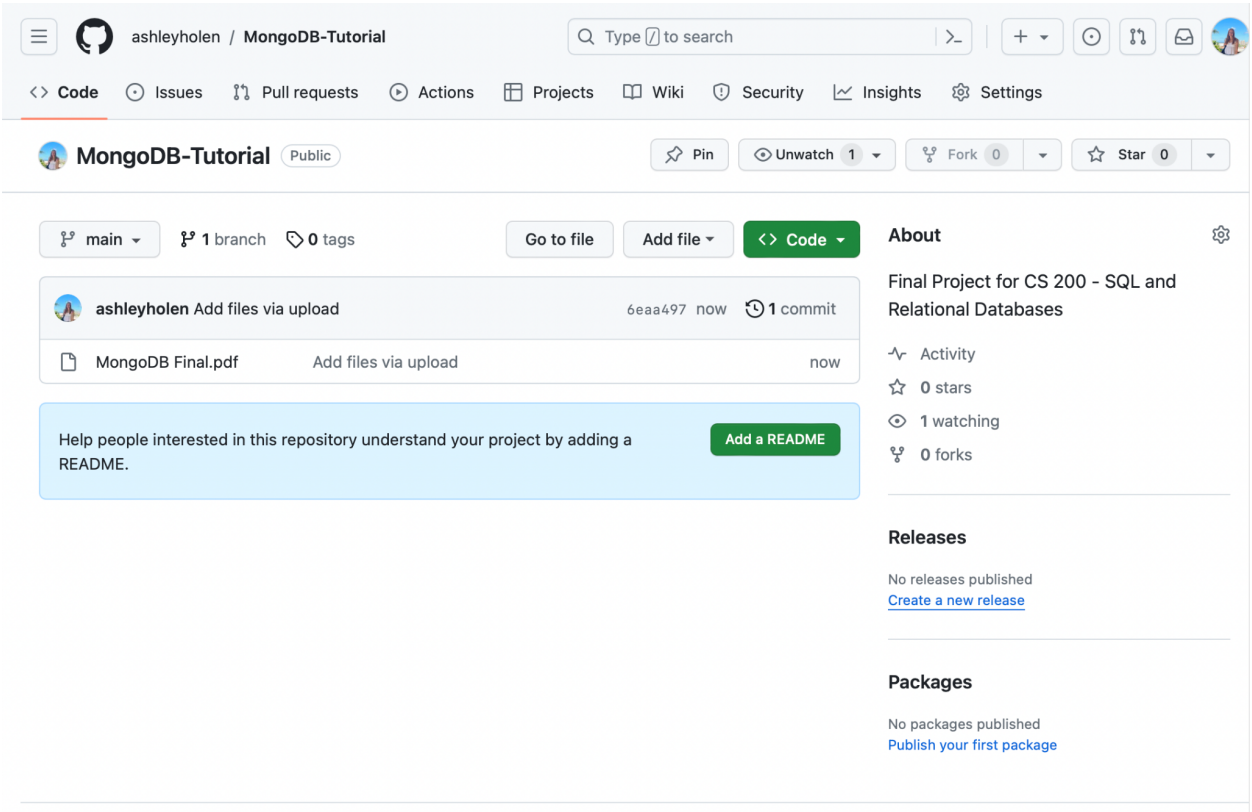
GitHub Submissions

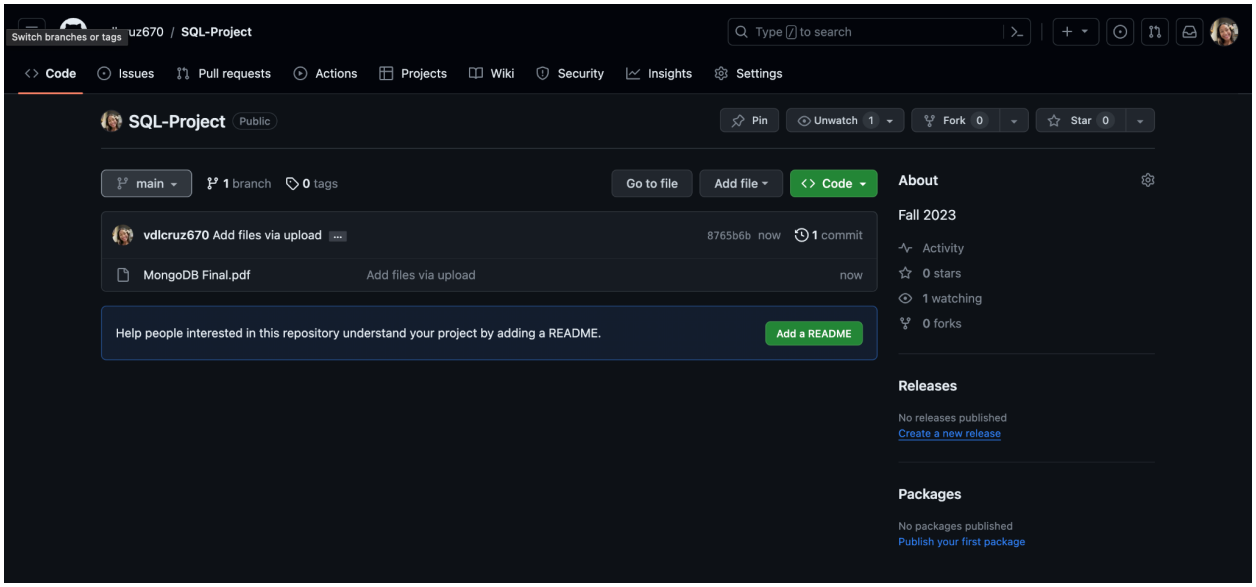
Lydia



Ashley



Victoria



Sadie