

Отчет

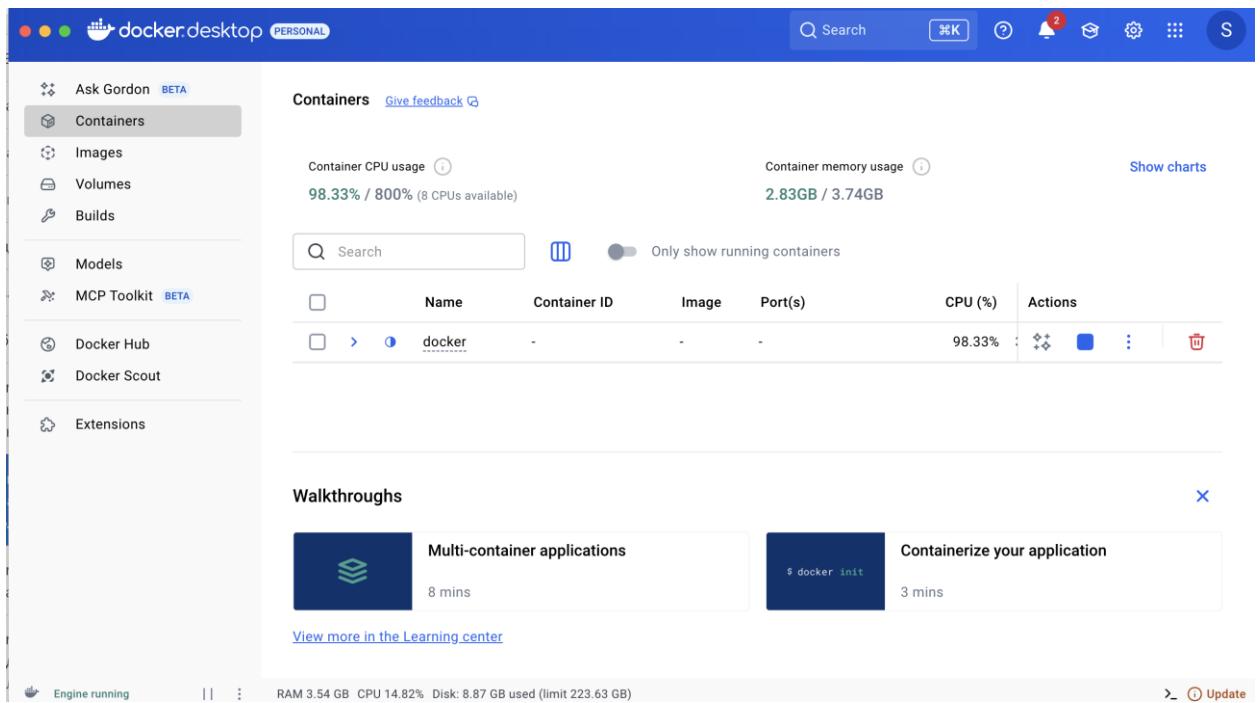
Лабораторная работа 2.1. Изучение методов хранения данных на основе NoSQL

Цель работы: освоить принципы хранения и обработки данных в различных типах NoSQL систем — документо-ориентированных (MongoDB), графовых (Neo4j) и ключ-значение (Redis). В ходе выполнения работы необходимо научиться создавать и наполнять базы данных, выполнять запросы и анализировать результаты, что позволит закрепить навыки работы с нереляционными моделями данных и понять их особенности.

Описание процесса выполнения

Установка

Установила докер и проверила успешность его установки через терминал



Клонировала данный в задании репозиторий

```

(base) sofia@MacBook-Air-2 ~ % cd ~
(base) sofia@MacBook-Air-2 ~ % git clone https://github.com/BosenkoTM/nosql-workshop.git
Cloning into 'nosql-workshop'...
remote: Enumerating objects: 2483, done.
remote: Counting objects: 100% (225/225), done.
remote: Compressing objects: 100% (200/200), done.
remote: Total 2483 (delta 105), reused 5 (delta 5), pack-reused 2258 (from 3)
Receiving objects: 100% (2483/2483), 177.45 MiB | 7.21 MiB/s, done.
Resolving deltas: 100% (420/420), done.
Updating files: 100% (1407/1407), done.
(base) sofia@MacBook-Air-2 ~ %

```

Перешла в нужный каталог, подняла контейнеры и проверила

```

(base) sofia@MacBook-Air-2 ~ % cd ~/nosql-workshop/01-environment/docker
(base) sofia@MacBook-Air-2 docker % docker compose up -d
[+] Running 75/75
  ✓ neo4j-1 Pulled
  ✓ cassandra-1 Pulled
  ✓ redis-1 Pulled
  ✓ mongo-1 Pulled
  ✓ mongo-1 Pulled
  ✓ admin-mongo Pulled
  ✓ redis-commander Pulled
  ✓ cassandra-web Pulled
  ✓ jupyter Pulled
neo4j-1          Started      211.4s
cassandra-1     Started      154.4s
redis-1          Started      71.6s
mongo-1          Started      123.9s
mongo-1          Started      139.5s
admin-mongo      Started      155.8s
redis-commander Started      20.1s
cassandra-web   Started      186.7s
jupyter          Started      266.4s

```

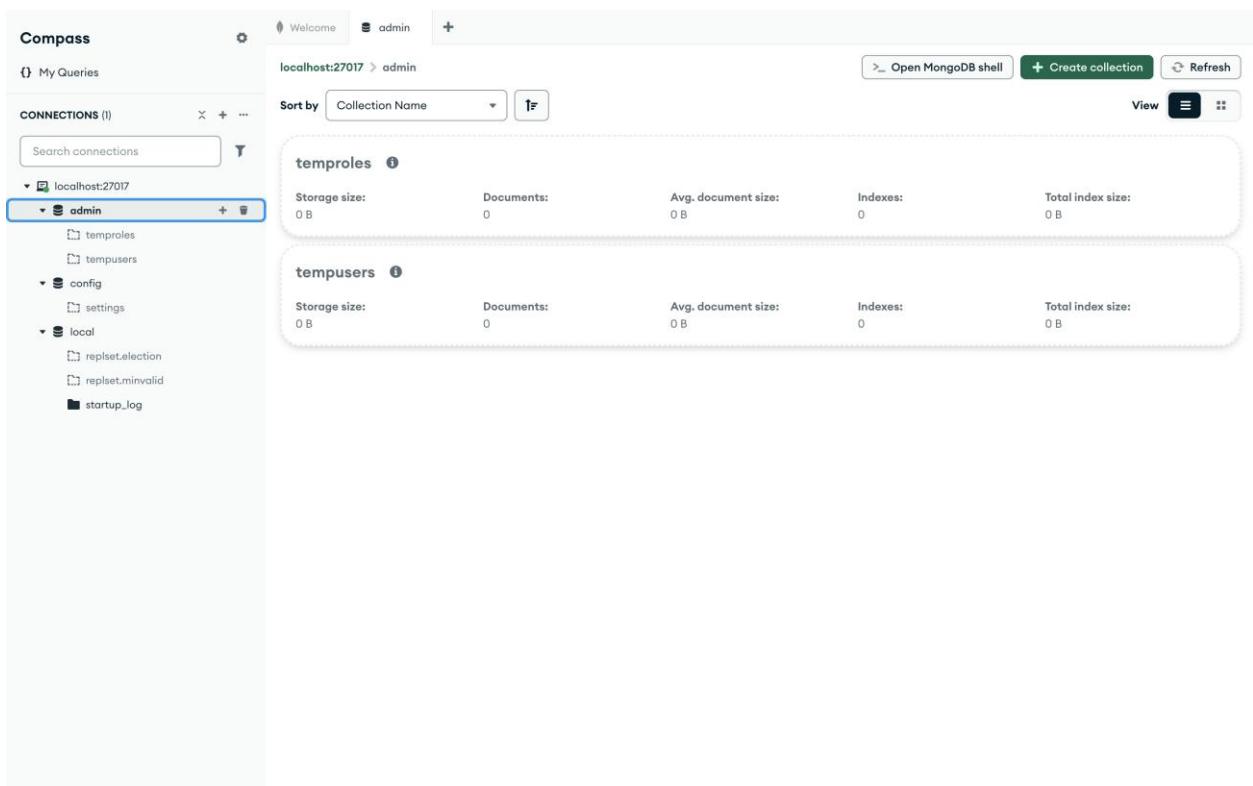
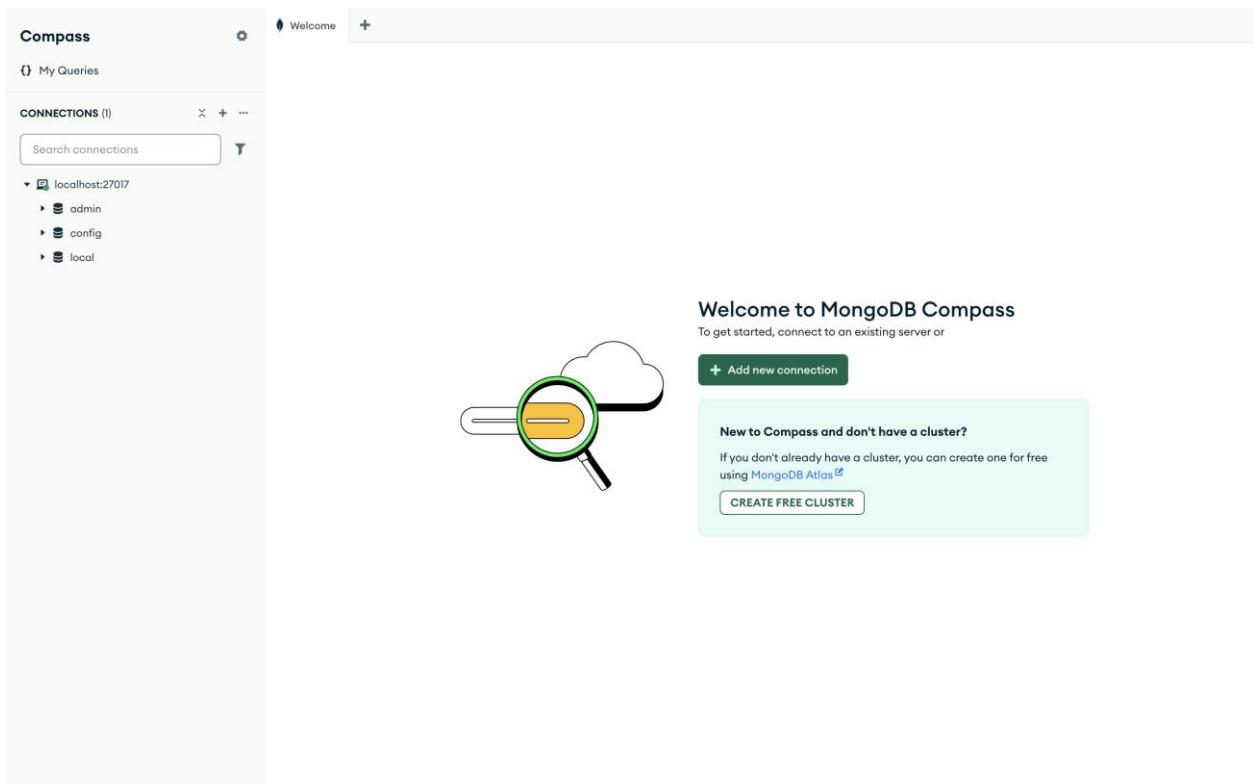
```

[+] Running 10/10
  ✓ Network nosql-platform  Created      0.0s
  ✓ Container redis-commander Started      1.0s
  ✓ Container admin-mongo    Started      1.4s
  ✓ Container mongo-express Started      1.1s
  ✓ Container cassandra-web Started      1.1s
  ✓ Container mongo-1       Started      1.2s
  ✓ Container cassandra-1   Started      1.3s
  ✓ Container jupyter       Started      1.6s
  ✓ Container neo4j-1        Started      1.0s
neo4j-1          Started      1.0s
cassandra-1     Started      1.4s
redis-commander Started      1.0s
mongo-express    Started      1.0s
cassandra-web   Started      1.0s
jupyter          Started      1.0s
neo4j-1          Started      1.0s
(base) sofia@MacBook-Air-2 docker %

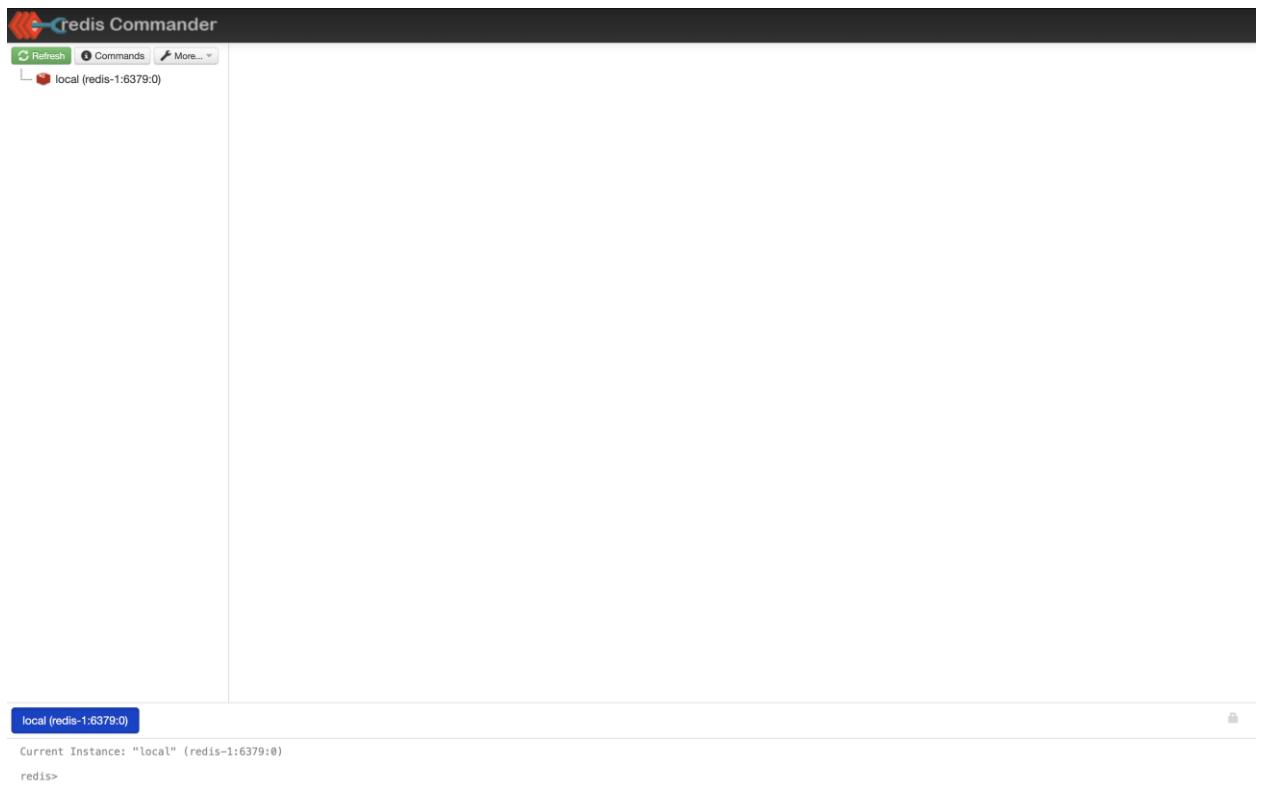
```

| CONTAINER ID | IMAGE | COMMAND | CREATED | STATUS | PORTS | |
|-----------------|-------------------------------------|---------------------------------------|--------------------------|------------------------|--|--|
| NAMES | | | | | | |
| 73fc1e6a519c | jupyter/minimal-notebook:latest | "tini -g -- bash -c -" | 7 minutes ago | Up 7 minutes (healthy) | 0.0.0.0:14840->4040/tcp, [::]:14840->4040/tcp, 0.0.0.0:14841->4041/tcp, [::]:14841->4041/tcp, 0.0.0.0:14842->4042/tcp, [::]:14842->4042/tcp, 0.0.0.0:14843->4043/tcp, [::]:14843->4043/tcp, 0.0.0.0:14844->4044/tcp, [::]:14844->4044/tcp, 0.0.0.0:28888->8888/tcp, [::]:28888->8888/tcp | |
| cf_jupyter | f8409a44304f | neo4j:5.19 | "tini -g -- /startup..." | 7 minutes ago | Up 7 minutes (healthy) | |
| 7687-7687/tcp | neo4j-1 | | | | 0.0.0.0:7474->7474/tcp, [::]:7474->7474/tcp, 0.0.0.0:7687->7687/tcp, [::]:7687->7687/tcp | |
| 9e811b3974e4 | mongo:7.0 | "docker-entrypoint.s..." | 7 minutes ago | Up 7 minutes | 0.0.0.0:27017->27017/tcp, [::]:27017->27017/tcp | |
| mongo-1 | 32f2d48de1be | mongo-express:latest | "/sbin/tini -- /dock..." | 7 minutes ago | Up 7 minutes | 0.0.0.0:28203->8081/tcp, [::]:28203->8081/tcp |
| mongo-express | 4f1fce681e1df | bitnami/cassandra:4.1 | "/opt/bitnami/script..." | 7 minutes ago | Up 7 minutes | 0.0.0.0:7199->7199/tcp, [::]:7199->7199/tcp, 0.0.0.0:9160->9160/tcp, [::]:9160->9160/tcp |
| 9160->9160/tcp | 56ca08d57fc4 | cassandra-1 | "/opt/bitnami/script..." | 7 minutes ago | Up 7 minutes (healthy) | 0.0.0.0:6379->6379/tcp, [::]:6379->6379/tcp |
| redis-1 | 9133b0b08ae5 | adicom/admin-mongo:latest | "node app.js" | 7 minutes ago | Up 7 minutes | 0.0.0.0:28204->1234/tcp, [::]:28204->1234/tcp |
| admin-mongo | 9c2fed2ababd5 | rediscommander/redis-commander:latest | "/usr/bin/dumb-init ..." | 7 minutes ago | Up 7 minutes (unhealthy) | 0.0.0.0:28119->8081/tcp, [::]:28119->8081/tcp |
| redis-commander | d876694a6462 | trivadis/cassandra-web | "/entrypoint.sh" | 7 minutes ago | Restarting (139) 22 seconds ago | |
| cassandra-web | (base) sofia@MacBook-Air-2 docker % | | | | | |

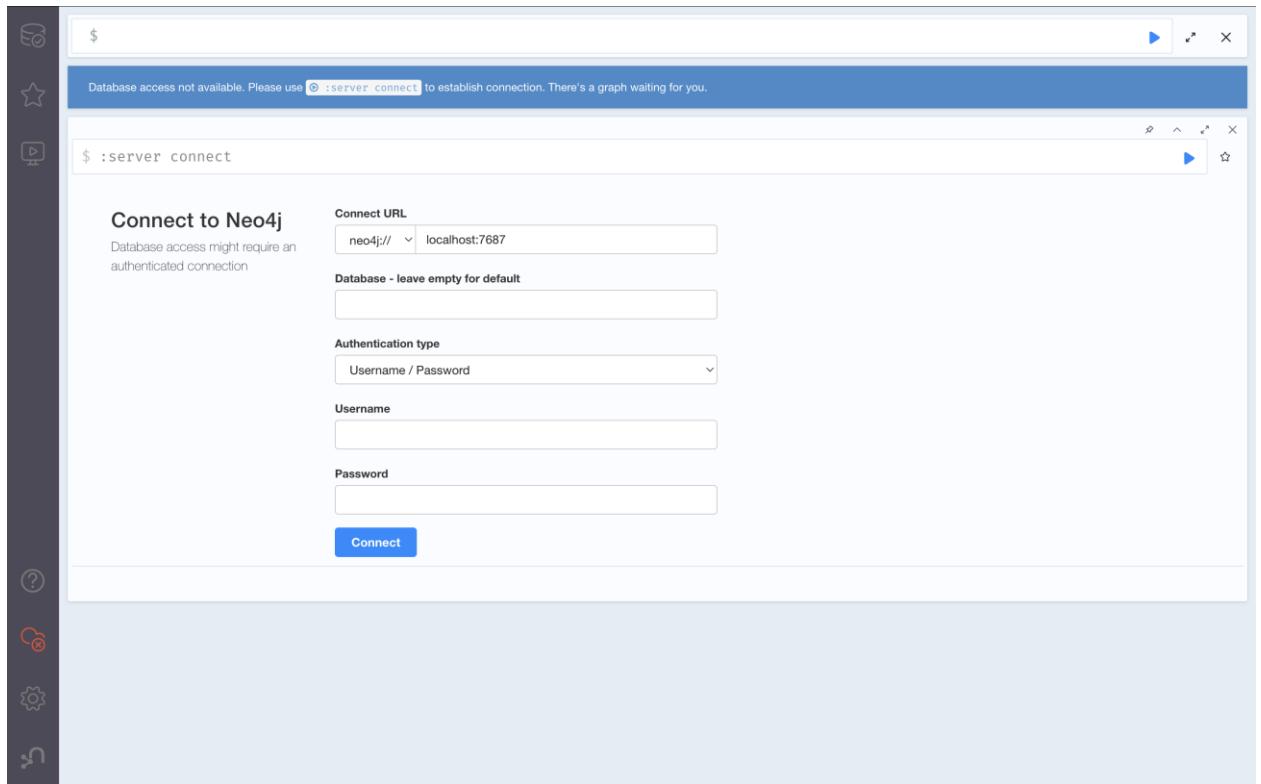
Установила MongoDB Compass и создала подключение

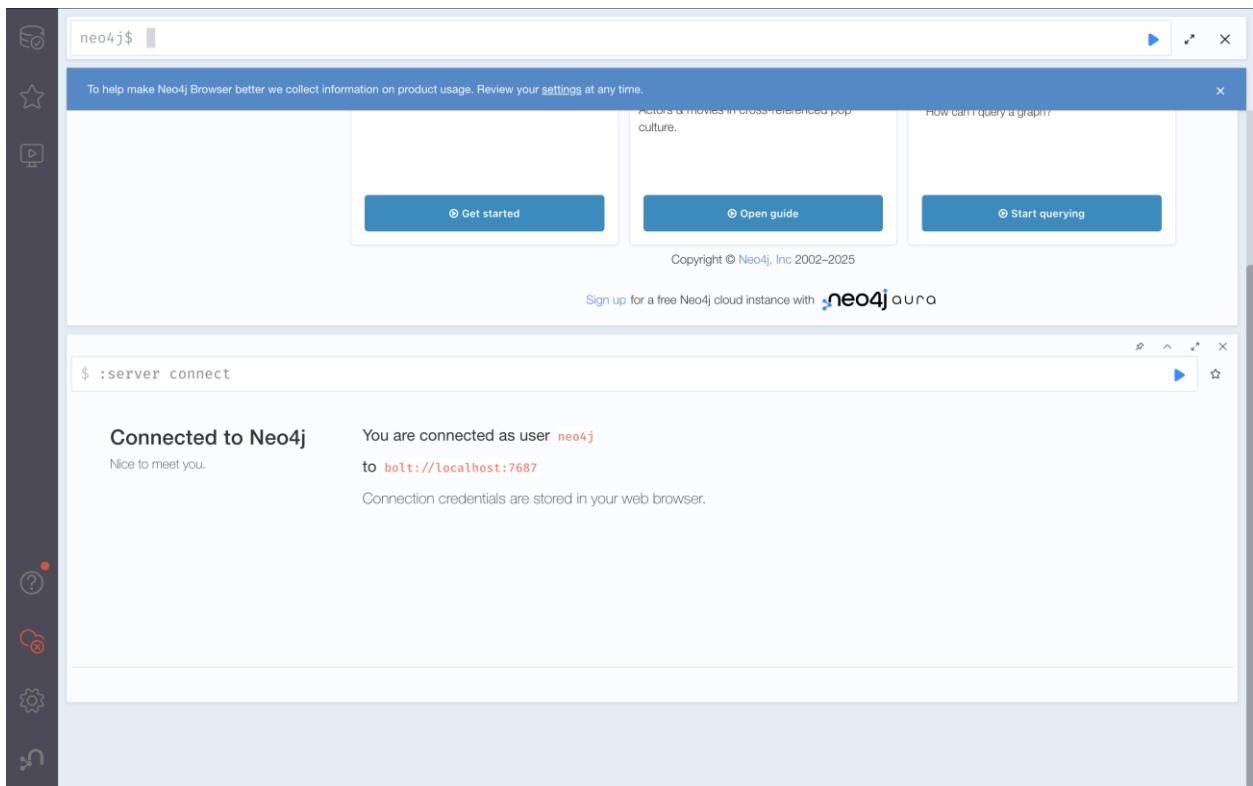


Открыла в браузере Redis Commander с помощью ссылки <http://localhost:8082>



Открыла в браузере Neo4j с помощью ссылки <http://localhost:7474>, создала соединение





Установила необходимые библиотеки питон

```
(base) sofia@MacBook-Air-2 docker % conda activate nosql_lab
pip install pymongo redis neo4j
```

```
EnvironmentNameNotFound: Could not find conda environment: nosql_lab
You can list all discoverable environments with `conda info --envs`.
```

```
Collecting pymongo
  Downloading pymongo-4.14.1-cp311-cp311-macosx_11_0_arm64.whl.metadata (22 kB)
Collecting redis
  Downloading redis-6.4.0-py3-none-any.whl.metadata (10 kB)
Collecting neo4j
  Downloading neo4j-5.28.2-py3-none-any.whl.metadata (5.9 kB)
Collecting dnsPYTHON<3.0.0,>=1.16.0 (from pymongo)
  Downloading dnsPYTHON-2.7.0-py3-none-any.whl.metadata (5.8 kB)
Requirement already satisfied: pytz in /opt/anaconda3/lib/python3.11/site-packages (from neo4j) (2023.3.post1)
Downloading pymongo-4.14.1-cp311-cp311-macosx_11_0_arm64.whl (859 kB)
   859.7/859.7 kB 3.1 MB/s eta 0:00:00
Downloading redis-6.4.0-py3-none-any.whl (279 kB)
   279.8/279.8 kB 12.2 MB/s eta 0:00:00
Downloading neo4j-5.28.2-py3-none-any.whl (313 kB)
   313.2/313.2 kB 12.1 MB/s eta 0:00:00
Downloading dnsPYTHON-2.7.0-py3-none-any.whl (313 kB)
   313.6/313.6 kB 11.4 MB/s eta 0:00:00
Installing collected packages: redis, neo4j, dnsPYTHON, pymongo
Successfully installed dnsPYTHON-2.7.0 neo4j-5.28.2 pymongo-4.14.1 redis-6.4.0
(base) sofia@MacBook-Air-2 docker %
```

Подключение на питоне

Работа с MongoDB через pymongo

Скопировала и выполнила код, данный в задании, в ячейке Jupyter. Он демонстрирует полный цикл CRUD-операций: подключение, создание данных, чтение, обновление и удаление.

The screenshot shows a Jupyter Notebook interface with a single code cell labeled [1]. The code performs the following steps:

- Establishes a connection to MongoDB using the URI `mongo_uri = "mongodb://root:abc123@localhost:27017/"`.
- Creates a database named `"student"` and a collection named `"test_labs"`.
- Tries to connect to MongoDB using `MongoClient(mongo_uri)` and prints a success message if `ping()` returns successfully.
- Selects the `"student"` database and the `"test_labs"` collection.
- Deletes all documents in the collection using `collection.delete_many({})`.
- Inserts three test documents into the collection:

| Lab Name | Subject | Score |
|----------|-----------|-------|
| Lab 1 | Physics | 85 |
| Lab 2 | Chemistry | 90 |
| Lab 3 | Biology | 88 |

- Prints the number of inserted documents.
- Reads all documents from the collection and prints them.
- Updates a document in the collection where `subject: "Physics"` to have a score of 95.
- Prints the updated document.
- Deletes a document from the collection where `subject: "Chemistry"`.
- Prints the number of documents remaining after deletion.

At the bottom, the status bar shows "Mode: Command" and "Ln 1, Col 1 ЛБ_1.ipynb 1".

The screenshot shows the execution results of the code in the previous screenshot. The output includes:

- Confirmation of successful connection: "Подключение к MongoDB установлено успешно!"
- Count of inserted documents: "Вставлено документов: 3"
- Content of the collection: "Содержимое коллекции:" followed by the three inserted documents.
- Confirmation of update: "Документ после обновления:" followed by the updated document with a score of 95.
- Confirmation of deletion: "Количество документов после удаления: (collection.count_documents({}))"
- Confirmation of collection drop: "Коллекция 'test_labs' удалена."
- Exception handling: "Ошибка: (e)"
- Final confirmation of connection closure: "Подключение к MongoDB закрыто."

At the bottom, the status bar shows "Mode: Command" and "Ln 1, Col 1 ЛБ_1.ipynb 1".

Работа с Redis через redis-py

Следующий код демонстрирует работу с основными типами данных в Redis. Выполнила его в новой ячейке Jupyter.

```
File Edit View Run Kernel Tabs Settings Help
ЛБ_1.ipynb + +
[2]: import redis

try:
    # 1. Подключение к Redis (корректные параметры для VM)
    r = redis.Redis(host='localhost', port=6379, db=0, decode_responses=True)
    r.ping()
    print("Соединение с Redis успешно установлено.")

    # 2. Работа со строками (String)
    r.set('user1:name', 'Alice')
    user_name = r.get('user1:name')
    print(f"\nСтрока: user1:name = {user_name}")

    # 3. Работа с хешами (Hash) – для хранения объектов
    r.hset('user2', mapping={'name': 'Bob', 'email': 'bob@example.com'})
    user_info = r.hgetall('user2')
    print(f"\nХеш: user2 = {user_info}")

    # 4. Работа со списками (List) – для очередей, логов
    r.lpush('tasks', 'task1', 'task2', 'task3')
    tasks = r.lrange('tasks', 0, -1)
    print(f"\nСписок: tasks = {tasks}")

    # 5. Работа с множествами (Set) – для уникальных элементов
    r.sadd('online_users', 'user_a', 'user_b', 'user_c', 'user_a')
    online_count = r.scard('online_users')
    print(f"\nМножество: {r.smembers('online_users')}, количество онлайн: {online_count}")

    # 6. Очистка созданных ключей
    keys_to_delete = ['user1:name', 'user2', 'tasks', 'online_users']
    r.delete(*keys_to_delete)
    print(f"\nТестовые ключи удалены.")

except redis.ConnectionError as e:
    print(f"Ошибка подключения к Redis: {e}")

Соединение с Redis успешно установлено.

Строка: user1:name = Alice
Хеш: user2 = {'name': 'Bob', 'email': 'bob@example.com'}
Список: tasks = ['task3', 'task2', 'task1']
Множество: {'user_c', 'user_b', 'user_a'}, количество онлайн: 3
```

Работа с Neo4j через neo4j-driver

Данный код показывает, как выполнить Cypher-запрос к базе данных Neo4j и обработать результаты.

The screenshot shows a Jupyter Notebook interface with a single code cell containing Python code. The code uses the Py2neo library to connect to a Neo4j database and execute a Cypher query to retrieve movie titles. A red box highlights a warning message from the Neo4j server about missing labels in the query.

```
# 1. Задайте параметры подключения (корректные для VM)
uri = "bolt://localhost:7687"
user = "neo4j"
password = "abc123abc123" # <<< МИНИМАЛЬНОЕ изменение: твой пароль из docker inspect

def get_movies(tx, movie_limit):
    # 2. Cypher-запрос для получения названий фильмов
    query = """
    MATCH (m:Movie)
    RETURN m.title AS title
    LIMIT $limit
    """
    result = tx.run(query, limit=movie_limit)

    # 3. Извлечение данных из результата
    return [record["title"] for record in result]

try:
    # 4. Создание сессии и выполнение транзакции
    with GraphDatabase.driver(uri, auth=(user, password)) as driver:
        with driver.session() as session:
            movies = session.read_transaction(get_movies, 5) # Получаем 5 фильмов
            print("Подключение к Neo4j успешно.")
            print("5 фильмов из базы данных:")
            for movie in movies:
                print(f"- {movie}")

except Exception as e:
    print(f"Ошибка при работе с Neo4j: {e}")

/var/folders/wf/q9h5vr9x74g6d9d5q68_1m4m0000gn/T/ipykernel_93477/2640146855.py:24: DeprecationWarning: read_transaction has been renamed to execute_read
    movies = session.read_transaction(get_movies, 5) # Получаем 5 фильмов
Received notification from DBMS server: {severity: WARNING} {code: Neo.ClientNotification.Statement.UnknownLabelWarning} {category: UNRECOGNIZED} {title: The provided label is not in the database.} {description: One of the labels in your query is not available in the database, make sure you didn't misspell it or that the label is available when you run this statement in your application (the missing label name is: Movie)} {position: line: 2, column: 10, offset: 14} for query: '\n    MATCH (m:Movie)\n    RETURN m.title AS title\n    LIMIT $limit\n'
Received notification from DBMS server: {severity: WARNING} {code: Neo.ClientNotification.Statement.UnknownPropertyKeyWarning} {category: UNRECOGNIZED} {title: The provided property key is not in the database.} {description: One of the property names in your query is not available in the database, make sure you didn't misspell it or that the label is available when you run this statement in your application (the missing property name is: title)} {position: line: 3, column: 18, offset: 34} for query: '\n    MATCH (m:Movie)\n    RETURN m.title AS title\n    LIMIT $limit\n'
Подключение к Neo4j успешно.
5 фильмов из базы данных:
```

В результате код выдал предупреждение о том, что в базе Neo4j нет узлов с меткой Movie. Код выполняется, но возвращать нечего, поэтому список фильмов пустой.

Работа с MongoDB

Загрузка данных

Загрузила данные в монго (взяты с гитхаба)

Коллекция фильмов

Compass

Welcome +

CONNECTIONS ()

Search connections

- localhost:27017
 - admin
 - config
 - local

Create Database

Database Name: filmdb

Collection Name: movies

Time-Series
Time-series collections efficiently store sequences of measurements over a period of time. [Learn More](#)

Additional preferences (e.g. Custom collation, Clustered collections)

Cancel Create Database

DB Compass

Compass is ready to update to 1.46.9! RESTART

Compass

Welcome movies +

localhost:27017 > Collection movies

Documents Type

ADD DATA

Insert Document

To collection filmdb.movies

```

1  [
2   {
3     "id": "0110912",
4     "title": "Pulp Fiction",
5     "year": 1994,
6     "runtime": 154,
7     "languages": ["en", "es", "fr"],
8     "rating": 8.9,
9     "votes": 2084331,
10    "genres": ["Crime", "Drama"],
11    "plotOutline": "Jules Winnfield (Samuel L. Jackson) and",
12    "coverUrl": "https://m.media-amazon.com/images/M/MV5BNG",
13    "actors": [
14      {
15        "actorID": "0000619", "name": "Tim Roth"
16      },
17      {
18        "actorID": "0001625", "name": "Amanda Plummer"
19      },
20      {
21        "actorID": "0522503", "name": "Laura Lovelace"
22      },
23      {
24        "actorID": "0000237", "name": "John Travolta"
25      },
26      {
27        "actorID": "0000168", "name": "Samuel L. Jackson"
28      },
29      {
30        "actorID": "0482851", "name": "Phil LaMarr"
31      },
32      {
33        "actorID": "0001844", "name": "Frank Whaley"
34      },
35      {
36        "actorID": "0824882", "name": "Burr Steers"
37      },
38      {
39        "actorID": "0000246", "name": "Bruce Willis"
39      },
40      {
41        "actorID": "0000609", "name": "Ving Rhames"
41      },
42      {
43        "actorID": "0000235", "name": "Uma Thurman"
43      },
44      {
45        "actorID": "0000233", "name": "Quentin Tarantino"
45      }
46    ],
47    "directors": [
48      {
49        "directorID": "0000233", "name": "Quentin Tarantino"
50      }
51    ],
52    "producers": [
53      {
54        "producerID": "0004744", "name": "Lawrence Bender"
55      },
56      {
57        "producerID": "0000362", "name": "Danny DeVito"
58      },
59      {
60        "producerID": "0321621", "name": "Richard N. Glad"
61      },
62      {
63        "producerID": "0787834", "name": "Michael Shamber"
63      }
64    ]
65  ]
66
```

VIEW

Explain Reset Find Options ▾

25 0 - 0 of 0

Cancel Insert

Compass is ready to update to 1.46.9! RESTART

The screenshot shows the Compass MongoDB interface. The left sidebar lists connections, with 'localhost:27017' and its 'filmdb' database selected. The main area shows the 'Documents' tab for the 'movies' collection. A modal window titled 'Insert Document' is open, displaying a complex JSON document. The document includes fields such as 'id', 'title', 'year', 'runtime', 'languages', 'rating', 'votes', 'genres', 'plotOutline', 'coverUrl', and arrays for 'actors', 'directors', and 'producers'. The 'Insert' button at the bottom right of the modal is highlighted.

The screenshot shows the Compass MongoDB interface. The left sidebar lists connections, with 'localhost:27017' and its 'filmdb' database selected. The main area shows the 'Documents' tab for the 'movies' collection. Two documents are listed in the table:

- Pulp Fiction** (id: 0110912):
 - title: "Pulp Fiction"
 - year: 1994
 - runtime: 154
 - languages: Array (3)
 - rating: 8.9
 - votes: 2084331
 - genres: Array (2)
 - plotOutline: "Jules Winnfield (Samuel L. Jackson) and Vincent Vega (John Travolta) a..."
 - coverUrl: "https://m.media-amazon.com/images/M/MV5BNjM0MDIzZTUtNTBLZi00MTlLWFjM2--"
 - actors: Array (12)
 - directors: Array (1)
 - producers: Array (7)
- The Matrix** (id: 0133893):
 - title: "The Matrix"
 - year: 1999
 - runtime: 136
 - languages: Array (1)
 - rating: 8.7
 - votes: 1496538
 - genres: Array (2)
 - plotOutline: "Thomas A. Anderson is a man living two lives..."
 - coverUrl: "https://m.media-amazon.com/images/M/MV5BNzQzOTk3OTAtNDQ0Zi00ZTVkLWI0MT--"
 - actors: Array (2)
 - directors: Array (2)
 - producers: Array (1)

Создала документы актеров в коллекции persons

Compass

Welcome movies filldb

localhost:27017 > filldb

Sort by Collection Name

movies

Storage size: 20.48 kB Documents: 2 Avg. document size: 1.40 kB Indexes: 1 Total index size: 20.48 kB

Create Collection

Collection Name: persons

Time-Series

Time-series collections efficiently store sequences of measurements over a period of time. [Learn More](#)

Additional preferences (e.g. Custom collation, Clustered collections)

Cancel Create Collection

Compass

Welcome movies filldb persons

localhost:27017 > filldb > persons

Documents: 0 Aggregations Schema Indexes: 1 Validation

Insert Document

To collection filldb.persons

```

1   {
2     "id": 246,
3     "name": "Bruce Willis",
4     "headshot": "https://m.media-amazon.com/images/M/MV5BMjA0M...",
5     "birthDate": "1955-03-19",
6     "tradeMarks": [
7       "Frequently plays a man who suffered a tragedy, had lost",
8       "Frequently plays likeable wisecracking heroes with a mo",
9       "Headlines action-adventures, often playing a policeman",
10      "Often plays men who get caught up in situations far beyo",
11      "Sardonic one-liners",
12      "Shaven head",
13      "Distinctive, gravelly voice",
14      "Smirky grin.",
15      "Known for playing cynical anti-heroes with unhappy pers",
16    ],
17    "actedInMovies": [
18      { "movieId": "0110912", "title": "Pulp Fiction" },
19      { "movieId": "1606378", "title": "A Good Day to Die Hard" },
20      { "movieId": "0217869", "title": "Unbreakable" },
21      { "movieId": "0377917", "title": "The Fifth Element" },
22      { "movieId": "0112864", "title": "Die Hard: With a Venge... "
23    ]
24  }
25
26

```

VIEW Explain Reset Find Options ▾

25 0 - 0 of 0

Cancel Insert

Compass

Welcome movies filmdb persons

localhost:27017 > filmdb > persons

My Queries

CONNECTIONS ()

Search connections

localhost:27017 admin config filldb movies persons local

Documents 4 Aggregations Schema Indexes 1 Validation

Type a query: { field: 'value' } or [Generate query](#)

[Explain](#) [Reset](#) [Find](#) [Options](#)

Insert Document

To collection filmdb.persons

```

1  {
2    "id": 113,
3    "name": "Sandra Bullock",
4    "headshot": "https://m.media-amazon.com/images/M/MV5BMTI5
5    "birthDate": "1964-07-26",
6    "actedInMovies": [
7      { "movieId": "2737304", "title": "Bird Box" },
8      { "movieId": "0120179", "title": "Speed 2: Cruise Contr
9      { "movieId": "0111257", "title": "Speed" },
10     { "movieId": "0212346", "title": "Miss Congeniality" }
11   ]
12 }
13

```

[Cancel](#) [Insert](#)

[VIEW](#) [F](#) [E](#)

[_id: 06](#) [id: 24](#) [name: Sandra Bullock](#) [headshot: https://m.media-amazon.com/images/M/MV5BMTI5](#) [birthDate: 1964-07-26](#) [actedInMovies: \[](#) [movieId: 2737304, title: Bird Box](#) [movieId: 0120179, title: Speed 2: Cruise Contr](#) [movieId: 0111257, title: Speed](#) [movieId: 0212346, title: Miss Congeniality](#) [\]](#)

[_id: 08](#) [id: 113](#) [name: Sandra Bullock](#) [headshot: https://m.media-amazon.com/images/M/MV5BMTI5](#) [birthDate: 1964-07-26](#) [actedInMovies: \[](#) [movieId: 2737304, title: Bird Box](#) [movieId: 0120179, title: Speed 2: Cruise Contr](#) [movieId: 0111257, title: Speed](#) [movieId: 0212346, title: Miss Congeniality](#) [\]](#)

[_id: ObjectID\('68bfccbb86690dd5e150425e5'\)](#) [id: 233](#) [name: Quentin Tarantino](#) [headshot: https://m.media-amazon.com/images/M/MV5BMTgyMjI3ODA3Nl5BMl5BanBnXkFzT...](#) [birthDate: 1963-03-27](#) [tradeMarks: Array \(9\)](#) [actedInMovies: Array \(4\)](#)

Compass

Welcome movies filmdb persons

localhost:27017 > filmdb > persons

My Queries

CONNECTIONS ()

Search connections

localhost:27017 admin config filldb movies persons local

Documents 1 Aggregations Schema Indexes 1 Validation

Type a query: { field: 'value' } or [Generate query](#)

[Explain](#) [Reset](#) [Find](#) [Options](#)

Insert Document

To collection filmdb.persons

```

1  {
2    "id": 206,
3    "name": "Keanu Reeves",
4    "headshot": "https://m.media-amazon.com/images/M/MV5BMjA0
5    "birthDate": "1964-09-02",
6    "tradeMarks": [
7      "Intense contemplative gaze",
8      "Deep husky voice",
9      "Known for playing stoic reserved characters"
10    ],
11    "actedInMovies": [
12      { "movieId": "0133093", "title": "The Matrix" },
13      { "movieId": "0234215", "title": "The Matrix Reloaded" }
14      { "movieId": "0111257", "title": "Speed" }
15    ]
16  }
17

```

[Cancel](#) [Insert](#)

[VIEW](#) [F](#) [E](#)

[_id: 06](#) [id: 24](#) [name: Sandra Bullock](#) [headshot: https://m.media-amazon.com/images/M/MV5BMTI5](#) [birthDate: 1964-07-26](#) [actedInMovies: \[](#) [movieId: 2737304, title: Bird Box](#) [movieId: 0120179, title: Speed 2: Cruise Contr](#) [movieId: 0111257, title: Speed](#) [movieId: 0212346, title: Miss Congeniality](#) [\]](#)

[_id: 08](#) [id: 113](#) [name: Sandra Bullock](#) [headshot: https://m.media-amazon.com/images/M/MV5BMTI5](#) [birthDate: 1964-07-26](#) [actedInMovies: \[](#) [movieId: 2737304, title: Bird Box](#) [movieId: 0120179, title: Speed 2: Cruise Contr](#) [movieId: 0111257, title: Speed](#) [movieId: 0212346, title: Miss Congeniality](#) [\]](#)

[_id: ObjectID\('68bfccbb86690dd5e150425e5'\)](#) [id: 233](#) [name: Quentin Tarantino](#) [headshot: https://m.media-amazon.com/images/M/MV5BMTgyMjI3ODA3Nl5BMl5BanBnXkFzT...](#) [birthDate: 1963-03-27](#) [tradeMarks: Array \(9\)](#) [actedInMovies: Array \(4\)](#)

Подключение к среде MongoDB

Запрос документов с помощью селектора запросов

Использовала метод insertMany для добавления нескольких документов JSON одновременно. Предварительно создала подключение к среде MongoDB.

```
(base) sofia@MacBook-Air-2 ~ % docker exec -it mongo-1 mongosh -u root -p abc123! --authenticationDatabase admin
Current Mongosh Log ID: 68bfceaf2154255260cfa334f
Connecting to: mongodb://<credentials>@127.0.0.1:27017/?directConnection=true&serverSelectionTimeoutMS=2000&authSource=admin&appName=mongosh+2.5.7
Using MongoDB: 2.5.7
Using Mongosh: 2.5.7

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/
-----
The server generated these startup warnings when booting
2025-09-08T15:04:00.390+00:00: Using the XFS filesystem is strongly recommended with the WiredTiger storage engine. See http://dochub.mongodb.org/core/prodnotes-filesystem
2025-09-08T15:04:03.300+00:00: Unable to tell whether transparent hugepages are disabled for this process via prctl, as a result unable to verify the state of transparent hugepages on this system.
2025-09-08T15:04:03.304+00:00: vm.max_map_count is too low

[...
switched to db filmdb
filmdb> db.movies.countDocuments()
filmdb> db.movies.insertMany([
  ...
  {"id": "e1111102", "title": "The Shawshank Redemption", "genres": ["Drama"], "year": 1994, "rating": 9.2, "rank": 1},
  ...
  {"id": "08686462", "title": "The Godfather", "genres": ["Crime", "Drama"], "year": 1972, "rating": 9.2, "rank": 2},
  ...
  {"id": "08715622", "title": "The Godfather: Part II", "genres": ["Crime", "Drama"], "year": 1974, "rating": 9.0, "rank": 3},
  ...
  {"id": "08888504", "title": "The Dark Knight", "genres": ["Action", "Crime", "Drama"], "year": 2008, "rating": 9.0, "rank": 4},
  ...
  {"id": "08888932", "title": "The Godfather: Part III", "genres": ["Drama"], "year": 1973, "rating": 8.9, "rank": 5},
  ...
  {"id": "08888922", "title": "Schindler's List", "genres": ["Biography", "Drama", "History"], "year": 1993, "rating": 8.9, "rank": 6},
  ...
  {"id": "08872608", "title": "The Lord of the Rings: The Return of the King", "genres": ["Adventure", "Drama", "Fantasy"], "year": 2003, "rating": 8.9, "rank": 7},
  ...
  {"id": "08601956", "title": "The Good, the Bad, and the Ugly", "genres": ["Western"], "year": 1966, "rating": 8.8, "rank": 8},
  ...
  {"id": "08137532", "title": "Fight Club", "genres": ["Drama"], "year": 1999, "rating": 8.8, "rank": 10},
  ...
  {"id": "41547956", "title": "Avengers: Endgame", "genres": ["Action", "Adventure", "Fantasy"], "year": 2019, "rating": 8.8, "rank": 11},
  ...
  {"id": "08128739", "title": "The Lord of the Rings: The Fellowship of the Ring", "genres": ["Adventure", "Drama", "Fantasy"], "year": 2001, "rating": 8.8, "rank": 12},
  ...
  {"id": "08888938", "title": "The Empire Strikes Back", "genres": ["Action", "Adventure", "Fantasy"], "year": 1980, "rating": 8.7, "rank": 13},
  ...
  {"id": "08888648", "title": "Star Wars: Episode V - The Empire Strikes Back", "genres": ["Action", "Adventure", "Sci-Fi"], "year": 1980, "rating": 8.7, "rank": 14},
  ...
  {"id": "08756646", "title": "Inception", "genres": ["Action", "Adventure", "Sci-Fi"], "year": 2010, "rating": 8.7, "rank": 15},
  ...
  {"id": "08167261", "title": "The Lord of the Rings: The Two Towers", "genres": ["Adventure", "Drama", "Fantasy"], "year": 2002, "rating": 8.7, "rank": 16},
  ...
  {"id": "08734866", "title": "One Flew Over the Cuckoo's Nest", "genres": ["Drama"], "year": 1975, "rating": 8.7, "rank": 17},
  ...
  {"id": "08996658", "title": "Goodfella", "genres": ["Biography", "Crime", "Drama"], "year": 1990, "rating": 8.7, "rank": 18},
  ...
  {"id": "08947487", "title": "Seven Samurai", "genres": ["Adventure", "Drama"], "year": 1954, "rating": 8.6, "rank": 19},
  ...
  {"id": "08128136", "title": "Seven Samurai", "genres": ["Action", "Drama", "Mystery"], "year": 1954, "rating": 8.6, "rank": 20},
  ...
  {"id": "08131408", "title": "The Empire of Oz", "genres": ["Crime", "Drama", "Mystery"], "year": 1995, "rating": 8.6, "rank": 21},
  ...
  {"id": "08767599", "title": "Star Wars: Episode IV - A New Hope", "genres": ["Action", "Adventure", "Fantasy"], "year": 1977, "rating": 8.6, "rank": 22},
  ...
  {"id": "08102926", "title": "The Silence of the Lambs", "genres": ["Crime", "Drama", "Thriller"], "year": 1991, "rating": 8.6, "rank": 23},
  ...
  {"id": "08386690", "title": "It's a Wonderful Life", "genres": ["Drama", "Family", "Fantasy"], "year": 1946, "rating": 8.6, "rank": 25},
  ...
  {"id": "08183799", "title": "Life Is Beautiful", "genres": ["Comedy", "Drama", "Romance"], "year": 1997, "rating": 8.6, "rank": 26},
  ...
  {"id": "08245429", "title": "Spirited Away", "genres": ["Animation", "Adventure", "Family", "Fantasy", "Mystery"], "year": 2001, "rating": 8.5, "rank": 27},
  ...
  {"id": "08120881", "title": "Saving Private Ryan", "genres": ["Drama", "War"], "year": 1998, "rating": 8.5, "rank": 28},
  ...
  {"id": "08104114", "title": "The Usual Suspects", "genres": ["Crime", "Drama", "Mystery"], "year": 1995, "rating": 8.5, "rank": 29},
  ...
  {"id": "08104133", "title": "The Usual Suspects", "genres": ["Action", "Crime", "Drama", "Thriller"], "year": 1995, "rating": 8.5, "rank": 30},
  ...
  {"id": "08106889", "title": "The Green Mile", "genres": ["Crime", "Drama", "Fantasy", "Mystery"], "year": 1999, "rating": 8.5, "rank": 31},
  ...
  {"id": "08166922", "title": "Interstellar", "genres": ["Adventure", "Drama", "Sci-Fi"], "year": 2014, "rating": 8.5, "rank": 32},
  ...
  {"id": "08584215", "title": "Psycho", "genres": ["Horror", "Mystery", "Thriller"], "year": 1960, "rating": 8.5, "rank": 33},
  ...
  {"id": "08120566", "title": "American History X", "genres": ["Drama"], "year": 1998, "rating": 8.5, "rank": 34},
  ...
  {"id": "08021749", "title": "City Lights", "genres": ["Comedy", "Drama", "Romance"], "year": 1931, "rating": 8.5, "rank": 35},
  ...
  {"id": "08021749", "title": "City Lights", "genres": ["Comedy", "Drama", "Romance"], "year": 1931, "rating": 8.5, "rank": 36},
  ...
  {"id": "08041162", "title": "Once Upon a Time in the West", "genres": ["Western"], "year": 1968, "rating": 8.5, "rank": 37},
  ...
  {"id": "02534747", "title": "The Pianist", "genres": ["Biography", "Drama", "Music"], "year": 2002, "rating": 8.5, "rank": 38},
  ...
  {"id": "00279777", "title": "Modern Times", "genres": ["Comedy", "Drama", "Family", "Romance"], "year": 1936, "rating": 8.5, "rank": 39},
  ...
  {"id": "16756344", "title": "The Intouchables", "genres": ["Biography", "Comedy", "Drama", "Romance"], "year": 2011, "rating": 8.5, "rank": 40},
  ...
  {"id": "08407887", "title": "The Departed", "genres": ["Crime", "Drama", "Thriller"], "year": 2006, "rating": 8.5, "rank": 41},
  ...
  {"id": "08887637", "title": "Back to the Future", "genres": ["Adventure", "Comedy", "Sci-Fi"], "year": 1985, "rating": 8.5, "rank": 42},
  ...
  {"id": "08138386", "title": "Terminator 2: Judgment Day", "genres": ["Action", "Sci-Fi"], "year": 1991, "rating": 8.5, "rank": 43},
  ...
  {"id": "08138386", "title": "Terminator 2: Judgment Day", "genres": ["Action", "Sci-Fi"], "year": 1991, "rating": 8.5, "rank": 44},
  ...
  {"id": "08103867", "title": "The Lion King", "genres": ["Animation", "Adventure", "Drama", "Family", "Musical"], "year": 1994, "rating": 8.5, "rank": 45},
  ...
  {"id": "08873956", "title": "Rear Window", "genres": ["Mystery", "Thriller"], "year": 1954, "rating": 8.5, "rank": 46},
  ...
  {"id": "08829711", "title": "Raiders of the Lost Ark", "genres": ["Action", "Adventure", "Drama"], "year": 1981, "rating": 8.5, "rank": 47},
  ...
  {"id": "08127495", "title": "Gladiator", "genres": ["Action", "Adventure", "Drama"], "year": 2000, "rating": 8.5, "rank": 48},
  ...
  {"id": "08428571", "title": "The Prestige", "genres": ["Drama", "Mystery", "Sci-Fi", "Thriller"], "year": 2006, "rating": 8.5, "rank": 49},
  ...
  {"id": "08878788", "title": "Apocalypse Now", "genres": ["Drama", "War"], "year": 1979, "rating": 8.4, "rank": 50}
  ...
])
{
  acknowledged: true,
  insertedIds: [
    '0: ObjectId("68bfceaf2154255260cfa3350")',
    '1: ObjectId("68bfceaf2154255260cfa3351")',
    '2: ObjectId("68bfceaf2154255260cfa3352")',
    '3: ObjectId("68bfceaf2154255260cfa3353")',
    '4: ObjectId("68bfceaf2154255260cfa3354")',
    '5: ObjectId("68bfceaf2154255260cfa3355")'
  ]
}
```

После выполнения мультивставки убедилась, что в нашей коллекции movies на самом деле имеется 50 фильмов.

```

... {"id": "0110387", "title": "The Lion King", "genres": ["Animation", "Drama", "Family", "Musical"], "year": 1994, "rating": 8.6, "rank": 46},
... {"id": "0847306", "title": "Rear Window", "genres": ["Mystery", "Thriller"], "year": 1954, "rating": 8.0, "rank": 48},
... {"id": "0882971", "title": "Raiders of the Lost Ark", "genres": ["Action", "Adventure"], "year": 1981, "rating": 8.5, "rank": 47},
... {"id": "0172495", "title": "Gladiator", "genres": ["Action", "Adventure", "Drama"], "year": 2000, "rating": 8.5, "rank": 48},
... {"id": "0482571", "title": "The Prestige", "genres": ["Drama", "Mystery", "Sci-Fi", "Thriller"], "year": 2006, "rating": 8.5, "rank": 49},
... {"id": "0878788", "title": "Apocalypse Now", "genres": ["Drama", "War"], "year": 1979, "rating": 8.4, "rank": 50}
[...]
{
  acknowledged: true,
  insertedId: {
    '0': ObjectId('68bfcf0f05154255260cfa3350'),
    '1': ObjectId('68bfcf0f05154255260cfa3351'),
    '2': ObjectId('68bfcf0f05154255260cfa3352'),
    '3': ObjectId('68bfcf0f05154255260cfa3353'),
    '4': ObjectId('68bfcf0f05154255260cfa3354'),
    '5': ObjectId('68bfcf0f05154255260cfa3355'),
    '6': ObjectId('68bfcf0f05154255260cfa3356'),
    '7': ObjectId('68bfcf0f05154255260cfa3357'),
    '8': ObjectId('68bfcf0f05154255260cfa3358'),
    '9': ObjectId('68bfcf0f05154255260cfa3359'),
    '10': ObjectId('68bfcf0f05154255260cfa335a'),
    '11': ObjectId('68bfcf0f05154255260cfa335b'),
    '12': ObjectId('68bfcf0f05154255260cfa335c'),
    '13': ObjectId('68bfcf0f05154255260cfa335d'),
    '14': ObjectId('68bfcf0f05154255260cfa335e'),
    '15': ObjectId('68bfcf0f05154255260cfa335f'),
    '16': ObjectId('68bfcf0f05154255260cfa3360'),
    '17': ObjectId('68bfcf0f05154255260cfa3361'),
    '18': ObjectId('68bfcf0f05154255260cfa3362'),
    '19': ObjectId('68bfcf0f05154255260cfa3363'),
    '20': ObjectId('68bfcf0f05154255260cfa3364'),
    '21': ObjectId('68bfcf0f05154255260cfa3365'),
    '22': ObjectId('68bfcf0f05154255260cfa3366'),
    '23': ObjectId('68bfcf0f05154255260cfa3367'),
    '24': ObjectId('68bfcf0f05154255260cfa3368'),
    '25': ObjectId('68bfcf0f05154255260cfa3369'),
    '26': ObjectId('68bfcf0f05154255260cfa336a'),
    '27': ObjectId('68bfcf0f05154255260cfa336b'),
    '28': ObjectId('68bfcf0f05154255260cfa336c'),
    '29': ObjectId('68bfcf0f05154255260cfa336d'),
    '30': ObjectId('68bfcf0f05154255260cfa336e'),
    '31': ObjectId('68bfcf0f05154255260cfa336f'),
    '32': ObjectId('68bfcf0f05154255260cfa336g'),
    '33': ObjectId('68bfcf0f05154255260cfa3371'),
    '34': ObjectId('68bfcf0f05154255260cfa3372'),
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    '37': ObjectId('68bfcf0f05154255260cfa3375'),
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    '39': ObjectId('68bfcf0f05154255260cfa3377'),
    '40': ObjectId('68bfcf0f05154255260cfa3378'),
    '41': ObjectId('68bfcf0f05154255260cfa3379'),
    '42': ObjectId('68bfcf0f05154255260cfa337a'),
    '43': ObjectId('68bfcf0f05154255260cfa337b'),
    '44': ObjectId('68bfcf0f05154255260cfa337c'),
    '45': ObjectId('68bfcf0f05154255260cfa337d'),
    '46': ObjectId('68bfcf0f05154255260cfa337e'),
    '47': ObjectId('68bfcf0f05154255260cfa337f')
  }
}

filmdb db.movies.countDocuments()
50
filmdb> []

```

Проверка:

Чтобы получить все Family фильмы, выполнила:

```
[filmdb> db.movies.find({"genres": "Family"})
[
  {
    _id: ObjectId('68bfcf05154255260cfa3366'),
    id: '0038650',
    title: "It's a Wonderful Life",
    genres: [ 'Drama', 'Family', 'Fantasy' ],
    year: 1946,
    rating: 8.6,
    rank: 25
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3368'),
    id: '0245429',
    title: 'Spirited Away',
    genres: [ 'Animation', 'Adventure', 'Family', 'Fantasy', 'Mystery' ],
    year: 2001,
    rating: 8.5,
    rank: 27
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3374'),
    id: '0027977',
    title: 'Modern Times',
    genres: [ 'Comedy', 'Drama', 'Family', 'Romance' ],
    year: 1936,
    rating: 8.5,
    rank: 39
  },
  {
    _id: ObjectId('68bfcf05154255260cfa337a'),
    id: '0110357',
    title: 'The Lion King',
    genres: [ 'Animation', 'Adventure', 'Drama', 'Family', 'Musical' ],
    year: 1994,
    rating: 8.5,
    rank: 45
  }
]
filmdb> █
```

Чтобы хотим получить все фильмы, которые были опубликованы в 2010 году и позже, мы можем сделала следующее:

```
[filmdb]> db.movies.find({ "genres": "Action", "year": { $gte : 2010 } })
[
  {
    _id: ObjectId('68bfcf05154255260cfa3359'),
    id: '4154796',
    title: 'Avengers: Endgame',
    genres: [ 'Action', 'Adventure', 'Fantasy', 'Sci-Fi' ],
    year: 2019,
    rating: 8.8,
    rank: 11
  },
  {
    _id: ObjectId('68bfcf05154255260cfa335d'),
    id: '1375666',
    title: 'Inception',
    genres: [ 'Action', 'Adventure', 'Sci-Fi', 'Thriller' ],
    year: 2010,
    rating: 8.7,
    rank: 15
  }
]
filmdb>
```

Чтобы найти все фильмы, которые не относятся к жанру Drama

```
[filmdb]> db.movies.find({ $ne: "Drama" })
[
  {
    _id: ObjectId('68bfcf05154255260cfa3359'),
    id: '0133893',
    title: 'The Matrix',
    year: 1999,
    runtime: 136,
    languages: [ 'en' ],
    rating: 8.7,
    votes: 1496538,
    genres: [ 'Action', 'Sci-Fi' ],
    plotOutline: 'Thomas A. Anderson is a man living two lives...',
    coverImage: 'https://m.media-amazon.com/images/M/AVBNBZQ2OTk30TAtNDQ0Zl00ZTVKLW10HTEtMD11ZjNkYzNjNTc4L2ltYwd1XxEyXXFqcGdeQXVynJu00TQ80TY0._V1_SX101_CR0,0,101,150_.jpg',
    actors: [
      { actorID: '0008206', name: 'Keanu Reeves' },
      { actorID: '0008401', name: 'Laurence Fishburne' }
    ],
    directors: [
      { directorID: '0905154', name: 'Lana Wachowski' },
      { directorID: '0905152', name: 'Lilly Wachowski' }
    ],
    producers: [ { producerID: '0075732', name: 'Bruce Berman' } ]
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3357'),
    id: '0866196',
    title: 'The Good, the Bad and the Ugly',
    genres: [ 'Western' ],
    year: 1966,
    rating: 8.8,
    rank: 9
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3359'),
    id: '4154796',
    title: 'Avengers: Endgame',
    genres: [ 'Action', 'Adventure', 'Fantasy', 'Sci-Fi' ],
    year: 2019,
    rating: 8.8,
    rank: 11
  },
  {
    _id: ObjectId('68bfcf05154255260cfa335c'),
    id: '0008604',
    title: 'Star Wars: Episode V – The Empire Strikes Back',
    genres: [ 'Action', 'Adventure', 'Fantasy', 'Sci-Fi' ],
    year: 1980,
    rating: 8.7,
    rank: 14
  },
  {
    _id: ObjectId('68bfcf05154255260cfa335d'),
    id: '1375666',
    title: 'Inception',
    genres: [ 'Action', 'Adventure', 'Sci-Fi', 'Thriller' ],
    year: 2010,
    rating: 8.7,
    rank: 15
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3364'),
    id: '0076759',
    title: 'The Dark Knight Rises
```

Оператор \$exists может использоваться для проверки наличия или отсутствия поля.

```

filmdb> db.movies.find({ "plotOutline": { $exists: true} })
[ {
    _id: ObjectId('68bfc7d86690dd5e150425d6'),
    id: '0118912',
    title: 'Pulp Fiction',
    year: 1994,
    runtime: 154,
    languages: [ 'en', 'es', 'fr' ],
    rating: 8.9,
    votes: 208433,
    genres: [ 'Crime', 'Drama' ],
    plotOutline: 'Jules Winnfield (Samuel L. Jackson) and Vincent Vega (John Travolta) are two hit men who are out to retrieve a suitcase stolen from their employer, mob boss Marsellus Wallace (Ving Rhames). Wallace has also asked Vincent to take his wife Mia (Uma Thurman) out a few days later when Wallace himself will be out of town. Butch Coolidge (Bruce Willis) is an aging boxer who is paid by Wallace to lose his fight. The lives of these seemingly unrelated people are woven together comprising of a series of funny, bizarre and uncalled-for incidents.',
    coverURL: 'https://m.media-amazon.com/images/M/VEBNONhMDizZTUtNTB1zI0@MTRlWFjM2ItYzViMjE3YzI5Mj1jXkEyXkFqcGdeQXVyNzkwMjQ5NzM0_.Vi_SV150_CR1,0,101,150_.jpg',
    actors: [
        { actorID: '0000619', name: 'Tim Roth' },
        { actorID: '0002625', name: 'Amanda Plummer' },
        { actorID: '0522593', name: 'Laura Lovelace' },
        { actorID: '0000237', name: 'John Travolta' },
        { actorID: '0000168', name: 'Samuel L. Jackson' },
        { actorID: '0482851', name: 'Phil LaMarr' },
        { actorID: '0001844', name: 'Frank Whaley' },
        { actorID: '0000246', name: 'Michael Ironside' },
        { actorID: '0000246', name: 'Bruce Willis' },
        { actorID: '0000699', name: 'Ving Rhames' },
        { actorID: '0000235', name: 'Uma Thurman' },
        { actorID: '0000233', name: 'Quentin Tarantino' }
    ],
    directors: [ { directorID: '0000233', name: 'Quentin Tarantino' } ],
    producers: [ { producerID: '0004744', name: 'Lawrence Bender' },
        { producerID: '0000362', name: 'Danny DeVito' },
        { producerID: '0321621', name: 'Richard N. Gladstein' },
        { producerID: '0787834', name: 'Michael Shenberg' },
        { producerID: '0792869', name: 'Stacey Sher' },
        { producerID: '0918424', name: 'Bob Weinstein' },
        { producerID: '0000544', name: 'Harvey Weinstein' }
    ],
    _id: ObjectId('68bfc9d16690dd5e150425da'),
    id: '0133093',
    title: 'The Matrix',
    year: 1999,
    runtime: 146,
    languages: [ 'en' ],
    rating: 8.7,
    votes: 1496538,
    genres: [ 'Action', 'Sci-Fi' ],
    plotOutline: 'Thomas A. Anderson is a man living two lives...',
    coverURL: 'https://m.media-amazon.com/images/M/VEBNbzQzOTk30TAtND0BZi0@ZTVKLW1@MTEtMD11ZjNKYzNjNtC4L2ltYw1XkEyXkFqcGdeQXVyNjU0@TQ8OTY_.Vi_SX101_CR0,0,101,150_.jpg',
    actors: [
        { actorID: '0000206', name: 'Keanu Reeves' },
        { actorID: '0000481', name: 'Laurence Fishburne' }
    ],
    directors: [
        { directorID: '0905154', name: 'Lana Wachowski' },
        { directorID: '0905152', name: 'Lilly Wachowski' }
    ],
    producers: [ { producerID: '0075732', name: 'Bruce Berman' } ]
}
]

```

Мы видим, что только два фильма имеют установленное свойство `plotOutline`.

Оператор `$in` можно использовать для сопоставления одного из нескольких значений, которые мы передаем как массив.

```
[filmdb> db.movies.find({ "genres": { $in: ['Family', 'Mistery'] } })
[
  {
    _id: ObjectId('68bfcf05154255260cfa3366'),
    id: '0038650',
    title: "It's a Wonderful Life",
    genres: [ 'Drama', 'Family', 'Fantasy' ],
    year: 1946,
    rating: 8.6,
    rank: 25
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3368'),
    id: '0245429',
    title: 'Spirited Away',
    genres: [ 'Animation', 'Adventure', 'Family', 'Fantasy', 'Mystery' ],
    year: 2001,
    rating: 8.5,
    rank: 27
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3374'),
    id: '0027977',
    title: 'Modern Times',
    genres: [ 'Comedy', 'Drama', 'Family', 'Romance' ],
    year: 1936,
    rating: 8.5,
    rank: 39
  },
  {
    _id: ObjectId('68bfcf05154255260cfa337a'),
    id: '0110357',
    title: 'The Lion King',
    genres: [ 'Animation', 'Adventure', 'Drama', 'Family', 'Musical' ],
    year: 1994,
    rating: 8.5,
    rank: 45
  }
]
```

который возвращает все фильмы в жанре Family или Mistery.

Чтобы найти все фильмы жанра Music OR которые были выпущены в 2012 году или позже

```
[filmdb> db.movies.find({ $or: [ { "genres":"Music" }, { "year": { $gte : 2012 } } ] })
[
  {
    _id: ObjectId('68bfcf05154255260cfa3359'),
    id: '4154796',
    title: 'Avengers: Endgame',
    genres: [ 'Action', 'Adventure', 'Fantasy', 'Sci-Fi' ],
    year: 2019,
    rating: 8.8,
    rank: 11
  },
  {
    _id: ObjectId('68bfcf05154255260cfa336d'),
    id: '0816692',
    title: 'Interstellar',
    genres: [ 'Adventure', 'Drama', 'Sci-Fi' ],
    year: 2014,
    rating: 8.5,
    rank: 32
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3373'),
    id: '0253474',
    title: 'The Pianist',
    genres: [ 'Biography', 'Drama', 'Music', 'War' ],
    year: 2002,
    rating: 8.5,
    rank: 38
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3379'),
    id: '2582802',
    title: 'Whiplash',
    genres: [ 'Drama', 'Music' ],
    year: 2014,
    rating: 8.5,
    rank: 44
  }
]
```

filmdb> █

Чтобы найти все фильмы жанра Action AND, которые были выпущены в 2010 году или позже OR имеют рейтинг выше 8.8

```
[filmdb> db.movies.find({ "genres":"Action", $or: [ { "year": { $gte : 2010 } }, { "rating": { $gt : 8.8 } } ] })
[
  {
    _id: ObjectId('68bfcf05154255260cfa3353'),
    id: '0468569',
    title: 'The Dark Knight',
    genres: [ 'Action', 'Crime', 'Drama', 'Thriller' ],
    year: 2008,
    rating: 9,
    rank: 4
  },
  {
    _id: ObjectId('68bfcf05154255260cfa3359'),
    id: '4154796',
    title: 'Avengers: Endgame',
    genres: [ 'Action', 'Adventure', 'Fantasy', 'Sci-Fi' ],
    year: 2019,
    rating: 8.8,
    rank: 11
  },
  {
    _id: ObjectId('68bfcf05154255260cfa335d'),
    id: '1375666',
    title: 'Inception',
    genres: [ 'Action', 'Adventure', 'Sci-Fi', 'Thriller' ],
    year: 2010,
    rating: 8.7,
    rank: 15
  }
]
filmdb> █
```

ObjectId, который MongoDB сгенерировал для нашего поля `_id`, можно выбрать следующим образом:

```
filmdb> db.movies.find({_id: ObjectId("68bfce26315fd46642fa3350")})
...
filmdb> █
```

Обновление документов

В своей простейшей форме `updateOne()` принимает два параметра: селектор (`where`) для использования и обновления, которые нужно применить к полям. Допустим, мы хотим изменить рейтинг фильма *Fight Club* на 9

```
[filmdb> db.movies.updateOne ( {title: 'Fight Club'} , { $set: {rating: 9} } )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
filmdb> █
```

Если мы хотим увеличить количество голосов для фильма "The Matrix", которое в настоящее время установлено на 1496538, как мы можем легко увидеть с помощью `find`

```
[filmdb> db.movies.find( {title: 'The Matrix'}, {"votes":1})
[ { _id: ObjectId('68bfc9d16690dd5e150425da'), votes: 1496538 } ]
[filmdb> db.movies.updateOne( {title: 'The Matrix'} , { $inc: {votes: 1} } )
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
filmdb> █
```

В данном случае результат говорит нам, что операция успешно обновила один документ с названием "The Matrix", увеличив значение его поля votes на 1.

проверить новый результат, используя тот же find второй раз

```
[filmdb> db.movies.find( {title: 'The Matrix'}, {"votes":1})
[ { _id: ObjectId('68bfc9d16690dd5e150425da'), votes: 1496539 } ]
filmdb> █
```

Оптимизация производительности с помощью индексов

Давайте добавим индекс по названию фильмов. Для возрастающего индекса по полю укажите значение 1; для убывающего индекса укажите значение -1.

если мы теперь выполним запрос по названию, будет использован индекс

```

[filmdb> db.movies.createIndex( {title: 1} );
title_1
filmdb> db.movies.find({ title: "The Matrix" }).explain();
[...
{
  explainVersion: '1',
  queryPlanner: {
    namespace: 'filmdb.movies',
    indexFilterSet: false,
    parsedQuery: { title: { '$eq': 'The Matrix' } },
    queryHash: '553F28EB',
    planCacheKey: 'DA190D56',
    optimizationTimeMillis: 10,
    maxIndexedOrSolutionsReached: false,
    maxIndexedAndSolutionsReached: false,
    maxScansToExplodeReached: false,
    winningPlan: {
      stage: 'FETCH',
      inputStage: {
        stage: 'IXSCAN',
        keyPattern: { title: 1 },
        indexName: 'title_1',
        isMultiKey: false,
        multiKeyPaths: { title: [] },
        isUnique: false,
        isSparse: false,
        isPartial: false,
        indexVersion: 2,
        direction: 'forward',
        indexBounds: { title: [ '["The Matrix", "The Matrix"]' ] }
      }
    },
    rejectedPlans: []
  },
  command: { find: 'movies', filter: { title: 'The Matrix' }, '$db': 'filmdb' },
  serverInfo: {
    host: 'mongo-1',
    port: 27017,
    version: '7.0.23',
    gitVersion: '78d6d71385be23831b5971993af60bcfed785bc'
  },
  serverParameters: {
    internalQueryFacetBufferSizeBytes: 104857600,
    internalQueryFacetMaxOutputDocSizeBytes: 104857600,
    internalLookupStageIntermediateDocumentMaxSizeBytes: 104857600,
    internalDocumentSourceGroupMaxMemoryBytes: 104857600,
    internalQueryMaxBlockingSortMemoryUsageBytes: 104857600,
    internalQueryProhibitBlockingMergeOnMongoS: 0,
    internalQueryMaxAddToSetBytes: 104857600,
    internalDocumentSourceSetWindowFieldsMaxMemoryBytes: 104857600,
    internalQueryFrameworkControl: 'forceClassicEngine'
  },
  ok: 1
}
filmdb> █

```

Давайте добавим индекс по полю id, чтобы убедиться, что оно уникально.

```
[filmdb> db.movies.createIndex( {id: 1}, {unique: true} );
id_1
filmdb> █
```

Если мы теперь попытаемся добавить один из фильмов второй раз, мы получим ошибку:

```
[filmdb> db.movies.insertOne( {"id": "0111161", "title": "The Shawshank Redemption", "genres": ["Drama"], "year": 1994, "rating": 9.2, "rank": 1}
MongoServerError: E11000 duplicate key error collection: filmdb.movies index: id_1 dup key: { id: "0111161" }
filmdb> █
```

Мы можем просмотреть индексы, которые у нас есть в настоящее время в коллекции movies, используя db.movies.getIndexes():

```
[filmdb> db.movies.getIndexes()
[
  { v: 2, key: { _id: 1 }, name: '_id_' },
  { v: 2, key: { title: 1 }, name: 'title_1' },
  { v: 2, key: { id: 1 }, name: 'id_1', unique: true }
]
filmdb> █
```

Индекс может быть удален с помощью команды dropIndex.

```
[filmdb> db.movies.dropIndex( {title: 1} );
{ nIndexesWas: 3, ok: 1 }
filmdb> █
```

Текстовый поиск

Например, вы можете выполнить следующее в оболочке mongo, чтобы разрешить текстовый поиск по полям title и plotOutline:

```
[filmdb> db.movies.createIndex ( { title: "text", plotOutline: "text" } )
title_text_plotOutline_text
```

Теперь давайте выполним текстовый поиск по термину "fight"

```

[filmdb> db.movies.find( { $text: { $search: "fight" } } )
[
  {
    _id: ObjectId('68bfcf05154255260cfca3358'),
    id: '0137523',
    title: 'Fight Club',
    genres: ['Drama'],
    year: 1999,
    rating: 9,
    rank: 10
  },
  {
    _id: ObjectId('68bfcf7d86698dd5e150425d6'),
    id: '0139912',
    title: 'Pulp Fiction',
    year: 1994,
    runtime: 154,
    languages: ['en', 'es', 'fr'],
    rating: 8.9,
    votes: 2884331,
    genres: ['Crime', 'Drama'],
    plotline: 'Julius Wainfield (Samuel L. Jackson) and Vincent Vega (John Travolta) are two hit men who are sent to retrieve a suitcase stolen from their employer, mob boss Marsellus Wallace (Ving Rhames). Wallace has also asked Vincent to take his wife Mia (Uma Thurman) out a few days later when Wallace himself will be out of town. Butch Coolidge (Bruce Willis) is an aging boxer who is paid by Wallace to lose his fight. The lives of these seemingly unrelated people are woven together comprising of a series of funny, bizarre and uncalled-for incidents.',
    coverURL: 'https://m.media-amazon.com/images/MV5BNGNhMDIzZTUtNTB1Zj00MTRlLWFjM2ItYzViMjE3YzI5Mj1jXkEyXkFqcGdeQXVyNzkwMjQSNzM0.._V1_SV150_CR1,0,181,150_.jpg',
    actors: [
      { actorID: '0000619', name: 'Tim Roth' },
      { actorID: '0001625', name: 'Amanda Plummer' },
      { actorID: '0002226', name: 'Laura Elena' },
      { actorID: '0002277', name: 'John Travolta' },
      { actorID: '0001608', name: 'Samuel L. Jackson' },
      { actorID: '0042851', name: 'Phil LaMarr' },
      { actorID: '0001844', name: 'Frank Whaley' },
      { actorID: '0024882', name: 'Buzz Steers' },
      { actorID: '0000246', name: 'Bruce Willis' },
      { actorID: '0000609', name: 'Ving Rhames' },
      { actorID: '0000236', name: 'Uma Thurman' },
      { actorID: '0000233', name: 'Quentin Tarantino' }
    ],
    directors: [ { directorID: '0000233', name: 'Quentin Tarantino' } ],
    producers: [
      { producerID: '0004744', name: 'Lawrence Bender' },
      { producerID: '0000362', name: 'Danny DeVito' },
      { producerID: '0000226', name: 'Howard Glazstein' },
      { producerID: '0797834', name: 'Michael Showalter' },
      { producerID: '0792849', name: 'Stacey Sher' },
      { producerID: '0918424', name: 'Bob Weinstein' },
      { producerID: '00005644', name: 'Harvey Weinstein' }
    ]
  }
]
filmdb>

```

Агрегация данных

мы хотим увидеть, сколько фильмов у нас есть для разных рейтингов

```

[filmdb> db.movies.aggregate( [{$group:{_id:'$rating', total: { $sum:1 }}}])
[
  { _id: 8.6, total: 7 },
  { _id: 8.9, total: 4 },
  { _id: 8.4, total: 1 },
  { _id: 8.8, total: 3 },
  { _id: 8.5, total: 23 },
  { _id: 8.7, total: 7 },
  { _id: 9, total: 3 },
  { _id: 9.2, total: 2 }
]
filmdb>

```

В следующем примере мы группируем по genres и подсчитываем количество фильмов для каждого жанра. Поскольку поле genres является массивом, сначала мы должны использовать \$unwind для разворачивания массива. Мы также возвращаем минимальный, максимальный и средний рейтинг для каждой группы. Результат сортируется по количеству фильмов в жанре в порядке убывания.

```

filmdb> db.movies.aggregate([
...   { $match: {year:{$gt:2000}}},
...   { $unwind: "$genres" },
...   { $group: {_id:$genres,
...     number :{$sum:1},
...     minRating:{$min:'$rating'},
...     maxRating:{$max:'$rating'},
...     avgRating:{$avg:'$rating'}
...   },
...   {$sort:{number:-1}} ] )
[ {
  _id: 'Drama',
  number: 11,
  minRating: 8.5,
  maxRating: 9,
  avgRating: 8.636363636363637
},
{
  _id: 'Adventure',
  number: 7,
  minRating: 8.5,
  maxRating: 8.9,
  avgRating: 8.7
},
{
  _id: 'Fantasy',
  number: 5,
  minRating: 8.5,
  maxRating: 8.9,
  avgRating: 8.74
},
{
  _id: 'Sci-Fi',
  number: 4,
  minRating: 8.5,
  maxRating: 8.8,
  avgRating: 8.625
},
{
  _id: 'Thriller',
  number: 4,
  minRating: 8.5,
  maxRating: 9,
  avgRating: 8.675
},
{
  _id: 'Crime',
  number: 3,
  minRating: 8.5,
  maxRating: 9,
  avgRating: 8.700000000000001
},
{
  _id: 'Action',
  number: 3,
  minRating: 8.7,
  maxRating: 9,
  avgRating: 8.833333333333334
},
{
  _id: 'Mystery',
  number: 2,
}

```

Удаление документов

Если мы хотим удалить конкретный документ, например фильм "Fight Club", мы можем выполнить

```
[filmdb> db.movies.deleteOne( { "title": "Fight Club" } )
{ acknowledged: true, deletedCount: 1 }
filmdb> █
```

Мы видим, что, как и ожидалось, один фильм был удален.

ИНДИВИДУАЛЬНОЕ ЗАДАНИЕ 1

Задание 1 (MongoDB)

вариант 17

Найти все фильмы, у которых в массиве genres ровно 2 элемента (\$size).

Через терминал:

```

filmdb> db.movies.find({ genres: { $size: 2 } })
...
[ {
  _id: ObjectId('68bfc7d86690dd5e150425d6'),
  id: '0118912',
  title: 'Pulp Fiction',
  year: 1994,
  runtime: 154,
  languages: [ 'en', 'es', 'fr' ],
  rating: 8.9,
  votes: 288433,
  genres: [ 'Crime', 'Drama' ],
  plotOutline: 'Jules Winnfield (Samuel L. Jackson) and Vincent Vega (John Travolta) are two hit men who are out to retrieve a suitcase stolen from their employer, mob boss Marsellus Wallace (Ving Rhames). Wallace has also asked Vincent to take his wife Mia (Uma Thurman) out a few days later when Wallace himself will be out of town. Butch Coolidge (Bruce Willis) is an aging boxer who is paid by Wallace to lose his fight. The lives of these seemingly unrelated people are woven together comprising of a series of funny, bizarre and uncalled-for incidents.',
  coverURL: 'https://m.media-amazon.com/images/M/MV5BNGNhMDIzZTUtNTB1Z10@MTR1LWFjM2ItYzv1MjE3YzI5Mj1jXkEyXkFqcGdeQXVyNzkwMjQSNzMo._V1_SV158_CR1,0,101,150_.jpg',
  actors: [
    { actorID: '0000619', name: 'Tim Roth' },
    { actorID: '0001282', name: 'Amanda Plummer' },
    { actorID: '0522509', name: 'Laura Lovelace' },
    { actorID: '0000237', name: 'John Travolta' },
    { actorID: '0000168', name: 'Samuel L. Jackson' },
    { actorID: '0482851', name: 'Phil LaMarr' },
    { actorID: '0000180', name: 'Frank Whaley' },
    { actorID: '0000807', name: 'Uma Thurman' },
    { actorID: '0000699', name: 'Ving Rhames' },
    { actorID: '0000235', name: 'Uma Thurman' },
    { actorID: '0000233', name: 'Quentin Tarantino' }
  ],
  directors: [ { directorID: '0000233', name: 'Quentin Tarantino' } ],
  producers: [ { producerID: '0000744', name: 'Lawrence Bender' },
    { producerID: '0000362', name: 'Danny DeVito' },
    { producerID: '0321621', name: 'Richard N. Gladstein' },
    { producerID: '0787834', name: 'Michael Shamberg' },
    { producerID: '0792849', name: 'Stacey Sher' },
    { producerID: '0918424', name: 'Bob Weinstein' },
    { producerID: '0000544', name: 'Harvey Weinstein' }
  ],
  _id: ObjectId('68bfc9d16690dd5e150425da'),
  id: '0133893',
  title: 'The Matrix',
  year: 1999,
  runtime: 146,
  languages: [ 'en' ],
  rating: 8.7,
  votes: 1496539,
  genres: [ 'Action', 'Sci-Fi' ],
  plotOutline: 'Thomas A. Anderson is a man living two lives...',
  coverURL: 'https://m.media-amazon.com/images/M/MV5BNzQzOTkWI0MTETMD11ZjNkYzNjNtC4L2ltYwdlXkEyXkFqcGdeQXVyNjU0OTQ8OTY0._V1_SX101_CR0,0,101,150_.jpg',
  actors: [
    { actorID: '0000206', name: 'Keanu Reeves' },
    { actorID: '0000401', name: 'Laurence Fishburne' }
  ],
  directors: [
    { directorID: '0905154', name: 'Lana Wachowski' },
    { directorID: '0905152', name: 'Lilly Wachowski' }
  ],
  producers: [ { producerID: '0075732', name: 'Bruce Berman' } ]

  _id: ObjectId('68bff63f154255260cfa3382'),
  id: '0000646',
  title: 'The Godfather',
  genres: [ 'Crime', 'Drama' ],
  year: 1972,
  rating: 9.2,
  rank: 2
},
{
  _id: ObjectId('68bff63f154255260cfa3383'),
  id: '0071562',
  title: 'The Godfather: Part II',
  genres: [ 'Crime', 'Drama' ],
  year: 1974,
  rating: 9,
  rank: 3
},
{
  _id: ObjectId('68bff63f154255260cfa3384'),
  id: '0109830',
  title: 'Forrest Gump',
  genres: [ 'Drama', 'Romance' ],
  year: 1994,
  rating: 8.7,
  rank: 13
},
{
  _id: ObjectId('68bff63f154255260cfa3385'),
  id: '0047478',
  title: 'Seven Samurai',
  genres: [ 'Adventure', 'Drama' ],
  year: 1954,
  rating: 8.6,
  rank: 20
},
{
  _id: ObjectId('68bff63f154255260cfa3394'),
  id: '0317260',
  title: 'City of God',
  genres: [ 'Crime', 'Drama' ],
  year: 2002,
  rating: 8.6,
  rank: 22
},
{
  _id: ObjectId('68bff63f154255260cfa3395'),
  id: '0120815',
  title: 'Saving Private Ryan',
  genres: [ 'Drama', 'War' ],
  year: 1998,
  rating: 8.5,
  rank: 28
},
{
  _id: ObjectId('68bff63f154255260cfa3396'),
  id: '0103864',
  title: 'Terminator 2: Judgment Day',
  genres: [ 'Action', 'Sci-Fi' ],
  year: 1991,
  rating: 8.5,
  rank: 43
}
]

```

```
id: '0317248',
title: 'City of God',
genres: [ 'Crime', 'Drama' ],
year: 2002,
rating: 8.6,
rank: 22
},
{
_id: ObjectId('68bff63f154255260cfa339a'),
id: '0120815',
title: 'Saving Private Ryan',
genres: [ 'Drama', 'War' ],
year: 1998,
rating: 8.5,
rank: 28
},
{
_id: ObjectId('68bff63f154255260cfa33a9'),
id: '0103864',
title: 'Terminator 2: Judgment Day',
genres: [ 'Action', 'Sci-Fi' ],
year: 1991,
rating: 8.5,
rank: 43
},
{
_id: ObjectId('68bff63f154255260cfa33aa'),
id: '25022802',
title: 'Whiplash',
genres: [ 'Drama', 'Music' ],
year: 2014,
rating: 8.5,
rank: 44
},
{
_id: ObjectId('68bff63f154255260cfa33ac'),
id: '0047396',
title: 'Rean Window',
genres: [ 'Mystery', 'Thriller' ],
year: 1994,
rating: 8.5,
rank: 46
},
{
_id: ObjectId('68bff63f154255260cfa33ad'),
id: '0012971',
title: 'Raiders of the Lost Ark',
genres: [ 'Action', 'Adventure' ],
year: 1981,
rating: 8.5,
rank: 47
},
{
_id: ObjectId('68bff63f154255260cfa33b0'),
id: '0076768',
title: 'Apocalypse Now',
genres: [ 'Drama', 'War' ],
year: 1979,
rating: 8.4,
rank: 50
}
]
filmdb> ||
```

На питоне:

```

from pymongo import MongoClient

client = MongoClient("mongodb://root:abc123!@localhost:27017/")
db = client.filmdb
movies_collection = db.movies

query = { "genres": { "$size": 2 } }
results = movies_collection.find(query)

for movie in results:
    title = movie.get("title", "No Title")
    genres = movie.get("genres", [])
    print(f"{title} - Жанры: {genres}")

```

Pulp Fiction – Жанры: ['Crime', 'Drama']
The Matrix – Жанры: ['Action', 'Sci-Fi']
The Godfather – Жанры: ['Crime', 'Drama']
The Godfather: Part II – Жанры: ['Crime', 'Drama']
Forrest Gump – Жанры: ['Drama', 'Romance']
Seven Samurai – Жанры: ['Adventure', 'Drama']
City of God – Жанры: ['Crime', 'Drama']
Saving Private Ryan – Жанры: ['Drama', 'War']
Terminator 2: Judgment Day – Жанры: ['Action', 'Sci-Fi']
Whiplash – Жанры: ['Drama', 'Music']
Rear Window – Жанры: ['Mystery', 'Thriller']
Raiders of the Lost Ark – Жанры: ['Action', 'Adventure']
Apocalypse Now – Жанры: ['Drama', 'War']

Начало работы с Redis

Использование утилиты командной строки Redis

Открыла еще одно окно терминала и ввела следующую команду, чтобы запустить Redis CLI в другом docker-контейнере:

```
(base) sofia@MacBook-Air-2 ~ % docker run -it --rm --network nosql-platform bitnami/redis redis-cli -h redis-1 -p 6379
Unable to find image 'bitnami/redis:latest' locally
latest: Pulling from bitnami/redis
fd8e129b0d03: Pull complete
Digest: sha256:25bf63f3ca7f75af4628c0dfcf398859ad1ac8abe135be85e99699f9637b16dc28
Status: Downloaded newer image for bitnami/redis:latest
redis> 10:15:49.53 INFO >>>
redis 10:15:49.53 INFO ==> Welcome to the Bitnami redis container
redis 10:15:49.53 INFO ==> Subscribe to project updates by watching https://github.com/bitnami/containers
redis 10:15:49.53 INFO ==> NOTICE: Starting August 28th, 2025, only a limited subset of images/charts will remain available for free. Backup will be available for some time at the 'Bitnami Legacy' repository. More info at https://github.com/bitnami/containers/issues/83267
redis 10:15:49.54 INFO >>>
```

Для проверки соединения ввела простую команду PING

Ввела help, чтобы увидеть версию установленного Redis.

```

[redis-1:6379> PING
PONG
[redis-1:6379> help
redis-cli 8.2.1
To get help about Redis commands type:
  "help @<group>" to get a list of commands in <group>
  "help <command>" for help on <command>
  "help <tab>" to get a list of possible help topics
  "quit" to exit

To set redis-cli preferences:
  ":set hints" enable online hints
  ":set nohints" disable online hints
Set your preferences in ~/.redisclirc
redis-1:6379> █

```

Структура данных "Строка" (String)

```

redis-1:6379> help @string
APPEND key value
summary: Appends a string to the value of a key. Creates the key if it doesn't exist.
since: 2.0.0

DECR key
summary: Decrements the integer value of a key by one. Uses 0 as initial value if the key doesn't exist.
since: 1.0.0

DECRBY key decrement
summary: Decrements a number from the integer value of a key. Uses 0 as initial value if the key doesn't exist.
since: 1.0.0

GET key
summary: Returns the string value of a key.
since: 1.0.0

GETDEL key
summary: Returns the string value of a key after deleting the key.
since: 6.2.0

GETEX key [EX seconds|PX milliseconds|EXAT unix-time-seconds|PXAT unix-time-milliseconds|PERSIST]
summary: Returns the string value of a key after setting its expiration time.
since: 6.2.0

GETRANGE key start end
summary: Returns a substring of the string stored at a key.
since: 2.4.0

GETSET key value
summary: Returns the previous string value of a key after setting it to a new value.
since: 1.0.0

INCR key
summary: Increments the integer value of a key by one. Uses 0 as initial value if the key doesn't exist.
since: 1.0.0

INCRBY key increment
summary: Increments the integer value of a key by a number. Uses 0 as initial value if the key doesn't exist.
since: 1.0.0

INCRBYFLOAT key increment
summary: Increments the floating point value of a key by a number. Uses 0 as initial value if the key doesn't exist.
since: 2.6.0

LCS key1 key2 [LEN] [IDX] [MINMATCHLEN min-match-len] [WITHMATCHLEN]
summary: Finds the longest common substring.
since: 7.0.0

MGET key [key ...]
summary: Atomically returns the string values of one or more keys.
since: 1.0.0

MSET key value [key value ...]
summary: Atomically creates or modifies the string values of one or more keys.
since: 1.0.1

MSETNX key value [key value ...]
summary: Atomically modifies the string values of one or more keys only when all keys don't exist.
since: 1.0.1

PSETEX key milliseconds value

```

Работа с ключами

Можно использовать команду SET для сохранения значения “redis-server” по ключу “server:name”

Redis сохранит данные на постоянной основе, поэтому позже можем спросить: «Какое значение хранится по ключу server:name?»

и Redis ответит “redis-server”.

```
[redis-1:6379> SET server:name "redis-server"
OK
[redis-1:6379> GET server:name
"redis-server"
redis-1:6379> EXISTS server:name
(integer) 1
[redis-1:6379> KEYS server*
1) "server:name"
[redis-1:6379> KEYS *
1) "server:name"
2) "task_queue"
redis-1:6379> █
```

Операции Get и Set

Сначала установим значение для ключа connections с помощью команды SET

Проверим значение с помощью команды GET

Попробуем перезаписать его с помощью другой команды SET

Посмотрим, что произойдет, если использовать команду SETNX

Если используем SETNX для ключа, который еще не существует, получим другой ответ

Используем MSET для установки нескольких пар «ключ-значение» и обратную команду MGET, чтобы получить несколько значений для нескольких ключей.

```
[redis-1:6379> SET connections 10
OK
[redis-1:6379> GET connections
"10"
[redis-1:6379> SET connections 20
OK
[redis-1:6379> GET connections
"20"
[redis-1:6379> SETNX connections 30
(integer) 0
[redis-1:6379> GET connections
"20"
[redis-1:6379> SETNX newkey 30
(integer) 1
[redis-1:6379> MSET key1 10 key2 20 key3 30
OK
[redis-1:6379> MGET key1 key3
1) "10"
2) "30"
redis-1:6379> █
```

Операции инкремента и декремента

Инициализируем значение connections равным 10, а затем используем INCR, чтобы увеличить его на единицу.

Видим, что в ответ получаем новое значение счетчика.

Увеличим его на 10, используя команду INCRBY.

Выполним обратную операцию: уменьшим значение счетчика. С помощью команды DECR счетчик уменьшается на единицу.

А затем с помощью DECRBY укажем величину, на которую уменьшим значение ключа (используем 10).

Удалим пару «ключ-значение» и посмотрим, что произойдет, если используем INCR для несуществующего ключа.

Мы видим, что INCR автоматически начинает со значения 0 и увеличивает его на 1, что и является результатом, который получили.

```
[redis-1:6379> SET connections 10
OK
[redis-1:6379> INCR connections
(integer) 11
[redis-1:6379> INCRBY connections 10
(integer) 21
[redis-1:6379> DECR connections
(integer) 20
[redis-1:6379> DECRBY connections 10
(integer) 10
[redis-1:6379> DEL connections
(integer) 1
[redis-1:6379> EXISTS connections
(integer) 0
[redis-1:6379> INCR connections
(integer) 1
redis-1:6379> █
```

Срок действия (Expiration) и время жизни (TTL)

В Redis можно указать, что ключ должен существовать только в течение определенного времени. Это достигается с помощью команд EXPIRE и TTL. Сначала установим новую пару «ключ-значение».

А затем установим срок его действия в 2 минуты (120 секунд) с помощью команды EXPIRE.

Это устанавливает, что ключ resource:lock будет удален через 120 секунд. Можно проверить, как долго ключ будет существовать, с помощью команды TTL. Она возвращает количество секунд до его удаления. Подождав 114 секунд и выполнив ту же команду снова, видим, что он был удален.

Значение -2 для TTL ключа означает, что ключ (больше) не существует. Проверяем с помощью команды EXISTS.

Если вы SET-ите новое значение для ключа, его TTL будет сброшен. Создать значение сразу со сроком действия. Это можно сделать либо с помощью специальной команды SETEX, либо с помощью SET и опции EX.

Мы видим, что время жизни было установлено при создании.

Теперь используем команду SET, чтобы обновить значение. Мы видим, что время жизни было сброшено.

```
[redis-1:6379> SET resource:lock "Redis Demo"
OK
[redis-1:6379> EXPIRE resource:lock 120
(integer) 1
[redis-1:6379> TTL resource:lock
(integer) 114
[redis-1:6379> TTL resource:lock
(integer) 60
[redis-1:6379> TTL resource:lock
(integer) 11
[redis-1:6379> TTL resource:lock
(integer) 3
[redis-1:6379> TTL resource:lock
(integer) -2
[redis-1:6379> EXISTS resource:lock
(integer) 0
[redis-1:6379> SET resource:lock "Redis Demo 1" EX 120
OK
[redis-1:6379> TTL resource:lock
(integer) 114
[redis-1:6379> SET resource:lock "Redis Demo 2"
OK
[redis-1:6379> TTL resource:lock
(integer) -1
redis-1:6379> █
```

Структуры данных "Список" (List)

Добавить новый элемент в конец несуществующего списка с именем skills с помощью команды RPUSH.

Мы видим, что теперь список содержит 1 элемент. Давайте добавим еще один навык в список skills.

Теперь посмотрим на значения, которые в данный момент находятся в списке skills. Можем использовать команду GET?

Команда GET относится к группе String и не может быть использована для структур list. В таком случае используют команду LRANGE.

LPUSH добавляет новое значение в начало списка.

LRANGE возвращает подмножество списка. Она принимает индекс первого элемента, который требуется получить, в качестве первого параметра, и

индекс последнего элемента, который требуется получить, в качестве второго параметра. Значение -1 для второго параметра означает получение элементов до конца списка.

LLEN возвращает текущую длину списка.

LPOP удаляет первый элемент из списка и возвращает его.

RPOP удаляет последний элемент из списка и возвращает его.

Примечание: теперь в списке остался только один элемент

```
[redis-1:6379> RPUSH skills "Oracle RDBMS"
(integer) 1
[redis-1:6379> RPUSH skills "Redis"
(integer) 2
[redis-1:6379> GET skills
(error) WRONGTYPE Operation against a key holding the wrong kind of value
[redis-1:6379> LRANGE skills 0 -1
1) "Oracle RDBMS"
2) "Redis"
[redis-1:6379> LPUSH skills "SQL Server"
(integer) 3
[redis-1:6379> LRANGE skills 0 -1
1) "SQL Server"
2) "Oracle RDBMS"
3) "Redis"
[redis-1:6379> LRANGE skills 0 -1
1) "SQL Server"
2) "Oracle RDBMS"
3) "Redis"
[redis-1:6379> LRANGE skills 0 1
1) "SQL Server"
2) "Oracle RDBMS"
[redis-1:6379> LRANGE skills 1 2
1) "Oracle RDBMS"
2) "Redis"
[redis-1:6379> LLEN skills
(integer) 3
[redis-1:6379> LPOP skills
"SQL Server"
[redis-1:6379> RPOP skills
"Redis"
[redis-1:6379> LLEN skills
(integer) 1
[redis-1:6379> LRANGE skills 0 -1
1) "Oracle RDBMS"
redis-1:6379> █
```

Структуры данных "Множество" (Set)

SADD добавляет заданное значение в множество.

SMEMBERS возвращает список всех элементов этого множества.

SREM удаляет заданное значение из множества.

SISMEMBER проверяет, находится ли заданное значение в множестве.

Cassandra является элементом nosql:products, а MongoDB — нет (поэтому результат 0).

SUNION объединяет два или более множества и возвращает список всех элементов.

Сначала создадим еще одно множество продуктов RDBMS

Теперь создадим объединение двух множеств

SUNIONSTORE объединяет два или более множества и сохраняет результат в новое множество.

SINTER находит пересечение двух или более множеств и возвращает список пересекающихся элементов.

```
[redis-1:6379> SADD nosql:products "Cassandra"
(integer) 1
[redis-1:6379> SADD nosql:products "Redis"
(integer) 1
[redis-1:6379> SADD nosql:products "MongoDB"
(integer) 1
[redis-1:6379> SMEMBERS nosql:products
1) "Cassandra"
2) "Redis"
3) "MongoDB"
[redis-1:6379> SREM nosql:products "MongoDB"
(integer) 1
[redis-1:6379> SMEMBERS nosql:products
1) "Cassandra"
2) "Redis"
[redis-1:6379> SISMEMBER nosql:products "Cassandra"
(integer) 1
[redis-1:6379> SISMEMBER nosql:products "MongoDB"
(integer) 0
[redis-1:6379> SADD rdbms:products "Oracle"
(integer) 1
[redis-1:6379> SADD rdbms:products "SQL Server"
(integer) 1
[redis-1:6379> SUNION rdbms:products nosql:products
1) "Oracle"
2) "SQL Server"
3) "Cassandra"
4) "Redis"
[redis-1:6379> SUNIONSTORE database:products rdbms:products nosql:products
(integer) 4
[redis-1:6379> SMEMBERS database:products
1) "Oracle"
2) "SQL Server"
3) "Cassandra"
4) "Redis"
[redis-1:6379> SADD favorite:products "Cassandra"
(integer) 1
[redis-1:6379> SADD favorite:products "Oracle"
(integer) 1
[redis-1:6379> SINTER database:products favorite:products
1) "Cassandra"
2) "Oracle"
redis-1:6379> █
```

Структуры данных "Упорядоченное множество" (Sorted Set)

ZADD добавляет один или несколько элементов в упорядоченное множество.

ZRANGE возвращает диапазон элементов в упорядоченном множестве по индексу (отсортировано от меньшего к большему, т.е. по возрастанию), опционально также возвращает оценки. Индекс начинается с 0.

ZREVRANGE возвращает диапазон элементов в упорядоченном множестве по индексу (отсортировано от большего к меньшему, т.е. по убыванию), дополнительно также возвращает оценки. Индекс начинается с 0.

```
[redis-1:6379> ZADD pioneers 1940 "Alan Kay"
(integer) 1
[redis-1:6379> ZADD pioneers 1906 "Grace Hopper"
(integer) 1
[redis-1:6379> ZADD pioneers 1953 "Richard Stallman"
(integer) 1
[redis-1:6379> ZADD pioneers 1965 "Yukihiro Matsumoto"
(integer) 1
[redis-1:6379> ZADD pioneers 1916 "Claude Shannon"
(integer) 1
[redis-1:6379> ZADD pioneers 1969 "Linus Torvalds"
(integer) 1
[redis-1:6379> ZADD pioneers 1957 "Sophie Wilson"
(integer) 1
redis-1:6379> ZADD pioneers 1912 "Alan Turing"
(integer) 1
[redis-1:6379> ZRANGE pioneers 2 4
1) "Claude Shannon"
2) "Alan Kay"
3) "Richard Stallman"
[redis-1:6379> ZRANGE pioneers 2 4 WITHSCORES
1) "Claude Shannon"
2) "1916"
3) "Alan Kay"
4) "1940"
5) "Richard Stallman"
6) "1953"
[redis-1:6379> ZREVRANGE pioneers 0 2
1) "Linus Torvalds"
2) "Yukihiro Matsumoto"
3) "Sophie Wilson"
redis-1:6379> █
```

Структуры данных "Хэш" (Hash)

HSET устанавливает значение для поля в хэше, хранящемся по заданному ключу.

Чтобы получить сохраненные данные, используйте команду HGETALL

Вы также можете установить несколько полей одновременно с помощью команды HMSET.

Давайте убедимся, что это сработало и был создан новый хэш.

Если требуется получить значение только одного поля, это также возможно с помощью команды HGET.

Числовые значения в полях хэша обрабатываются точно так же, как и в простых строках, и существуют операции для атомарного увеличения этого значения.

```
[redis-1:6379] > HSET user:1000 name "John Smith"
(integer) 1
[redis-1:6379] > HSET user:1000 email "john.smith@example.com"
(integer) 1
[redis-1:6379] >
[redis-1:6379] > HSET user:1000 password "s3cret"
(integer) 1
[redis-1:6379] > HGETALL user:1000
1) "name"
2) "John Smith"
3) "email"
4) "john.smith@example.com"
5) "password"
6) "s3cret"
[redis-1:6379] > HMSET user:1001 name "Mary Jones" password "hidden" email "mjones@example.com"
OK
[redis-1:6379] > HGETALL user:1001
1) "name"
2) "Mary Jones"
3) "password"
4) "hidden"
5) "email"
6) "mjones@example.com"
[redis-1:6379] > HGET user:1001 name
"Mary Jones"
[redis-1:6379] > HSET user:1000 visits 10
(integer) 1
[redis-1:6379] > HINCRBY user:1000 visits 1
(integer) 11
[redis-1:6379] > HINCRBY user:1000 visits 10
(integer) 21
[redis-1:6379] > HDEL user:1000 visits
(integer) 1
[redis-1:6379] >
```

Дополнительные возможности Redis

Геопространственные данные

Redis поддерживает работу с географическими координатами через команды GEO

```
[redis-1:6379> GEOADD cities:russia 37.6176 55.7558 "Moscow"
(integer) 0
redis-1:6379> GEOADD cities:russia 30.3351 59.9311 "Saint Petersburg"
(integer) 0
redis-1:6379> GEOADD cities:russia 82.9346 55.0084 "Novosibirsk"
(integer) 0
redis-1:6379> GEORADIUS cities:russia 37.6176 55.7558 500 km WITHDIST
1) 1) "Moscow"
   2) "0.0002"
```

Python

Установка библиотеки

```
(base) sofia@MacBook-Air-2 ~ % conda install redis-py
Channels:
- defaults
- conda-forge
Platform: osx-arm64
Collecting package metadata (repodata.json): done
Solving environment: done

## Package Plan ##

environment location: /opt/anaconda3

added / updated specs:
- redis-py
```

The following packages will be downloaded:

| package | build | |
|---------------------------|-----------------|--------|
| async-timeout-5.0.1 | py311hca03da5_0 | 16 KB |
| ca-certificates-2025.7.15 | hca03da5_0 | 127 KB |
| certifi-2025.8.3 | py311hca03da5_0 | 161 KB |
| conda-24.11.3 | py311hca03da5_0 | 1.2 MB |
| redis-py-5.2.0 | py311hca03da5_0 | 527 KB |
| | Total: | 2.0 MB |

The following NEW packages will be INSTALLED:

```
async-timeout      pkgs/main/osx-arm64::async-timeout-5.0.1-py311hca03da5_0
redis-py          pkgs/main/osx-arm64::redis-py-5.2.0-py311hca03da5_0
```

The following packages will be UPDATED:

```
ca-certificates      2024.9.24-hca03da5_0 --> 2025.7.15-hca03da5_0
certifi              2024.8.30-py311hca03da5_0 --> 2025.8.3-py311hca03da5_0
conda                24.9.2-py311hca03da5_0 --> 24.11.3-py311hca03da5_0
```

Proceed ([y]/n)? y

Downloading and Extracting Packages:

```
Preparing transaction: done
Verifying transaction: done
Executing transaction: done
(base) sofia@MacBook-Air-2 ~ %
```

Подключение к Redis из Python и проверка соединения

```

import redis
r = redis.Redis(host='localhost', port=6379, db=0)

!pip install redis
Requirement already satisfied: redis in /opt/anaconda3/lib/python3.11/site-packages (6.4.0)

r.ping()

True

r.set('foo','bar')

True

```

Полный пример для Jupyter:

```

import redis

# Создаем подключение (используем localhost, т.к. Jupyter на хосте VM)
# decode_responses=True автоматически преобразует ответы из байтов в строки
# r = redis.Redis(host='localhost', port=6379, db=0, decode_responses=True)
r = redis.Redis(host='localhost', port=6379, db=0, decode_responses=True)

# 1. Проверяем соединение
try:
    if r.ping():
        print("Соединение с Redis установлено!")
except redis.exceptions.ConnectionError as e:
    print(f"Не удалось подключиться к Redis: {e}")

# 2. Устанавливаем значение
key = 'message:1'
value = 'Hello from Python!'
result = r.set(key, value)
print(f"Команда SET для ключа '{key}' выполнена успешно: {result}")

# 3. Получаем значение обратно
retrieved_value = r.get(key)
print(f"Полученное значение для ключа '{key}': {retrieved_value}")

# 4. Удаляем ключ для очистки
r.delete(key)
print(f"Ключ '{key}' удален.")

```

Соединение с Redis установлено!
Команда SET для ключа 'message:1' выполнена успешно: True
Полученное значение для ключа 'message:1': Hello from Python!
Ключ 'message:1' удален.

ИНДИВИДУАЛЬНОЕ ЗАДАНИЕ

Задание 3 (Redis)

Сохранить в хэш request:xyz данные о ip, user_agent, timestamp. Получить только ip и user_agent с помощью HMGET.

На питоне:

```
import redis
from datetime import datetime

# подключение к Redis
r = redis.Redis(host="localhost", port=6379, db=0)

# сохраняем данные в хэш
r.hset("request:xyz", mapping={
    "ip": "192.168.0.1",
    "user_agent": "Mozilla/5.0",
    "timestamp": datetime.now().isoformat()
})

# получаем только ip и user_agent
ip, user_agent = r.hmget("request:xyz", "ip", "user_agent")

print("IP:", ip.decode())
print("User-Agent:", user_agent.decode())
```

```
IP: 192.168.0.1
User-Agent: Mozilla/5.0
```

Проверим через терминал: сначала выведем все содержимое хэша, а потом только ip и user_agent с помощью HMGET.

```
[redis-1:6379> HGETALL request:xyz
1) "ip"
2) "192.168.0.1"
3) "user_agent"
4) "Mozilla/5.0"
5) "timestamp"
6) "2025-09-09T15:23:39.551179"
[redis-1:6379> HMGET request:xyz ip user_agent
1) "192.168.0.1"
2) "Mozilla/5.0"
redis-1:6379> █
```

Только при помощи терминала:

```
redis-1:6379> DEL request:xyz
(integer) 1
redis-1:6379> HSET request:xyz ip "192.168.1.100" user_agent "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) Chrome/127.0.0.1 Safari/537.36" timestamp "1725891234"
(integer) 3
redis-1:6379> HGETALL request:xyz
1) "timestamp"
2) "1725891234"
3) "user_agent"
4) "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) Chrome/127.0.0.1 Safari/537.36"
5) "ip"
6) "192.168.1.100"
redis-1:6379> HMGET request:xyz ip user_agent
1) "192.168.1.100"
2) "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) Chrome/127.0.0.1 Safari/537.36"
redis-1:6379> █
```

Я удалила старый ключ, заново записала в Redis хэш с ip, user_agent и timestamp, проверила все данные и выбрала отдельно только ip и user_agent.

Работа с Neo4J

Подключение к Cypher Shell

:help, чтобы получить список доступных команд

```

[(base) sofia@MacBook-Air-2 ~ % sudo docker exec -ti neo4j-1 ./bin/cypher-shell -u neo4j -p abc123abc123
[Password:
Connected to Neo4j using Bolt protocol version 5.4 at neo4j://localhost:7687 as user neo4j.
Type :help for a list of available commands or :exit to exit the shell.
Note that Cypher queries must end with a semicolon.
[neo4j@neo4j> :help

Available commands:
:begin      Open a transaction
:commit     Commit the currently open transaction
:connect    Connects to a database
:disconnect Disconnects from database
:exit       Exit the logger
:help        Show this help message
:history    Statement history
:impersonate Impersonate user
:param      Set the value of a query parameter
:rollback   Rollback the currently open transaction
:source     Executes Cypher statements from a file
:sysinfo    Neo4j system information
:use        Set the active database

For help on a specific command type:
:help command

Keyboard shortcuts:
Up and down arrows to access statement history.
Tab for autocompletion of commands, hit twice to select suggestion from list using arrow keys.

For help on cypher please visit:
https://neo4j.com/docs/cypher-manual/current/

neo4j@neo4j> █

```

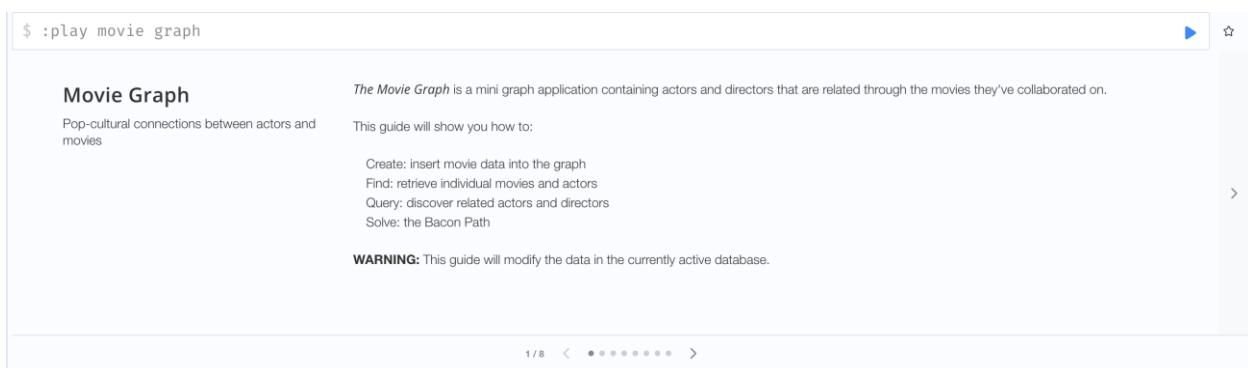
Подключение через Neo4J Browser

подробно описано в разделе Установка в самом начале

Граф фильмов

Культурные связи между актёрами и фильмами

В верхней панели ввела :play movie graph, чтобы начать работать с учебным пособием Movie Graph (Граф фильмов).



Загрузка графа фильмов

Использовала закрепление (-pin) на панели Movie Graph, чтобы закрепить эту панель сверху.

Нажала на следующий шаг в навигационной панели внизу, чтобы перейти к 2/8.

Нажала на маленькую стрелку слева от команды CREATE .., и она должна появиться в верхней панели.

Выполнила команду CREATE .., чтобы создать граф фильмов и добавить некоторые пробные данные о фильмах.

The screenshot shows the Neo4j browser interface. On the left, there's a sidebar with icons for help, graph, table, text, and a search bar. The main area has a title bar 'neo4j\$' and a command line '\$_ :play movie graph'. Below this, a section titled 'The Movie Graph' contains a 'Create' button. A large code block is displayed, starting with a multi-line Cypher query to create nodes for cast members and a movie, followed by a warning about adding data to the database. At the bottom of this section are links for 'help', 'cypher', and 'CREATE'. A navigation bar at the bottom indicates '2 / 8'. The bottom half of the screen shows a graph visualization with nodes for 'The Matrix' movie and its cast members like Keanu Reeves, Laurence Fishburne, and Carrie-Anne Moss. An 'Overview' panel on the right shows statistics: 19 nodes total, 9 Person nodes, 10 Movie nodes, 20 relationships total, 10 ACTED_IN relationships, and 10 DIRECTED relationships.

Прежде чем продолжить со следующим шагом, давайте посмотрим, как выглядит график. Нажала на иконку базы данных в левом верхнем углу браузера Neo4j.

The screenshot shows the Neo4j Browser interface. On the left, the 'Database Information' sidebar displays statistics like node counts (348), relationship types (ACTED_IN, FOLLOWED, PRODUCED, REVIEWED, WROTE), and property keys (born, name, rating, released, roles, since, summary, tagline, title). It also shows connected users and the DBMS cluster role.

In the center, a code editor window titled 'neo4j\$' contains the following Cypher query:

```

@CREATE (TheMatrix:Movie {title:'The Matrix', released:1999, tagline:'Welcome to the Real World'})
CREATE (Keanu:Person {name:'Keanu Reeves', born:1964})
CREATE (Carrie:Person {name:'Carrie-Anne Moss', born:1967})
CREATE (Laurence:Person {name:'Laurence Fishburne', born:1961})
CREATE (Hugo:Person {name:'Hugo Weaving', born:1960})
CREATE (LillyW:Person {name:'Lilly Wachowski', born:1967})
CREATE (LanaW:Person {name:'Lana Wachowski', born:1965})
CREATE (Joels:Person {name:'Joel Silver', born:1952})
CREATE
(Keanu)-[:ACTED_IN {roles:['Neo']}]→(TheMatrix),

```

To the right, a graph visualization shows nodes for 'The Matrix' movie and several actors (Keanu Reeves, Carrie-Anne Moss, Laurence Fishburne, Hugo Weaving, Lilly Wachowski, Lana Wachowski, Joel Silver) connected by directed edges representing their roles in the movie.

Мы можем увидеть различные Node Labels, Relationship Types и Property Keys, которые были созданы для графа фильмов, а также сколько их создано для каждого типа.

Примеры запросов

Перешла к шагу 3/8, чтобы найти несколько примеров операторов Cypher для поиска информации в графе.

Первый запрос находит актёра по имени "Том Хэнкс".

The screenshot shows the Neo4j browser interface. The top bar has the title "neo4j\$". Below it is a toolbar with icons for file operations (New, Open, Save, etc.). The main area is a query editor with the command `$:play movie graph`. To the left, there's a sidebar titled "Find" with sections for "The Movie Graph" and "Example queries for finding individual nodes". The "Example queries" section contains several examples of Cypher queries:

- Find the actor named "Tom Hanks" ...
Query: `@MATCH (tom {name: "Tom Hanks"}) RETURN tom`
- Find the movie with title "Cloud Atlas" ...
Query: `@MATCH (cloudAtlas {title: "Cloud Atlas"}) RETURN cloudAtlas`
- Find 10 people...
Query: `@MATCH (people:Person) RETURN people.name LIMIT 10`
- Find movies released in the 1990s...
Query: `@MATCH (nineties:Movie) WHERE nineties.released >= 1990 AND nineties.released < 2000 RETURN nineties.title`

At the bottom, there are navigation controls: a page number "3/8", back and forward arrows, and a zoom slider.

The screenshot shows the Neo4j browser interface. On the left, there's a vertical toolbar with icons for Help, Graph, Table, Text, and Query. The Graph icon is currently selected. The main workspace contains a query in the top bar: `neo4j$ MATCH (tom {name: "Tom Hanks"}) RETURN tom`. Below the query, the results are displayed in a table format. The right side of the screen shows an Overview panel with Node labels (`*` (1) and `Person` (1)), and a message indicating 1 node and 0 relationships.

The screenshot shows the Neo4j browser interface. The top navigation bar has a back arrow, a search input field containing "neo4j\$", and a right arrow. On the left sidebar, there are icons for a database, a star, and a play button. The main area contains a query editor with the following content:

Notice the syntax pattern
Try looking for other movies or actors

Find 10 people...

help `MATCH WHERE RETURN`

```
① MATCH (people:Person) RETURN people.name LIMIT 10
```

Find movies released in the 1990s...

```
② MATCH (nineties:Movie) WHERE nineties.released >= 1990 AND nineties.released < 2000 RETURN nineties.title
```

The screenshot shows the Neo4j Browser interface. On the left, there's a vertical toolbar with icons for Graph (selected), Table, Text, Code, Help, Refresh, and Settings. The main query window at the top contains the Cypher command: `neo4j$ MATCH (tom {name: "Tom Hanks"}) RETURN tom`. Below the query, a single purple circular node labeled "Tom Hanks" is displayed. To the right, the "Overview" panel shows "Node labels" with "Person (1)" highlighted in purple, and a message stating "Displaying 1 nodes, 0 relationships." A tooltip at the bottom left says "Use Cmd + scroll to zoom" with a "Don't show again" link.

Теперь найдём фильм с названием "Cloud Atlas"

The screenshot shows the Neo4j browser interface. In the top-left corner, there's a sidebar with various icons: a star, a play button, a refresh, a gear, a question mark, a magnifying glass, and a refresh. The main area has a title bar 'neo4j\$' and a status bar at the bottom with '3 / 8' and navigation arrows.

In the center, there are three code snippets:

- The first snippet is highlighted in green: `MATCH (cloudAtlas {title: "Cloud Atlas"}) RETURN cloudAtlas`. It shows a single orange node labeled 'Cloud Atlas' in the graph view.
- The second snippet is greyed out: `MATCH (people:Person) RETURN people.name LIMIT 10`.
- The third snippet is also greyed out: `MATCH (nineties:Movie) WHERE nineties.released > 1990 AND nineties.released < 2000 RETURN nineties.title`.

On the right side, there's an 'Overview' panel with 'Node labels' (Star (1), Movie (1)) and 'Relationship types' (none listed). Below it, it says 'Displaying 1 nodes, 0 relationships.'

Результат похож на предыдущий, но в этот раз возвращается другой тип узла — Movie (Movie node), и поэтому он показан другим цветом. Вы можете кликнуть по узлу и развернуть связь с/на узел фильма "Cloud Atlas".

Нажмите на кнопку "Развернуть" (expand), и вы увидите все узлы, связанные с узлом фильма.

This screenshot shows the same Neo4j browser interface after expanding the 'Cloud Atlas' node. The central graph view now displays several purple nodes connected to the central orange 'Cloud Atlas' node by various relationships:

- Relationships from 'Cloud Atlas':**
 - Tom Tykwer: DIRECTED
 - Jim Broadbent: IN_FILM
 - Halle Berry: ACTED_IN
 - Tom Hanks: ACTED_IN
 - Lana Wachowski: DIRECTED
 - Jessica Thomas: REVIEWED
 - Stefan Arndt: PRODUCED
 - David Mitchell: WROTE
- Relationships to 'Cloud Atlas':**
 - Tom Tykwer: WRITTEN_BY
 - Jim Broadbent: DIRECTED_BY
 - Halle Berry: ACTED_IN_BY
 - Tom Hanks: ACTED_IN_BY
 - Lana Wachowski: DIRECTED_BY
 - Jessica Thomas: REVIEWED_BY
 - Stefan Arndt: PRODUCED_BY
 - David Mitchell: WROTE_BY

A tooltip at the bottom of the graph area says: 'Use Cmd + scroll to zoom' and 'Don't show again'.

The right-hand 'Overview' panel now includes 'Relationship types' (ACTED_IN (4), DIRECTED (3), WRITEN_BY (1), PRODUCED (1), REVIEWED (1)). It also says 'Displaying 1 nodes, 0 relationships.'

Мы видим, что все они относятся к типу Person (что показывается одинаковым цветом).

Выполнила все запросы на панели 3/8

The screenshot shows the Neo4j Browser interface. The top panel has two queries:

```
neo4j$ MATCH (people:Person) RETURN people.name LIMIT 10
Find movies released in the 1990s...
```

```
neo4j$ @MATCH (nineties:Movie) WHERE nineties.released >= 1990 AND nineties.released < 2000 RETURN nineties.title
```

The bottom panel displays the results of the first query:

| people.name |
|----------------------|
| "Keanu Reeves" |
| "Carrie-Anne Moss" |
| "Laurence Fishburne" |
| "Hugo Weaving" |
| "Lilly Wachowski" |
| "Lana Wachowski" |

Started streaming 10 records after 52 ms and completed after 59 ms.

The screenshot shows the Neo4j Browser interface. The top panel has two queries:

```
neo4j$ Find movies released in the 1990s...
```

```
neo4j$ @MATCH (nineties:Movie) WHERE nineties.released >= 1990 AND nineties.released < 2000 RETURN nineties.title
```

The bottom panel displays the results of the second query:

| nineties.title |
|--------------------------|
| "The Matrix" |
| "The Devil's Advocate" |
| "A Few Good Men" |
| "As Good as It Gets" |
| "What Dreams May Come" |
| "Snow Falling on Cedars" |

Started streaming 20 records after 59 ms and completed after 141 ms.

neo4j\$ MATCH (people:Person) RETURN people.name LIMIT 10

\$:play movie graph

The Movie Graph

List all Tom Hanks movies...

```
④ MATCH (tom:Person {name: "Tom Hanks"})-[:ACTED_IN]→(tomHanksMovies) RETURN tom,tomHanksMovies
```

Query

Finding patterns within the graph.

Actors are people who acted in movies
Directors are people who directed a movie
What other relationships exist?

:help ④ MATCH

Who directed "Cloud Atlas"?

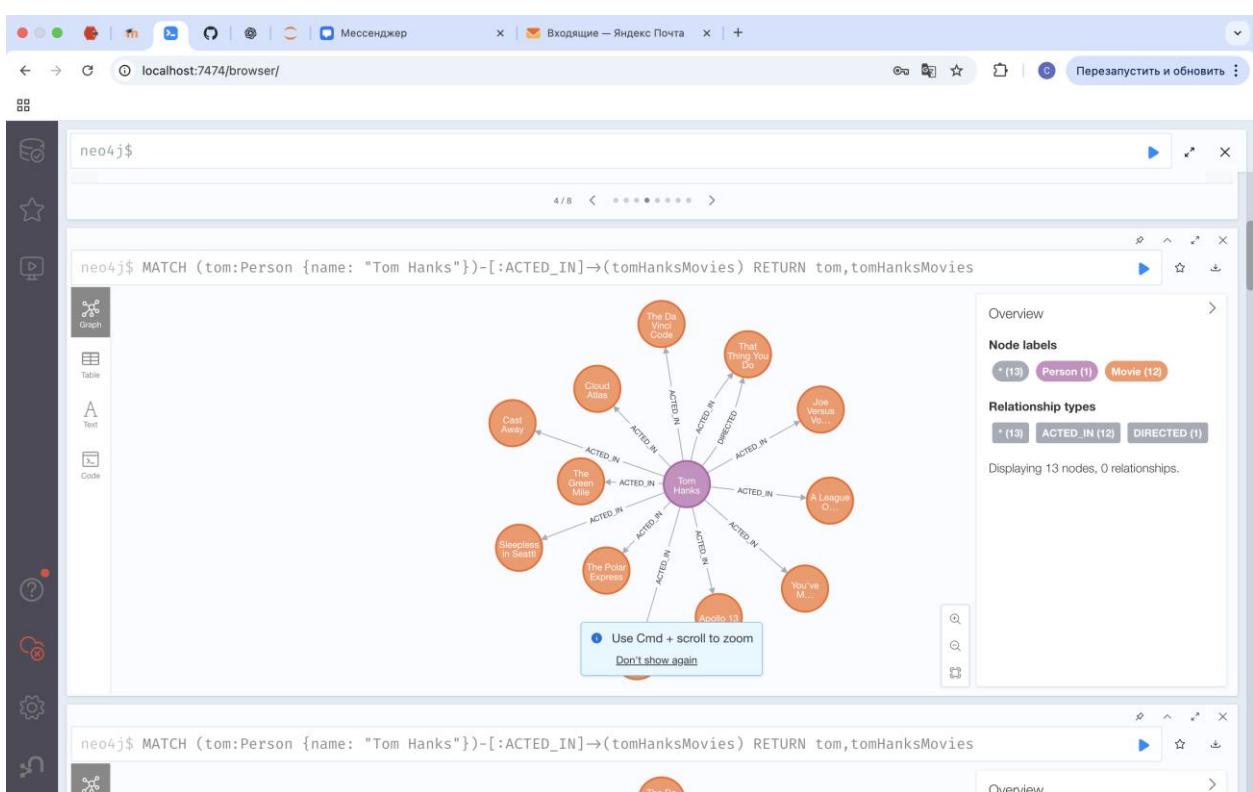
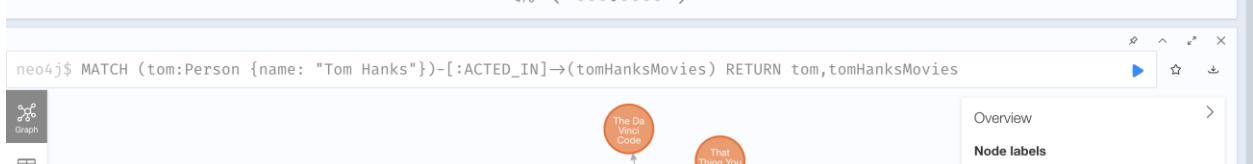
```
④ MATCH (cloudAtlas {title: "Cloud Atlas"})←[:DIRECTED]-(directors) RETURN directors.name
```

Tom Hanks' co-actors...

```
④ MATCH (tom:Person {name:"Tom Hanks"})-[:ACTED_IN]→(m)←[:ACTED_IN]-(coActors) RETURN coActors.name
```

How people are related to "Cloud Atlas"...

```
④ MATCH (people:Person)-[relatedTo]-(Movie {title: "Cloud Atlas"}) RETURN people.name, Type(relatedTo), relatedTo
```



neo4j\$

Finding patterns within the graph.

Who directed "Cloud Atlas"?

```
④ MATCH (cloudAtlas {title: "Cloud Atlas"})←[:DIRECTED]-(directors) RETURN directors.name
```

Actors are people who acted in movies
Directors are people who directed a movie
What other relationships exist?

Tom Hanks' co-actors...

```
④ MATCH (tom:Person {name:"Tom Hanks"})-[ACTED_IN]→(m)←[:ACTED_IN]-(coActors) RETURN coActors.name
```

How people are related to "Cloud Atlas"...

```
④ MATCH (people:Person)-[relatedTo]-(:Movie {title: "Cloud Atlas"}) RETURN people.name, Type(relatedTo), relatedTo
```

4/8 < ⏪ ⏴ ⏵ ⏩ ⏾ >

neo4j\$ MATCH (cloudAtlas {title: "Cloud Atlas"})←[:DIRECTED]-(directors) RETURN directors.name

| directors.name |
|---------------------|
| 1 "Tom Tykwer" |
| 2 "Lilly Wachowski" |
| 3 "Lana Wachowski" |

neo4j\$

Tom Hanks' co-actors...

help ④ MATCH

```
④ MATCH (tom:Person {name:"Tom Hanks"})-[ACTED_IN]→(m)←[:ACTED_IN]-(coActors) RETURN coActors.name
```

How people are related to "Cloud Atlas"...

```
④ MATCH (people:Person)-[relatedTo]-(:Movie {title: "Cloud Atlas"}) RETURN people.name, Type(relatedTo), relatedTo
```

4/8 < ⏪ ⏴ ⏵ ⏩ ⏾ >

neo4j\$ MATCH (tom:Person {name:"Tom Hanks"})-[ACTED_IN]→(m)←[:ACTED_IN]-(coActors) RETURN coActors.name

| coActors.name |
|------------------|
| 1 "Ed Harris" |
| 2 "Gary Sinise" |
| 3 "Kevin Bacon" |
| 4 "Bill Paxton" |
| 5 "Parker Posey" |

localhost:7474/browser/

```
neo4j$ How people are related to "Cloud Atlas"...
@MATCH (people:Person)-[relatedTo]-(:Movie {title: "Cloud Atlas"}) RETURN people.name, Type(relatedTo), relatedTo
```

neo4j\$ MATCH (people:Person)-[relatedTo]-(:Movie {title: "Cloud Atlas"}) RETURN people.name, Type(relatedTo), relatedTo

| people.name | Type(relatedTo) | relatedTo |
|-------------|-----------------|---|
| "Tom Hanks" | "ACTED_IN" | { "identity": 137, "start": 71, "end": 105, "type": "ACTED_IN", "properties": { "roles": ["Zachry", "Dr. Henry Goose", "Isaac Sachs", "Dermot Hoggins"] }, "elementId": "5:99170d14-e738-47ed-8558-43303733843d:137", "startNodeElementId": "4:99170d14-e738-47ed-8558-43303733843d:71", "endNodeElementId": "4:99170d14-e738-47ed-8558-43303733843d:105" } |

localhost:7474/browser/

The Movie Graph

Movies and actors up to 4 "hops" away from Kevin Bacon

```
@MATCH (bacon:Person {name:"Kevin Bacon"})-[*1..4]-(hollywood)
RETURN DISTINCT hollywood
```

Bacon path, the shortest path of any relationships to Meg Ryan

```
@MATCH p=shortestPath(
(bacon:Person {name:"Kevin Bacon"})-[*]-(meg:Person {name:"Meg Ryan"})
)
RETURN p
```

Note you only need to compare property values like this when first creating relationships

neo4j\$ MATCH (bacon:Person {name:"Kevin Bacon"})-[*1..4]-(hollywood) RETURN DISTINCT hollywood



Overview
Node labels
• (135) Movie (27) Person (108)
Relationship types
• (180) ACTED_IN (127)
DIRECTED (29) WROTE (8)
PRODUCED (11) FOLLOWS (1)
REVIEWED (4)

Найдите "Бейконовскую цепочку" — самый короткий путь через любые отношения к Meg Ryan.

Результат покажет самый короткий путь от Kevin Bacon до Meg Ryan.

neo4j\$ Variable length patterns
Built-in shortestPath() algorithm

```
④ MATCH p=shortestPath(
  (bacon:Person {name:"Kevin Bacon"})-[*]-(meg:Person {name:"Meg Ryan"})
)
RETURN p
```

Note you only need to compare property values like this when first creating relationships

neo4j\$ MATCH p=shortestPath((bacon:Person {name:"Kevin Bacon"})-[*]-(meg:Person {name:"Meg Ryan"})) RETURN p

Overview
Node labels: Person (3), Movie (2)
Relationship types: ACTED_IN (4)
Displaying 5 nodes, 4 relationships.

neo4j\$:play movie graph

The Movie Graph

Recommend

Let's recommend new co-actors for Tom Hanks. A basic recommendation approach is to find connections past an immediate neighborhood which are themselves well connected.

For Tom Hanks, that means:

- Find actors that Tom Hanks hasn't yet worked with, but his co-actors have.
- Find someone who can introduce Tom to his potential co-actor.

Extend Tom Hanks co-actors, to find co-co-actors who haven't worked with Tom Hanks...

```
④ MATCH (tom:Person {name:"Tom Hanks"})-[:ACTED_IN]→(m)←[:ACTED_IN]-(coActors),
      (coActors)-[:ACTED_IN]→(m2)←[:ACTED_IN]-(cocoActors)
WHERE NOT (tom)-[:ACTED_IN]→()←[:ACTED_IN]-(cocoActors) AND tom ≠ cocoActors
RETURN cocoActors.name AS Recommended, count(*) AS Strength ORDER BY Strength DESC
```

Find someone to introduce Tom Hanks to Tom Cruise

```
④ MATCH (tom:Person {name:"Tom Hanks"})-[:ACTED_IN]→(m)←[:ACTED_IN]-(coActors),
      (coActors)-[:ACTED_IN]→(m2)←[:ACTED_IN]-(cruise:Person {name:"Tom Cruise"})
RETURN tom, m, coActors, m2, cruise
```

neo4j\$ MATCH (tom:Person {name:"Tom Hanks"})-[:ACTED_IN]→(m)←[:ACTED_IN]-(coActors), (coActors)-[:ACTED_IN]→(m2)←... →

| Recommended | Strength |
|--------------|----------|
| "Tom Cruise" | 5 |

The screenshot shows the Neo4j browser interface. The top navigation bar includes tabs for 'Мессенджер' (Messenger) and 'Входящие — Яндекс Почта' (Incoming — Yandex Mail). The address bar shows the URL 'localhost:7474/browser/'. The main area displays a terminal window with the command `:play movie graph`. Below this, a section titled 'Clean up' contains a note about deleting the movie graph, followed by a warning that all Person and Movie nodes will be removed. A highlighted query `MATCH (n) DETACH DELETE n` is shown, along with a note to prove the graph is gone using `MATCH (n) RETURN n`. The bottom part of the screen shows the results of the execution: `neo4j$ MATCH (n) DETACH DELETE n` and the message 'Deleted 171 nodes, deleted 253 relationships, completed after 688 ms.'

The screenshot shows the Neo4j Browser interface running at localhost:7474/browser/. The main window displays the 'Clean up' section for the 'The Movie Graph'. It includes a note about deleting nodes and relationships, a warning about removing Person and Movie nodes, and two Cypher queries:

```
neo4j$ :play movie graph
The Movie Graph
Delete all Movie and Person nodes, and their relationships
Clean up
When you're done experimenting, you can remove the movie data set.

Note:
Nodes can't be deleted if relationships exist
Delete both nodes and relationships together
WARNING: This will remove all Person and Movie nodes!
:help ⚒ DELETE
```

Below this, a query is run:

```
neo4j$ MATCH (n) RETURN n
(neo4j) (no changes, no records)
```

ИНДИВИДУАЛЬНОЕ ЗАДАНИЕ

Загрузка данных

Создание компаний

The screenshot shows the Neo4j browser interface. On the left, the 'Database Information' sidebar is visible, showing the database is 'neo4j'. It includes sections for 'Use database', 'Node labels' (with 'Company' selected), 'Relationship types', 'Property keys', 'Connected as', and connection details ('Username: neo4j', 'Roles: -'). The main workspace displays a graph with four nodes: 'GHI Group', 'DEF Ltd', 'JKL Co', and 'XYZ Inc', each represented by a blue circle. The command line at the bottom shows: `neo4j$ MATCH (n:Company) RETURN n LIMIT 25`. The right panel shows an 'Overview' section with 'Node labels' (Company [5]) and a message: 'Displaying 5 nodes, 0 relationships.' A tooltip at the bottom says: 'Use Cmd + scroll to zoom' and 'Don't show again'.

Создание сотрудников

The screenshot shows the Neo4j browser interface. The 'Database Information' sidebar indicates the database is 'neo4j'. It includes sections for 'Use database', 'Node labels' (with 'Employee' selected), 'Relationship types', 'Property keys', 'Connected as', and connection details ('Username: neo4j', 'Roles: -'). The main workspace displays a graph with ten red circular nodes, each labeled with a name: 'David Miller', 'Emily Gray', 'Sarah Johnson', 'John Doe', 'Jane Smith', 'Bob Green', 'Alice Blue', 'Frank Red', 'Grace Blue', and 'Helen Purple'. The command line at the bottom shows: `neo4j$ MATCH (n:Employee) RETURN n LIMIT 25`. The right panel shows an 'Overview' section with 'Node labels' (Employee [10]) and a message: 'Displaying 10 nodes, 0 relationships.' A tooltip at the bottom says: 'Use Cmd + scroll to zoom' and 'Don't show again'.

Создание проектов

The screenshot shows the Neo4j browser interface. On the left, the 'Database Information' sidebar is visible, showing the database is set to 'neo4j'. It includes sections for 'Node labels' (Company, Employee, Project), 'Relationship types' (none listed), and 'Property keys' (various fields like id, name, position, rating, etc.). The main workspace displays a graph with 10 nodes labeled Project A through Project Z. The 'Overview' panel on the right shows 'Node labels' (Project (10)) and 'Displaying 10 nodes, 0 relationships'. A tooltip at the bottom of the graph area says 'Use Cmd + scroll to zoom'.

```
neo4j$ MATCH (n:Project) RETURN n LIMIT 25
```

neo4j\$ CREATE (:Project {id: 1, name: "Project X", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 2, name: "Project Y", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 3, name: "Project Z", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 4, name: "Project A", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 5, name: "Project B", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 6, name: "Project C", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 7, name: "Project D", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 8, name: "Project E", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 9, name: "Project F", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5}), (:Project {id: 10, name: "Project G", start_date: "2023-01-01", end_date: "2023-01-31", rating: 4.5})

Added 10 labels, created 10 nodes, set 50 properties, completed after 637 ms.

Создание клиентов

The screenshot shows the Neo4j browser interface. The 'Database Information' sidebar is identical to the previous one, showing the database is set to 'neo4j'. The main workspace displays a graph with 10 nodes labeled Client A through Client Z. The 'Overview' panel on the right shows 'Node labels' (Client (10)) and 'Displaying 10 nodes, 0 relationships'. A tooltip at the bottom of the graph area says 'Use Cmd + scroll to zoom'.

```
neo4j$ MATCH (n:Client) RETURN n LIMIT 25
```

```
neo4j$ CREATE (:Client {id: 1, name: "Client A", project_id: 1}), (:Client {id: 2, name: "Client B", project_id: 2}), (:Client {id: 3, name: "Client C", project_id: 3}), (:Client {id: 4, name: "Client D", project_id: 4}), (:Client {id: 5, name: "Client E", project_id: 5}), (:Client {id: 6, name: "Client F", project_id: 6}), (:Client {id: 7, name: "Client G", project_id: 7}), (:Client {id: 8, name: "Client H", project_id: 8}), (:Client {id: 9, name: "Client I", project_id: 9}), (:Client {id: 10, name: "Client J", project_id: 10})
```

Added 10 labels, created 10 nodes, set 30 properties, completed after 882 ms.

Создание отношений

Node labels

*(35) Client Company

Employee Project

Relationship types

*(35) HAS_PROJECT

IS_CLIENT_OF PARTICIPATES_IN

WORKS_AT

Задание 1 Найдите все компании, имеющие более 6 проектов.

```
1 MATCH (c:Company)-[:HAS_PROJECT]→(p:Project)
2 WITH c, COUNT(p) AS projectCount
3 WHERE projectCount > 6
4 RETURN c.name AS Company, projectCount
5 ORDER BY projectCount DESC;
```

(no changes, no records)

Completed after 168 ms.

Задание 2 Найдите всех сотрудников, занимающих должность "Designer".

```
1 MATCH (e:Employee)
2 WHERE e.position = "Designer"
3 RETURN e.id AS EmployeeID, e.name AS Name, e.company_id AS CompanyID
4 ORDER BY e.id;
5
```

Table

| | EmployeeID | Name | CompanyID |
|---|------------|---------------|-----------|
| 1 | 5 | "Carol White" | 5 |
| 2 | 10 | "Helen Pink" | 5 |

Text

Code

Started streaming 2 records after 984 ms and completed after 1017 ms.

Задание 3 Найдите все проекты, длительностью более 8 месяцев.

```
1 MATCH (p:Project)
2 WITH p, duration.between(date(p.start_date), date(p.end_date)) AS dur
3 WHERE dur.months + dur.years * 12 > 8
4 RETURN p.id AS ProjectID, p.name AS ProjectName, dur AS Duration
5 ORDER BY Duration DESC;
6
```

Table

(no changes, no records)

Code

Completed after 568 ms.

Задание 4 Найдите всех клиентов, связанных с проектами компании "GHI Group".

```

1 MATCH (company:Company {name: "GHI Group"})-[:HAS_PROJECT]→(p:Project)←
  [:IS_CLIENT_OF]-(client:Client)
2 RETURN DISTINCT client.id AS ClientID, client.name AS ClientName, p.id AS
  ProjectID, p.name AS ProjectName
3 ORDER BY client.id;
4

```

| | ClientID | ClientName | ProjectID | ProjectName |
|---|----------|------------|-----------|-------------|
| 1 | 4 | "Client D" | 4 | "Project A" |
| 2 | 9 | "Client I" | 9 | "Project F" |

Started streaming 2 records after 1519 ms and completed after 1664 ms.

Задание 5 Найдите все роли сотрудника "Carol White" в проектах.

```

1 MATCH (e:Employee {name: "Carol White"})-[:PARTICIPATES_IN]→(p:Project)
2 RETURN p.id AS ProjectID, p.name AS ProjectName, r.role AS Role
3 ORDER BY p.id;
4

```

| | ProjectID | ProjectName | Role |
|---|-----------|-------------|---------------|
| 1 | 5 | "Project B" | "UX Designer" |

Started streaming 1 records after 1727 ms and completed after 1765 ms.

Выводы

В ходе выполнения лабораторной работы были изучены основные концепции и операции для трех типов NoSQL баз данных:

- MongoDB — создание коллекций и документов, выполнение запросов с фильтрацией, обновление и удаление данных, использование индексов для оптимизации.
- Redis — работа с хэшами, добавление и выборка данных по ключам, применение команд для управления значениями.
- Neo4j — работа с графовой моделью, создание узлов и связей, выполнение запросов на языке Cypher.

В результате были получены практические навыки по созданию, наполнению и запросу данных в различных NoSQL системах, а также понимание различий между моделями данных и областями их применения.