Universitatea
Politehnica
din Timișoara

Proiect Administrarea Bazelor de Date

Student: Nicol-Anemona NETEDU

Coordonator științific: Valer BOCAN

Sesiune: Mai 2024

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}} }])

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" } } }])

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: 'Rancocas',
    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',ggregate([{ $group: { _id: { state_id: "$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 } }, {
...
```