Experiment 8

Name: Asad Shaikh
Branch: MTech CE
Registration Id: 242050023

Aim: Setup the MongoDB environment in your system. Import Restaurant dataset and perform CRUD operations

Theory:

What is NoSQL?

NoSQL stands for "**Not Only SQL**" and refers to a class of database systems that provide a mechanism for storage and retrieval of data modeled in ways other than the tabular relations used in relational databases (RDBMS).

Types of NoSQL Databases:

1. **Document-oriented** (e.g., MongoDB)
2. **Key-Value stores** (e.g., Redis)
3. **Column-oriented** (e.g., Apache Cassandra)
4. **Graph-based** (e.g., Neo4j)

Key Characteristics:

- **Schema-less data models**
- **Scalable** (horizontal scaling)
- **Flexible** data representation (JSON, BSON, XML)
- **High performance** for large volumes of unstructured or semi-structured data
- Designed for **distributed computing**

What is MongoDB?

MongoDB is a high-performance, open-source, document-oriented NoSQL database that stores data in BSON (Binary JSON) format. It's known for its flexibility, scalability, and ease of use.

MongoDB Data Structure:

MongoDB stores data in the following hierarchy:

- **Database** →
- **Collections** →

- **Documents** (equivalent to rows in SQL, but schema-less)

Example of a MongoDB document (BSON/JSON-like):

```
{
  "name": "Pizza Hut",
  "address": "Regent Street City Centre",
  "food": "Italian",
  "location": [52.20103, 0.126023],
  "priceRange": "cheap"
}
```

Key Features:

- **Schema-less**: Each document can have different fields.
- **Indexing**: Supports primary, secondary, text, geospatial indexes.
- **Aggregation Framework**: Powerful querying and data processing pipeline.
- **Replication**: High availability using replica sets.
- **Sharding**: Horizontal scaling to handle large data volumes.

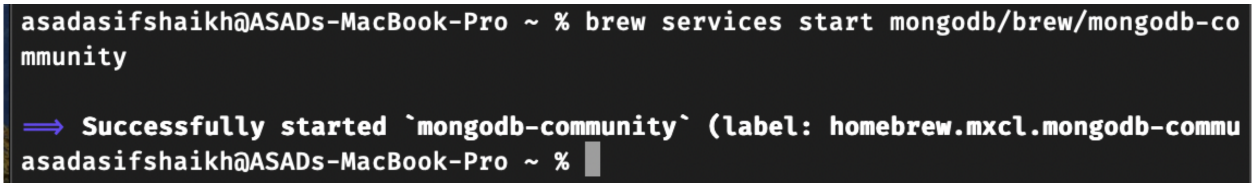
Code / Output:

Install MongoDB:

Command 1: brew tap mongodb/brew
Command 2: brew install mongodb-community@7.0

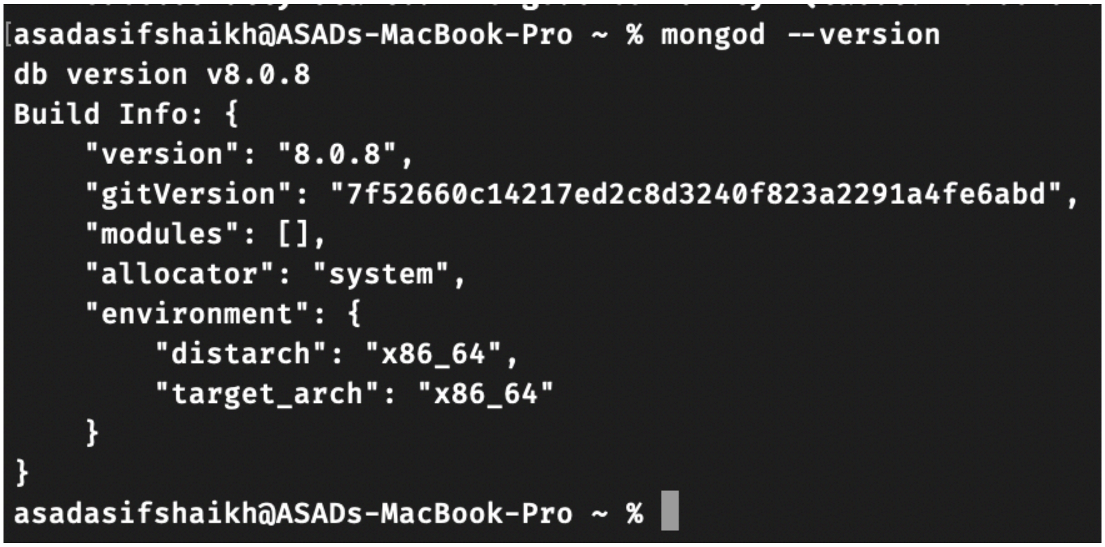
Start Services:

Command: brew services start mongodb/brew/mongodb-community



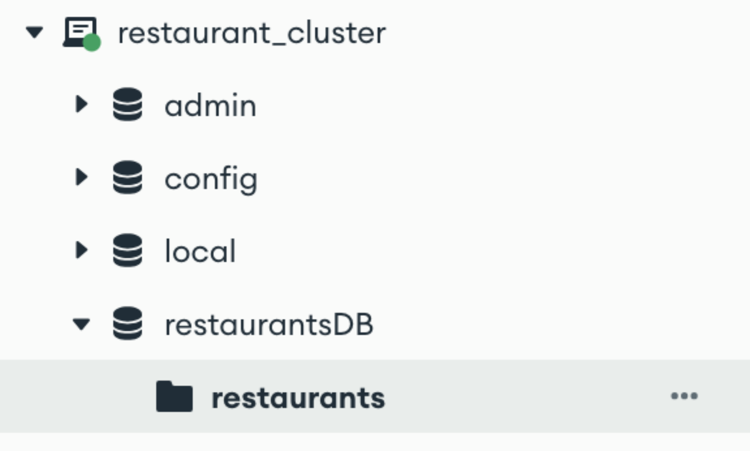
```
asadasifshaikh@ASADs-MacBook-Pro ~ % brew services start mongodb/brew/mongodb-co
mmunity

==> Successfully started `mongodb-community` (label: homebrew.mxcl.mongodb-commu
asadasifshaikh@ASADs-MacBook-Pro ~ % 
```

Check Installations:
Command: mongod --version



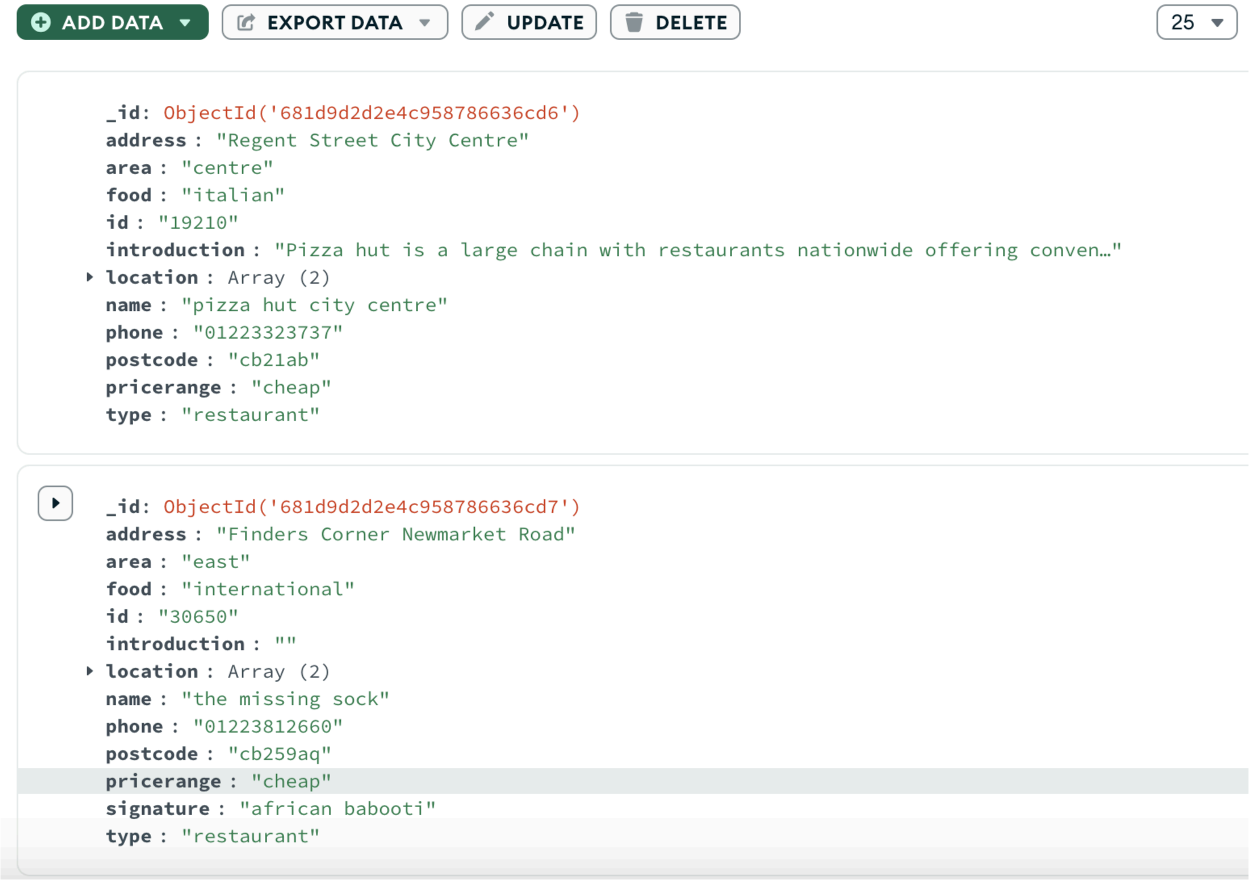
```
[asadasifshaikh@ASADs-MacBook-Pro ~ % mongod --version
db version v8.0.8
Build Info: {
    "version": "8.0.8",
    "gitVersion": "7f52660c14217ed2c8d3240f823a2291a4fe6abd",
    "modules": [],
    "allocator": "system",
    "environment": {
        "distarch": "x86_64",
        "target_arch": "x86_64"
    }
}
asadasifshaikh@ASADs-MacBook-Pro ~ %
```

In MongoDB Compass:
Create New cluster, database and a collection:



- restaurant_cluster
  - admin
  - config
  - local
  - restaurantsDB
    - **restaurants**

Importing the Data:

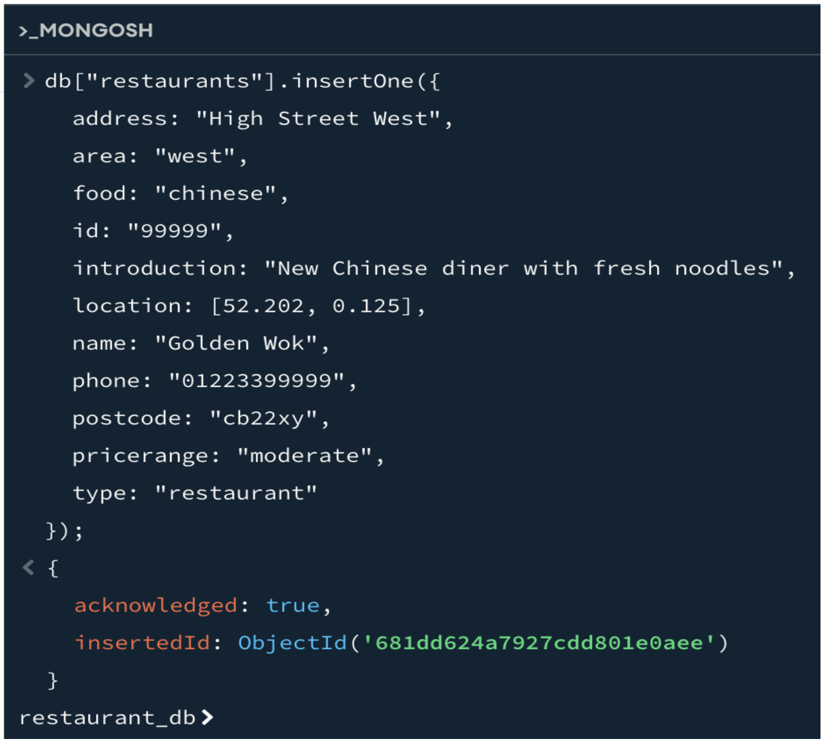


```
_id: ObjectId('681d9d2d2e4c958786636cd6')
address : "Regent Street City Centre"
area : "centre"
food : "italian"
id : "19210"
introduction : "Pizza hut is a large chain with restaurants nationwide offering conven…"
location : Array (2)
name : "pizza hut city centre"
phone : "01223323737"
postcode : "cb21ab"
pricerange : "cheap"
type : "restaurant"
```

```
_id: ObjectId('681d9d2d2e4c958786636cd7')
address : "Finders Corner Newmarket Road"
area : "east"
food : "international"
id : "30650"
introduction : ""
location : Array (2)
name : "the missing sock"
phone : "01223812660"
postcode : "cb259aq"
pricerange : "cheap"
signature : "african babooti"
type : "restaurant"
```

CRUD Operations:
Insert Document: (CREATE)

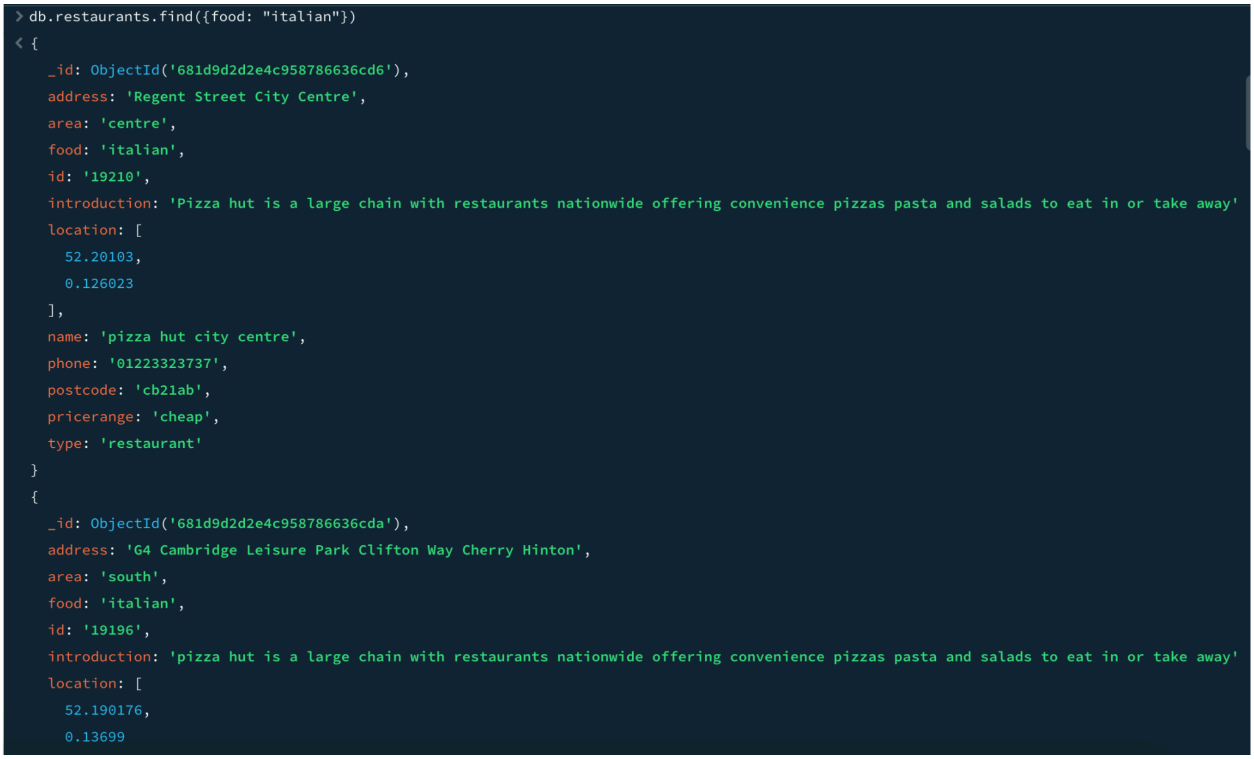
```
db.restaurants.insertOne({
  "address": "High Street West",
  "area": "west",
  "food": "chinese",
  "id": "99999",
  "introduction": "New Chinese diner with fresh noodles",
  "location": [52.202, 0.125],
  "name": "Golden Wok",
  "phone": "01223399999",
  "postcode": "cb22xy",
  "pricerange": "moderate",
  "type": "restaurant"
});
```



```
> db["restaurants"].insertOne({
    address: "High Street West",
    area: "west",
    food: "chinese",
    id: "99999",
    introduction: "New Chinese diner with fresh noodles",
    location: [52.202, 0.125],
    name: "Golden Wok",
    phone: "01223399999",
    postcode: "cb22xy",
    pricerange: "moderate",
    type: "restaurant"
  });
< {
    acknowledged: true,
    insertedId: ObjectId('681dd624a7927cdd801e0aee')
  }
restaurant_db >
```

Find Document: (READ)

db.restaurants.find({food: "italian"})

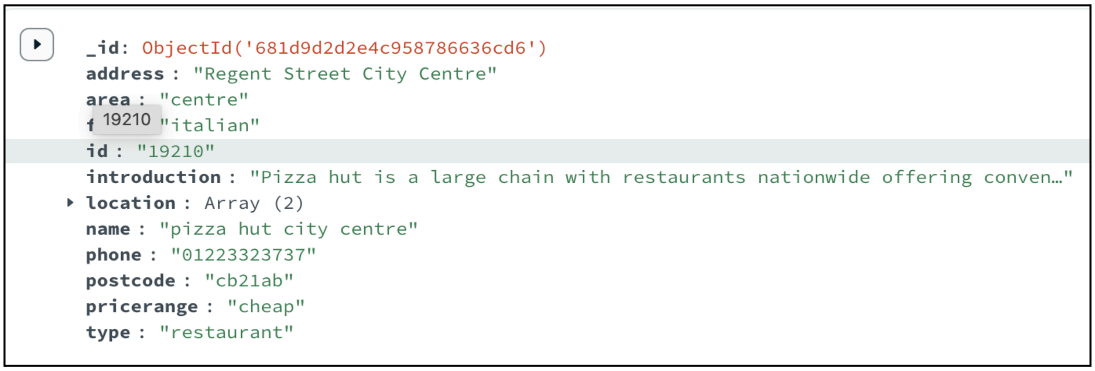


```
> db.restaurants.find({food: "italian"})
< {
    _id: ObjectId('681d9d2d2e4c958786636cd6'),
    address: 'Regent Street City Centre',
    area: 'centre',
    food: 'italian',
    id: '19210',
    introduction: 'Pizza hut is a large chain with restaurants nationwide offering convenience pizzas pasta and salads to eat in or take away'
    location: [
      52.20103,
      0.126023
    ],
    name: 'pizza hut city centre',
    phone: '01223323737',
    postcode: 'cb21ab',
    pricerange: 'cheap',
    type: 'restaurant'
  }
  {
    _id: ObjectId('681d9d2d2e4c958786636cda'),
    address: 'G4 Cambridge Leisure Park Clifton Way Cherry Hinton',
    area: 'south',
    food: 'italian',
    id: '19196',
    introduction: 'pizza hut is a large chain with restaurants nationwide offering convenience pizzas pasta and salads to eat in or take away'
    location: [
      52.190176,
      0.13699
```

Update Document: (UPDATE)

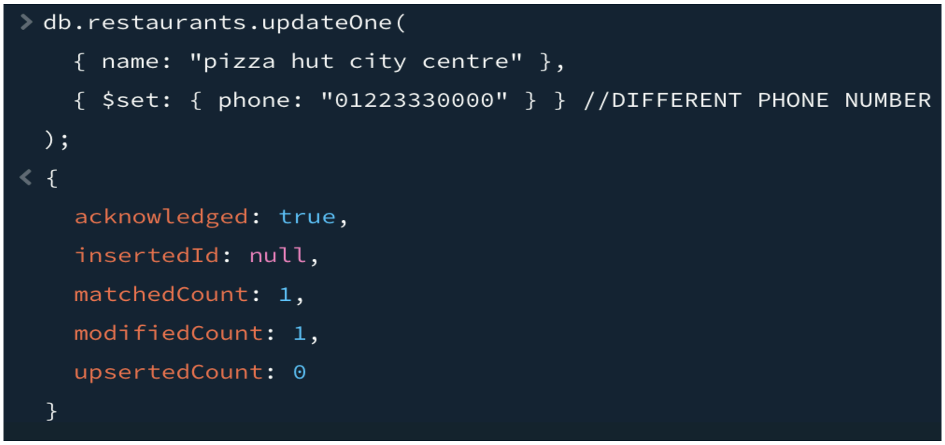
```
db.restaurants.updateOne(
  { name: "pizza hut city centre" },
  { $set: { phone: "01223330000" } } //DIFFERENT PHONE NUMBER
);
```

Before:



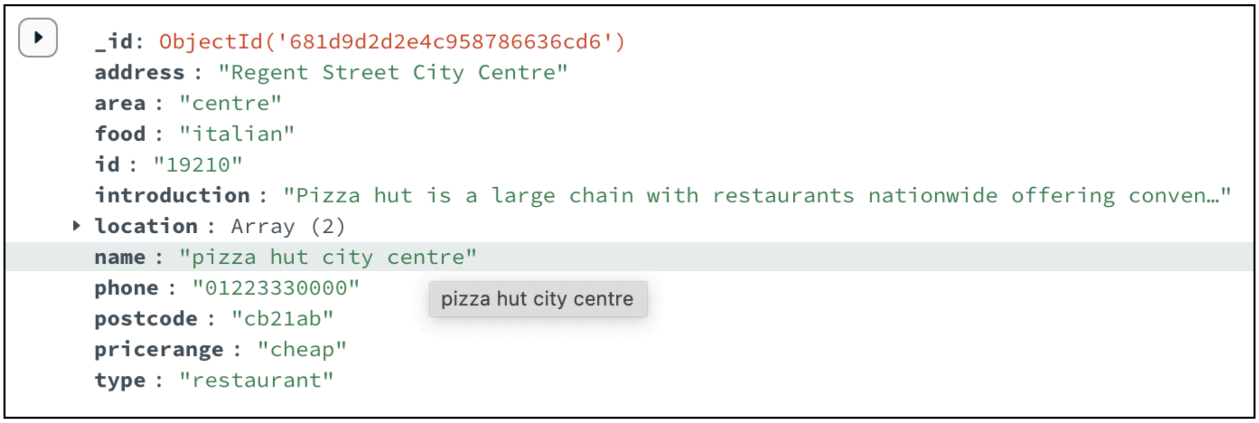
```
_id: ObjectId('681d9d2d2e4c958786636cd6')
address : "Regent Street City Centre"
area : "centre"
f 19210 "italian"
id : "19210"
introduction : "Pizza hut is a large chain with restaurants nationwide offering conven…"
location : Array (2)
name : "pizza hut city centre"
phone : "01223323737"
postcode : "cb21ab"
pricerange : "cheap"
type : "restaurant"
```

Update:



```
> db.restaurants.updateOne(
    { name: "pizza hut city centre" },
    { $set: { phone: "01223330000" } } //DIFFERENT PHONE NUMBER
  );
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0
  }
```

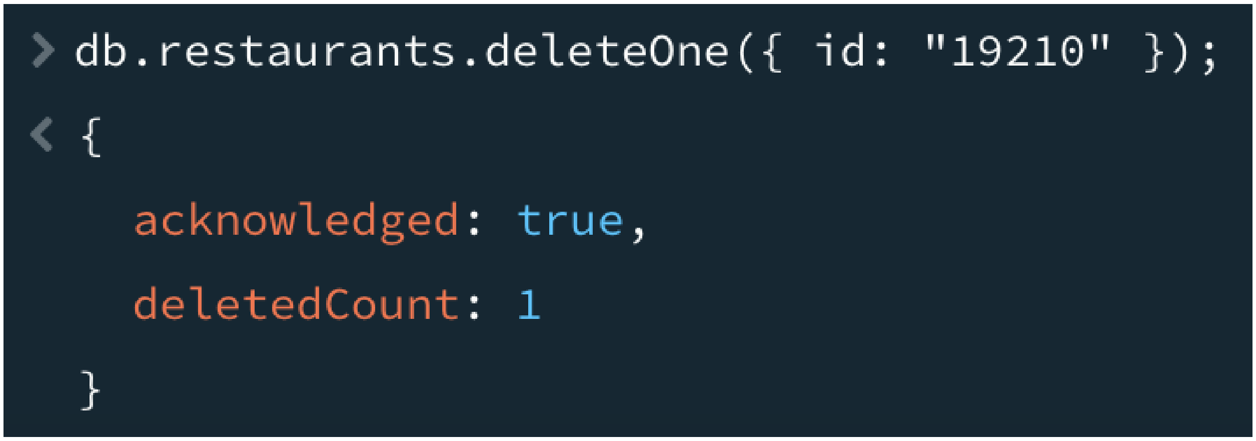
After:



```
_id: ObjectId('681d9d2d2e4c958786636cd6')
address : "Regent Street City Centre"
area : "centre"
food : "italian"
id : "19210"
introduction : "Pizza hut is a large chain with restaurants nationwide offering conven…"
location : Array (2)
name : "pizza hut city centre"
phone : "01223330000"        pizza hut city centre
postcode : "cb21ab"
pricerange : "cheap"
type : "restaurant"
```

Delete Document: (DELETE)

db.restaurants.deleteOne({ id: "19210" });



```
> db.restaurants.deleteOne({ id: "19210" });
< {
    acknowledged: true,
    deletedCount: 1
  }
```

Conclusion:

In this experiment, we learnt about NoSQL, MongoDB and its environment. We saw how to setup MongoDB in our system and how we can perform the CRUD operations in it. We also learnt about the advantages and disadvantages that come with using MongoDB and NoSQL.