

# Proiect Administrarea Bazelor de Date

**Student: Nicol-Anemona NETEDU**

**Coordonator științific: Valer BOCAN**

**Sesiune: Mai 2024**

```
▼ mongosh mongodb://localhost:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.2.2
Please enter a MongoDB connection string (Default: mongodb://localhost/): mongodb://localhost:27017/
mongodb://localhost:27017/
Current Mongosh Log ID: 66587e2877649dd8b9f9909
Connecting to:      mongodb://localhost:27017/?directConnection=true&serverSelectionTimeoutMS=2000&appName=mongosh+2.2.2
Using MongoDB:      7.0.6
Using Mongosh:      2.2.2
mongosh 2.2.6 is available for download: https://www.mongodb.com/try/download/shell

For mongosh info see: https://docs.mongodb.com/mongodb-shell/

-----
The server generated these startup warnings when booting
2024-05-26T18:31:54.902+03:00: Access control is not enabled for the database. Read and write access to data and configuration is unrestricted
-----
```

a. Get the states with a total population of over 10 million.

```
db.proiectNetedu.aggregate( [ { "$group": { "_id": "$state_id", "state_population": { "$sum": "$population" } } }, { "$match": { "state_population": { "$gt": 10000000 } } } ] )
```

```
test> use proiectNetedu
switched to db proiectNetedu
proiectNetedu> db.proiectNetedu.aggregate( [ { "$group": { "_id": "$state_id", "state_population": { "$sum": "$population" } } }, { "$match": { "state_population": { "$gt": 10000000 } } } ] )
[
  { "_id": "MI", state_population: 10057902 },
  { "_id": "GA", state_population: 10722352 },
  { "_id": "OH", state_population: 11774683 },
  { "_id": "NV", state_population: 12094379 },
  { "_id": "PA", state_population: 12089208 },
  { "_id": "NC", state_population: 10470214 },
  { "_id": "IL", state_population: 12757583 },
  { "_id": "CA", state_population: 39354820 },
  { "_id": "TX", state_population: 29242696 },
  { "_id": "FL", state_population: 21632280 }
]
```

b. Get the average city population by state.

```
db.proiectNetedu.aggregate([ { $group: { _id: { state_id: "$state_id", city: "$city" }, population: { $sum: "$population" } } }, { $group: { _id: "$_id.state_id", average_city_population: { $avg: "$population" } } } ])
```

```
proiectNetedu> db.proiectNetedu.aggregate([ { $group: { _id: { state_id: "$state_id", city: "$city" }, population: { $sum: "$population" } } }, { $group: { _id: "$_id.state_id", average_city_population: { $avg: "$population" } } } ] )
[
  { "_id": "WV", average_city_population: 3360.3313953488373 },
  { "_id": "AR", average_city_population: 5231.996533795494 },
  { "_id": "OK", average_city_population: 6965.724561403509 },
  { "_id": "NE", average_city_population: 2242.014583333333 },
  { "_id": "KS", average_city_population: 14582.470752089137 },
  { "_id": "ND", average_city_population: 17096.234758462107 },
  { "_id": "PA", average_city_population: 7915.422383473491 },
  { "_id": "CO", average_city_population: 14835.881748071979 },
  { "_id": "TX", average_city_population: 10149.230708035004 },
  { "_id": "DE", average_city_population: 3239.054502369608 },
  { "_id": "MA", average_city_population: 15083.846652267819 },
  { "_id": "VT", average_city_population: 2476.2153846153847 },
  { "_id": "NH", average_city_population: 6320.586826347306 },
  { "_id": "VA", average_city_population: 11912.802486197846 },
  { "_id": "RI", average_city_population: 13111.868190721311 },
  { "_id": "UT", average_city_population: 13076.505976095617 },
  { "_id": "RI", average_city_population: 16332.507462686568 },
  { "_id": "MO", average_city_population: 6846.150166852058 },
  { "_id": "SC", average_city_population: 14735.67335243553 },
  { "_id": "KS", average_city_population: 4712.313001605136 }
]
```

c. Get the largest and the smallest city in each state.

```
db.proiectNetedu.aggregate([ { $group: { _id: { state_id: "$state_id", city: "$city", state_name: "$state_name" }, population: { $sum: "$population" } } }, { $sort: { "_id.state_id": 1, "population": -1 } }, { $group: { _id: "$_id.state_id", largest_city: { $first: "$_id.city" }, largest_city_population: { $first: "$population" }, smallest_city: { $last: "$_id.city" }, smallest_city_population: { $last: "$population" } } }, { $project: { _id: 0, state_id: "$_id", state_name: "$_id.state_name", largest_city:
```

1, largest\_city\_population: 1, smallest\_city: 1, smallest\_city\_population: 1 } })

```
type "it" for more
... state_name: "$state_name" }, population: { $sum: "$population" } } }, { $sort: {
... "_id.state_id": 1, "population": -1 } }, { $group: { _id: "$_id.state_id", largest_city:
... { $first: "$_id.city" }, largest_city_population: { $first: "$population" },
... smallest_city: { $last: "$_id.city" }, smallest_city_population: { $last: "$population" }
... } }, { $project: { _id: 0, state_id: "$_id", state_name: "$_id.state_name", largest_city:
... 1, largest_city_population: 1, smallest_city: 1, smallest_city_population: 1 } }})
[
  {
    largest_city: 'Pago Pago',
    largest_city_population: 0,
    smallest_city: 'Pago Pago',
    smallest_city_population: 0,
    state_id: 'AS'
  },
  {
    largest_city: 'Wilmington',
    largest_city_population: 218967,
    smallest_city: 'Winterthur',
    smallest_city_population: 0,
    state_id: 'DE'
  },
  {
    largest_city: 'Indianapolis',
    largest_city_population: 978291,
    smallest_city: 'Atwood',
    smallest_city_population: 0,
    state_id: 'IN'
  },
  {
    largest_city: 'Newark',
    largest_city_population: 307483,
    smallest_city: 'Kankocas',
    smallest_city_population: 0,
    state_id: 'NJ'
  },
  {
    largest_city: 'Manchester',
    largest_city_population: 119416,
    smallest_city: 'Bretton Woods',
    smallest_city_population: 0,
    state_id: 'NH'
  },
  {
    largest_city: 'Brooklyn',
    largest_city_population: 2679609,
    smallest_city: 'West Camp',
    smallest_city_population: 0,
    state_id: 'NY'
  }
]
```

```
{
  largest_city: 'Portland',
  largest_city_population: 934313,
  smallest_city: 'Post',
  smallest_city_population: 0,
  state_id: 'OR'
},
{
  largest_city: 'Jackson',
  largest_city_population: 154490,
  smallest_city: 'Mayhew',
  smallest_city_population: 0,
  state_id: 'MS'
},
{
  largest_city: 'Billings',
  largest_city_population: 143280,
  smallest_city: 'Sumatra',
  smallest_city_population: 3,
  state_id: 'MT'
},
{
  largest_city: 'Houston',
  largest_city_population: 3206180,
  smallest_city: 'Woodlawn',
  smallest_city_population: 0,
  state_id: 'TX'
},
{
  largest_city: 'Little Rock',
  largest_city_population: 218640,
  smallest_city: 'Oneida',
  smallest_city_population: 0,
  state_id: 'AR'
},
{
  largest_city: 'Honolulu',
  largest_city_population: 416884,
  smallest_city: 'Tripler Army Medical Center',
  smallest_city_population: 0,
  state_id: 'HI'
},
{
  largest_city: 'Des Moines',
  largest_city_population: 221145,
  smallest_city: 'Ira',
  smallest_city_population: 0,
}
```

```
{
  largest_city: 'Des Moines',
  largest_city_population: 221145,
  smallest_city: 'Ira',
  smallest_city_population: 0,
  state_id: 'IA'
},
{
  largest_city: 'Louisville',
  largest_city_population: 767460,
  smallest_city: 'Marshes Siding',
  smallest_city_population: 0,
  state_id: 'KY'
},
{
  largest_city: 'Anchorage',
  largest_city_population: 242190,
  smallest_city: 'Meyers Chuck',
  smallest_city_population: 1,
  state_id: 'AK'
},
{
  largest_city: 'Chicago',
  largest_city_population: 2705664,
  smallest_city: 'Russell',
  smallest_city_population: 0,
  state_id: 'IL'
},
{
  largest_city: 'Minneapolis',
  largest_city_population: 1131403,
  smallest_city: 'Margie',
  smallest_city_population: 0,
  state_id: 'MN'
},
{
  largest_city: 'Saint Louis',
  largest_city_population: 901642,
  smallest_city: 'Rockbridge',
  smallest_city_population: 0,
  state_id: 'MO'
},
{
  largest_city: 'Albuquerque',
  largest_city_population: 653054,
  smallest_city: 'Trementina',
  smallest_city_population: 0,
  state_id: 'NM'
},
{
```

```
{
  largest_city: 'Albuquerque',
  largest_city_population: 653054,
  smallest_city: 'Trementina',
  smallest_city_population: 0,
  state_id: 'NM'
},
{
  largest_city: 'Atlanta',
  largest_city_population: 1029695,
  smallest_city: 'Red Oak',
  smallest_city_population: 0,
  state_id: 'GA'
}
}

type "it" for more
proiectNetedu>
```

d. Get the largest and the smallest counties in each state.

```
db.proiectNetedu.aggregate([
  { $group: { _id: { state_id: "$state_id", county_name:
"$county_name", state_name: "$state_name" }, population: { $sum: "$population" } } }, {
  $sort: { "_id.state_id": 1, "population": -1 } }, { $group: { _id: "$_id.state_id",
largest_county: { $first: "$_id.county_name" }, largest_county_population: { $first:
"$population" }, smallest_county: { $last: "$_id.county_name" },
smallest_county_population: { $last: "$population" } } }, { $project: { _id: 0,
```

state\_id: "\$\_id", state\_name: "\$\_id.state\_name", largest\_county: 1,  
largest\_county\_population: 1, smallest\_county: 1, smallest\_county\_population: 1 } } }

```
},
... "$county_name", state_name: "$state_name" }, population: { $sum: "$population" } } }, {
... $sort: { "_id.state_id": 1, "population": -1 } }, { $group: { _id: "$_id.state_id",
... largest_county: { $first: "$_id.county_name" }, largest_county_population: { $first:
... "$population" }, smallest_county: { $last: "$_id.county_name" },
... smallest_county_population: { $last: "$population" } } }, { $project: { _id: 0,
... state_id: "$_id", state_name: "$_id.state_name", largest_county: 1,
... largest_county_population: 1, smallest_county: 1, smallest_county_population: 1 } } } }
[
  {e "it" for more
    largest_county: 'New Castle', aggregate([ { $group: { _id: { state_id: "$state_id", county_name:
    largest_county_population: 566249,
    smallest_county: 'Kent',
    smallest_county_population: 177092,
    state_id: 'DE'
  },
  {
    largest_county: 'St. John',
    largest_county_population: 0,
    smallest_county: 'St. Croix',
    smallest_county_population: 0,
    state_id: 'VI'
  },
  {
    largest_county: 'Western',
    largest_county_population: 0,
    smallest_county: 'Western',
    smallest_county_population: 0,
    state_id: 'AS'
  },
  {
    largest_county: 'Hillsborough',
    largest_county_population: 422790,
    smallest_county: 'Oxford',
    smallest_county_population: 417,
    state_id: 'NH'
  },
  {
    largest_county: 'Kings',
    largest_county_population: 2679609,
    smallest_county: 'Hamilton',
    smallest_county_population: 8887,
    state_id: 'NY'
  },
  ],
  }
```

```
{
  largest_county: 'Marion',
  largest_county_population: 972652,
  smallest_county: 'Ohio',
  smallest_county_population: 5367,
  state_id: 'IN'
},
{
  largest_county: 'Bergen',
  largest_county_population: 953243,
  smallest_county: 'Salem',
  smallest_county_population: 66114,
  state_id: 'NJ'
},
{
  largest_county: 'Yellowstone',
  largest_county_population: 165098,
  smallest_county: 'Petroleum',
  smallest_county_population: 356,
  state_id: 'MT'
},
{
  largest_county: 'Multnomah',
  largest_county_population: 801225,
  smallest_county: 'Modoc',
  smallest_county_population: 345,
  state_id: 'OR'
},
{
  largest_county: 'Harris',
  largest_county_population: 4740519,
  smallest_county: 'Loving',
  smallest_county_population: 96,
  state_id: 'TX'
},
{
  largest_county: 'Hinds',
  largest_county_population: 227234,
  smallest_county: 'Issaquena',
  smallest_county_population: 550,
  state_id: 'MS'
},
}
```

```
{
  largest_county: 'Polk',
  largest_county_population: 489044,
  smallest_county: 'Adams',
  smallest_county_population: 3422,
  state_id: 'IA'
},
{
  largest_county: 'Jefferson',
  largest_county_population: 784949,
  smallest_county: 'Robertson',
  smallest_county_population: 2071,
  state_id: 'KY'
},
{
  largest_county: 'Pulaski',
  largest_county_population: 390423,
  smallest_county: 'Tipton',
  smallest_county_population: 15,
  state_id: 'AR'
},
{
  largest_county: 'Honolulu',
  largest_county_population: 1010100,
  smallest_county: 'Kalawao',
  smallest_county_population: 50,
  state_id: 'HI'
},
{
  largest_county: 'Anchorage',
  largest_county_population: 278071,
  smallest_county: 'Bristol Bay',
  smallest_county_population: 471,
  state_id: 'AK'
},
{
  largest_county: 'Cook',
  largest_county_population: 5234701,
  smallest_county: 'Hardin',
  smallest_county_population: 3197,
  state_id: 'IL'
},
{
  largest_county: 'St. Louis',
  largest_county_population: 1320952,
  smallest_county: 'Worth',
  smallest_county_population: 1967,
  state_id: 'MO'
}
```



```
{
  largest_county: 'Hennepin',
  largest_county_population: 1279974,
  smallest_county: 'Roberts',
  smallest_county_population: 981,
  state_id: 'MN'
},
{
  largest_county: 'Bernalillo',
  largest_county_population: 671497,
  smallest_county: 'Harding',
  smallest_county_population: 1590,
  state_id: 'NM'
}
]
Type "it" for more
proiectNetedu>
```

- e. Get the nearest 10 zips from one of Chicago's landmarks, the Willis Tower situated at coordinates 41.878876, -87.635918.

`db.proiectNetedu.updateMany({}, [{ "$set": { "location2dsphere.type":"Point",  
location2dsphere.coordinates": ["$lng", "$lat"] } }])`

`db.proiectNetedu.createIndex({ location2dsphere: "2dsphere" })`

`db.proiectNetedu.find({ location2dsphere: { $near: { $geometry: {  
type: "Point", coordinates: [-87.635918, 41.878876] } } }).limit(10)`

```
Type "it" for more
... type: "Point", coordinates: [-87.635918, 41.878876] } } }).limit(10)
location2dsphere_2dsphere
{cknowledged: true,
  _id: ObjectId('66587cd023d4f53daa4ba5de'),
  zip: 60606, 33787,
  lat: 41.88178, 3787,
  lng: -87.63724,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 3513,
  density: 5844.8,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.63724, 41.88178 ] }
},
{
  _id: ObjectId('66587cd023d4f53daa4ba5dc'),
  zip: 60604,
  lat: 41.87799,
  lng: -87.62928,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 737,
  density: 3684.3,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.62928, 41.87799 ] }
},
}
```

```
{
  _id: ObjectId('66587cd023d4f53daa4ba5db'),
  zip: 60603,
  lat: 41.88018,
  lng: -87.6274,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 1110,
  density: 3612.5,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.6274, 41.88018 ] }
},
{
  _id: ObjectId('66587cd023d4f53daa4ba5da'),
  zip: 60602,
  lat: 41.88304,
  lng: -87.62906,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 938,
  density: 4394.9,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.62906, 41.88304 ] }
},
```

```
{
  _id: ObjectId('66587cd023d4f53daa4ba610'),
  zip: 60661,
  lat: 41.88291,
  lng: -87.64409,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 11513,
  density: 14546.6,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.64409, 41.88291 ] }
},
{
  _id: ObjectId('66587cd023d4f53daa4ba5d9'),
  zip: 60601,
  lat: 41.88527,
  lng: -87.62197,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 16398,
  density: 16290.5,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.62197, 41.88527 ] }
},
{
```

```
{
  _id: ObjectId('66587cd023d4f53daa4ba5df'),
  zip: 60607,
  lat: 41.87467,
  lng: -87.65175,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 28797,
  density: 4806.3,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.65175, 41.87467 ] }
},
{
  _id: ObjectId('66587cd023d4f53daa4ba60a'),
  zip: 60654,
  lat: 41.89209,
  lng: -87.63673,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 23475,
  density: 16729.1,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.63673, 41.89209 ] }
},
```

```
{
  _id: ObjectId('66587cd023d4f53daa4ba5dd'),
  zip: 60605,
  lat: 41.86644,
  lng: -87.61956,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 34314,
  density: 9262.1,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.61956, 41.86644 ] }
},
{
  _id: ObjectId('66587cd023d4f53daa4ba5e3'),
  zip: 60611,
  lat: 41.89483,
  lng: -87.61944,
  city: 'Chicago',
  state_id: 'IL',
  state_name: 'Illinois',
  zcta: true,
  population: 35247,
  density: 17163,
  county_fips: 17031,
  county_name: 'Cook',
  county_weights: { '17031': 100 },
  county_names_all: 'Cook',
  county_fips_all: 17031,
  imprecise: false,
  military: false,
  timezone: 'America/Chicago',
  location2dsphere: { type: 'Point', coordinates: [ -87.61944, 41.89483 ] }
}
]
```

- f. Get the total population situated between 50 and 200 kms around New York's landmark, the Statue of Liberty at coordinates 40.689247, -74.044502.

```
db.proiectNetedu.aggregate([{$geoNear: { near: { type: "Point", coordinates:
[-74.044502, 40.689247] }, key: "location2dsphere_2dsphere", distanceField:
"distance", maxDistance: 200000, minDistance: 50000, spherical: true } }, {
$group: { _id: null, total_population: { $sum: "$population" } } }])
... [-74.044502, 40.689247] }, key: "location2dsphere_2dsphere", distanceField:
... "distance", maxDistance: 200000, minDistance: 50000, spherical: true } }, {
...
```