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Кафедра «Системи штучного інтелекту»



Звіт до лабораторної роботи №14
З дисципліни «Організація Баз Даних»

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Тема: Розробка бази даних типу NoSQL

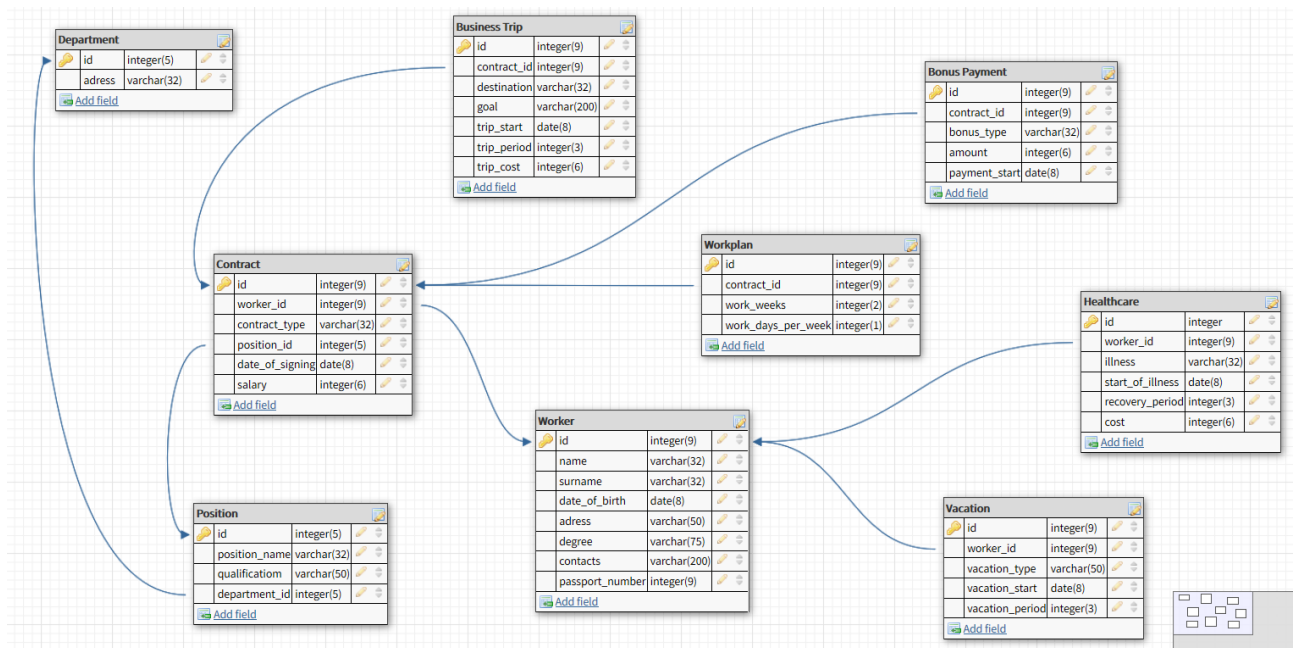
Мета: здобуття практичних навичок створення та обробки бази даних типу NoSQL на прикладі СУБД MongoDB

Завдання:

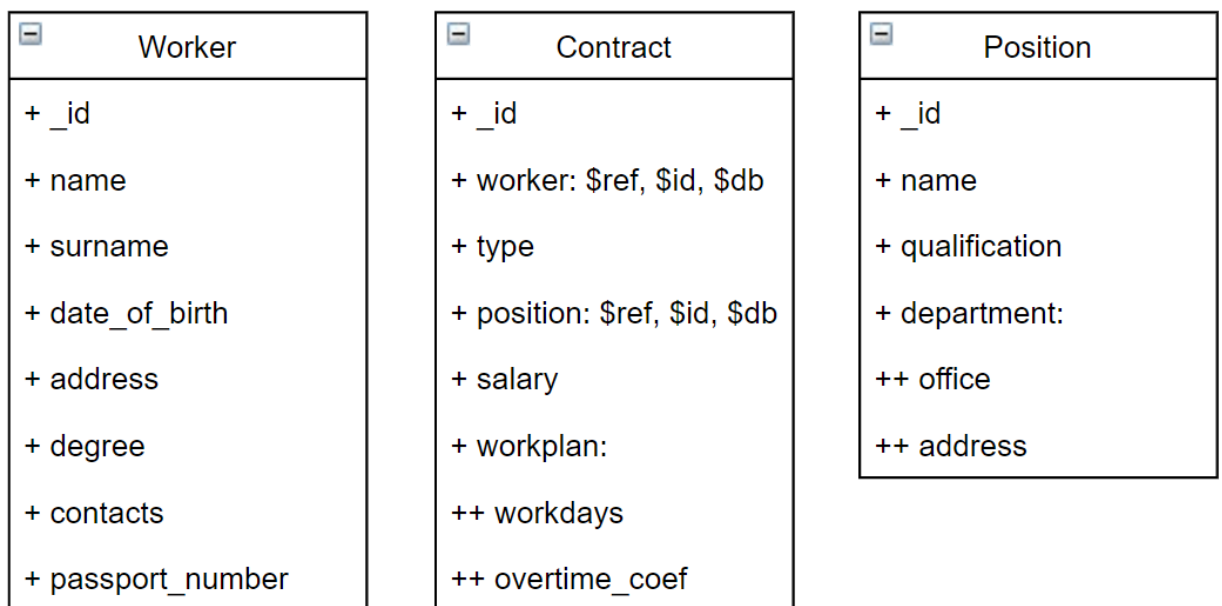
Проаналізувати роботу СУБД та оптимізувати виконання складних запитів на вибірку даних. Виконати аналіз складних запитів за допомогою директиви EXPLAIN, модифікувати найповільніші запити з метою їх пришвидшення

Виконання завдання:

Діаграма реляційної бази даних(відділ кадрів підприємства):



Діаграма нереляційної бази даних(відділ кадрів підприємства):



Створимо нереляційну базу даних, використовуючи mongoDB:

```
> use nosqldb
switched to db nosqldb
```

Створимо колекції – Worker, Contract, Position:

```
> db.createCollection("worker")
{ "ok" : 1 }
> db.createCollection("Contract")
{ "ok" : 1 }
> db.createCollection("Position")
{ "ok" : 1 }
```

Заповнимо колекцію Worker:

```
> db.worker.drop()
true
> db.worker.insertMany([
...   {
...     "id": "wrkr1",
...     "name": "lynn",
...     "surname": "gunn",
...     "date_of_birth": "1994-05-15",
...     "address": "someaddress",
...     "degree": "somedegree",
...     "contacts": "somecontacts",
...     "passport_number": "1"
...   },
```

(повний скрипт наведено в Додатку)

Заповнимо колекцію Position:

```
> db.Position.insertMany([
...   {
...     "id": "pstn1",
...     "name": "junior",
...     "qualification": "somequalification",
...     "department": [
...       {
...         "office": "office1",
...         "address": "someaddress"
...       }
...     ]
...   },
```

(повний скрипт наведено в Додатку)

Заповнимо колекцію Contract:

```
> db.Contract.insertMany([
...   {
...     "id": "cntrct1",
...     "worker": {
...       "$ref": "worker",
...       "$id": "wrkr1",
...       "$db": "nosqldb"
...     },
...     "type": "sometype",
...     "position": {
...       "$ref": "Position",
...       "$id": "pstn2",
...       "$db": "nosqldb"
...     },
...     "salary": "10k UAH",
...     "workplan": [
...       {
...         "workdays": "5",
...         "overtime_coef": "0.5"
...       }
...     ]
...   },
```

(повний скрипт наведено в Додатку)

Тепер виведемо дані з наших колекцій:

Worker:

```
> db.worker.find()
{ "_id" : "wrkr1", "name" : "lynn", "surname" : "gunn", "date_of_birth" : "1994-05-15", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "1" }
{ "_id" : "wrkr2", "name" : "alex", "surname" : "albon", "date_of_birth" : "1996-03-23", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "2" }
{ "_id" : "wrkr3", "name" : "hayley", "surname" : "williams", "date_of_birth" : "1988-12-27", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "3" }
{ "_id" : "wrkr4", "name" : "billie", "surname" : "eilish", "date_of_birth" : "2001-12-18", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "4" }
{ "_id" : "wrkr5", "name" : "matty", "surname" : "healy", "date_of_birth" : "1989-04-08", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "5" }
{ "_id" : "wrkr6", "name" : "chloe", "surname" : "price", "date_of_birth" : "1994-05-11", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "6" }
{ "_id" : "wrkr7", "name" : "finneas", "surname" : "o'connell", "date_of_birth" : "1997-07-30", "address" : "someaddress",
  "degree" : "somedegree", "contacts" : "somecontacts", "passport_number" : "7" }
```

Для форматування виведення даних використаємо команду `.pretty()`:

```
> db.worker.find().pretty()
{
  "_id" : "wrkr1",
  "name" : "lynn",
  "surname" : "gunn",
  "date_of_birth" : "1994-05-15",
  "address" : "someaddress",
  "degree" : "somedegree",
  "contacts" : "somecontacts",
  "passport_number" : "1"
}
```

Contract:

```
> db.Contract.find()
{ "_id" : "cntrct1", "worker" : DBRef("worker", "wrkr1", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn2", "nosqldb"), "salary" : "10k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.5" } ] }
{ "_id" : "cntrct2", "worker" : DBRef("worker", "wrkr2", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn1", "nosqldb"), "salary" : "7k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.3" } ] }
{ "_id" : "cntrct3", "worker" : DBRef("worker", "wrkr3", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn3", "nosqldb"), "salary" : "15k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.7" } ] }
{ "_id" : "cntrct4", "worker" : DBRef("worker", "wrkr4", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn4", "nosqldb"), "salary" : "5k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.3" } ] }
{ "_id" : "cntrct5", "worker" : DBRef("worker", "wrkr5", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn6", "nosqldb"), "salary" : "15k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.7" } ] }
{ "_id" : "cntrct6", "worker" : DBRef("worker", "wrkr6", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn5", "nosqldb"), "salary" : "10k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.5" } ] }
{ "_id" : "cntrct7", "worker" : DBRef("worker", "wrkr7", "nosqldb"), "type" : "sometype", "position" : DBRef("Position", "pstn7", "nosqldb"), "salary" : "7k UAH", "workplan" : [ { "workdays" : "5", "overtime_coef" : "0.3" } ] }
```

Для форматування виведення даних використаємо команду `.pretty()`:

```
> db.Contract.find().pretty()
{
  "_id" : "cntrct1",
  "worker" : DBRef("worker", "wrkr1", "nosqldb"),
  "type" : "sometype",
  "position" : DBRef("Position", "pstn2", "nosqldb"),
  "salary" : "10k UAH",
  "workplan" : [
    {
      "workdays" : "5",
      "overtime_coef" : "0.5"
    }
  ]
}
```

Position:

```
> db.Position.find()
{ "_id" : "pstn1", "name" : "junior", "qualification" : "somequalification", "department" : [ { "office" : "office1", "address" : "someaddress" } ] }
{ "_id" : "pstn2", "name" : "seniour", "qualification" : "somequalification", "department" : [ { "office" : "office1", "address" : "someaddress" } ] }
{ "_id" : "pstn3", "name" : "lead", "qualification" : "somequalification", "department" : [ { "office" : "office1", "address" : "someaddress" } ] }
{ "_id" : "pstn4", "name" : "junior", "qualification" : "somequalification", "department" : [ { "office" : "office2", "address" : "someaddress" } ] }
{ "_id" : "pstn5", "name" : "seniour", "qualification" : "somequalification", "department" : [ { "office" : "office2", "address" : "someaddress" } ] }
{ "_id" : "pstn6", "name" : "junior", "qualification" : "somequalification", "department" : [ { "office" : "office2", "address" : "someaddress" } ] }
```

Для форматування виведення даних використаємо команду `.pretty()`:

```
> db.Contract.find().pretty()
{
  "_id" : "cntrct1",
  "worker" : DBRef("worker", "wrkr1", "nosqldb"),
  "type" : "sometype",
  "position" : DBRef("Position", "pstn2", "nosqldb"),
  "salary" : "10k UAH",
  "workplan" : [
    {
      "workdays" : "5",
      "overtime_coef" : "0.5"
    }
  ]
}
```

Змінімо зарплату робітнику з id контракту “cntrct4” з 5 до 6 тисяч:

```
> db.Contract.update({"_id":"cntrct4"},{$set:{"salary":"6k UAH"}})
writeResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })
```

Перевіримо чи відбулися зміни:

```
> db.Contract.findOne({"_id":"cntrct4"})
{
  "_id" : "cntrct4",
  "worker" : DBRef("worker", "wrkr4", "nosqldb"),
  "type" : "sometype",
  "position" : DBRef("Position", "pstn4", "nosqldb"),
  "salary" : "6k UAH",
  "workplan" : [
    {
      "workdays" : "5",
      "overtime_coef" : "0.3"
    }
  ]
}
```

Для демонстрації видалимо з колекції Position, де id – pstn4:

```
> db.Position.remove({"_id":"pstn4"})
writeResult({ "nRemoved" : 1 })
```

Перевіримо чи спрацювало:

```
> db.Position.remove({"_id":"pstn4"})
writeResult({ "nRemoved" : 1 })
```

Висновок:

За час виконання лабораторної роботи я здобув практичні навички створення та обробки бази даних типу NoSQL на прикладі СУБД MongoDB

Додаток:

Скрипт заповнення колекції Worker:

```
db.Position.insertMany([{
  _id:"wrkr1",
  "name":"lynn",
  "surname":"gunn",
  "date_of_birth":"1994-05-15",
  "address":"someaddress",
  "degree":"somedegree",
  "contacts":"somecontacts",
  "passport_number":"1"
},
{
  _id:"wrkr2",
  "name":"alex",
  "surname":"albon",
  "date_of_birth":"1996-03-23",
  "address":"someaddress",
  "degree":"somedegree",
  "contacts":"somecontacts",
  "passport_number":"2"
},
{
  _id:"wrkr3",
  "name":"hayley",
  "surname":"williams",
  "date_of_birth":"1988-12-27",
  "address":"someaddress",
  "degree":"somedegree",
  "contacts":"somecontacts",
  "passport_number":"3"
},
{
  _id:"wrkr4",
  "name":"billie",
  "surname":"eilish",
  "date_of_birth":"2001-12-18",
  "address":"someaddress",
```



```
    "degree": "somedegree",
    "contacts": "somecontacts",
    "passport_number": "4"
  },
  {
    _id: "wrkr5",
    "name": "matty",
    "surname": "healy",
    "date_of_birth": "1989-04-08",
    "address": "someaddress",
    "degree": "somedegree",
    "contacts": "somecontacts",
    "passport_number": "5"
  },
  {
    _id: "wrkr6",
    "name": "chloe",
    "surname": "price",
    "date_of_birth": "1994-05-11",
    "address": "someaddress",
    "degree": "somedegree",
    "contacts": "somecontacts",
    "passport_number": "6"
  },
  {
    _id: "wrkr7",
    "name": "finneas",
    "surname": "o'connell",
    "date_of_birth": "1997-07-30",
    "address": "someaddress",
    "degree": "somedegree",
    "contacts": "somecontacts",
    "passport_number": "7"
  })
})
```

Скрипт заповнення колекції Position:

```
db.Position.insertMany([
  {
    _id:"pstn1",
    "name":"junior",
    "qualification":"somequalification",
    "department":[
      {
        "office":"office1",
        "address":"someaddress"
      }
    ]
  },
  {
    _id:"pstn2",
    "name":"seniour",
    "qualification":"somequalification",
    "department":[
      {
        "office":"office1",
        "address":"someaddress"
      }
    ]
  },
  {
    _id:"pstn3",
    "name":"lead",
    "qualification":"somequalification",
    "department":[
      {
        "office":"office1",
        "address":"someaddress"
      }
    ]
  },
  {
    _id:"pstn4",
    "name":"junior",
    "qualification":"somequalification",
```

```
"department":[
  {
    "office":"office2",
    "address":"someaddress"
  }
],
{
  _id:"pstn5",
  "name":"seniour",
  "qualification":"somequalification",
  "department":[
    {
      "office":"office2",
      "address":"someaddress"
    }
  ],
},
{
  _id:"pstn6",
  "name":"junior",
  "qualification":"somequalification",
  "department":[
    {
      "office":"office2",
      "address":"someaddress"
    }
  ],
}
])
```

Скрипт заповнення колекції Contract:

```
db.Contract.insertMany([{\n  _id:"cntrct1",\n  "worker":{\n    "$ref": "Worker",\n    "$id":"wrkr1",\n    "$db":"nosqldb"\n  },\n  "type":"sometype",\n  "position":{\n    "$ref":"Position",\n    "$id":"pstn2",\n    "$db":"nosqldb"\n  },\n  "salary":"10k UAH",\n  "workplan":[\n    {\n      "workdays":"5",\n      "overtime_coef":"0.5"\n    }\n  ]\n},\n{\n  _id:"cntrct2",\n  "worker":{\n    "$ref": "Worker",\n    "$id":"wrkr2",\n    "$db":"nosqldb"\n  },\n  "type":"sometype",\n  "position":{\n    "$ref":"Position",\n    "$id":"pstn1",\n    "$db":"nosqldb"\n  },\n  "salary":"7k UAH",\n  "workplan":[\n    {\n
```

```
        "workdays":"5",
        "overtime_coef":"0.3"
    }
]
},
{
    _id:"cntrct3",
    "worker":{
        "$ref": "Worker",
        "$id":"wrkr3",
        "$db":"nosqldb"
    },
    "type":"sometype",
    "position":{
        "$ref":"Position",
        "$id":"pstn3",
        "$db":"nosqldb"
    },
    "salary":"15k UAH",
    "workplan":[
        {
            "workdays":"5",
            "overtime_coef":"0.7"
        }
    ]
},
{
    _id:"cntrct4",
    "worker":{
        "$ref": "Worker",
        "$id":"wrkr4",
        "$db":"nosqldb"
    },
    "type":"sometype",
    "position":{
        "$ref":"Position",
        "$id":"pstn4",
        "$db":"nosqldb"
    },
    },
```

```
"salary":"5k UAH",
"workplan":[
  {
    "workdays":"5",
    "overtime_coef":"0.3"
  }
]
},
{
  _id:"cntrct5",
  "worker":{
    "$ref": "Worker",
    "$id":"wrkr5",
    "$db":"nosqldb"
  },
  "type":"sometype",
  "position":{
    "$ref":"Position",
    "$id":"pstr6",
    "$db":"nosqldb"
  },
  "salary":"15k UAH",
  "workplan":[
    {
      "workdays":"5",
      "overtime_coef":"0.7"
    }
  ]
},
{
  _id:"cntrct6",
  "worker":{
    "$ref": "Worker",
    "$id":"wrkr6",
    "$db":"nosqldb"
  },
  "type":"sometype",
  "position":{
    "$ref":"Position",
```

```
    "$id": "pstn5",
    "$db": "nosqldb"
  },
  "salary": "10k UAH",
  "workplan": [
    {
      "workdays": "5",
      "overtime_coef": "0.5"
    }
  ]
},
{
  _id: "cntrct7",
  "worker": {
    "$ref": "Worker",
    "$id": "wrkr7",
    "$db": "nosqldb"
  },
  "type": "sometype",
  "position": {
    "$ref": "Position",
    "$id": "pstn7",
    "$db": "nosqldb"
  },
  "salary": "7k UAH",
  "workplan": [
    {
      "workdays": "5",
      "overtime_coef": "0.3"
    }
  ]
}
])
```