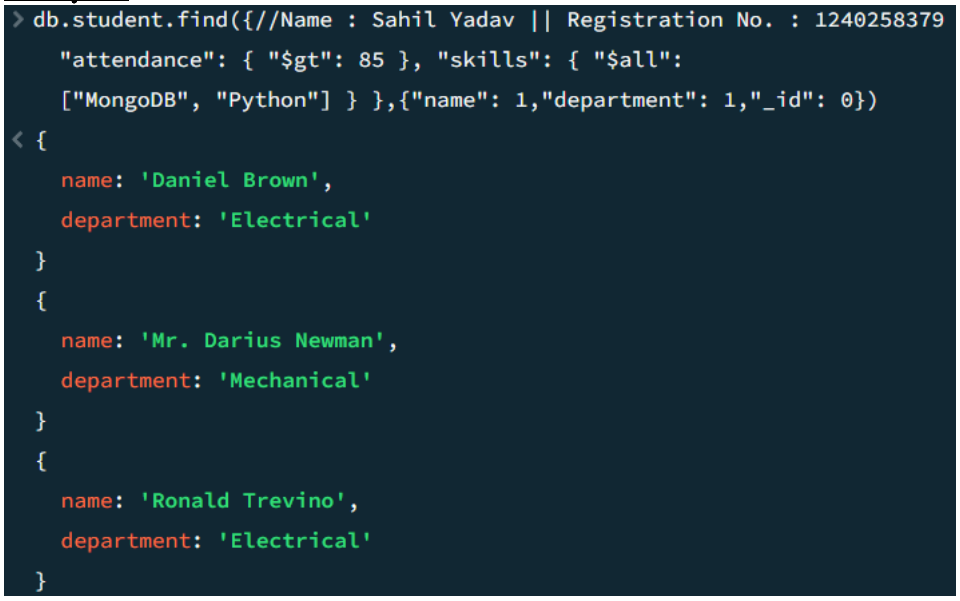
MongoDB Assignment

1.Complex Filters & Projections

Q1. List the names and departments of students who have more than 85% attendance and are skilled in both "MongoDB" and "Python".

Query -- *db.student.find({"attendance": { "$gt": 85 }, "skills": { "$all": ["MongoDB", "Python"] } },{"name": 1,"department": 1,"_id": 0})*

Output--



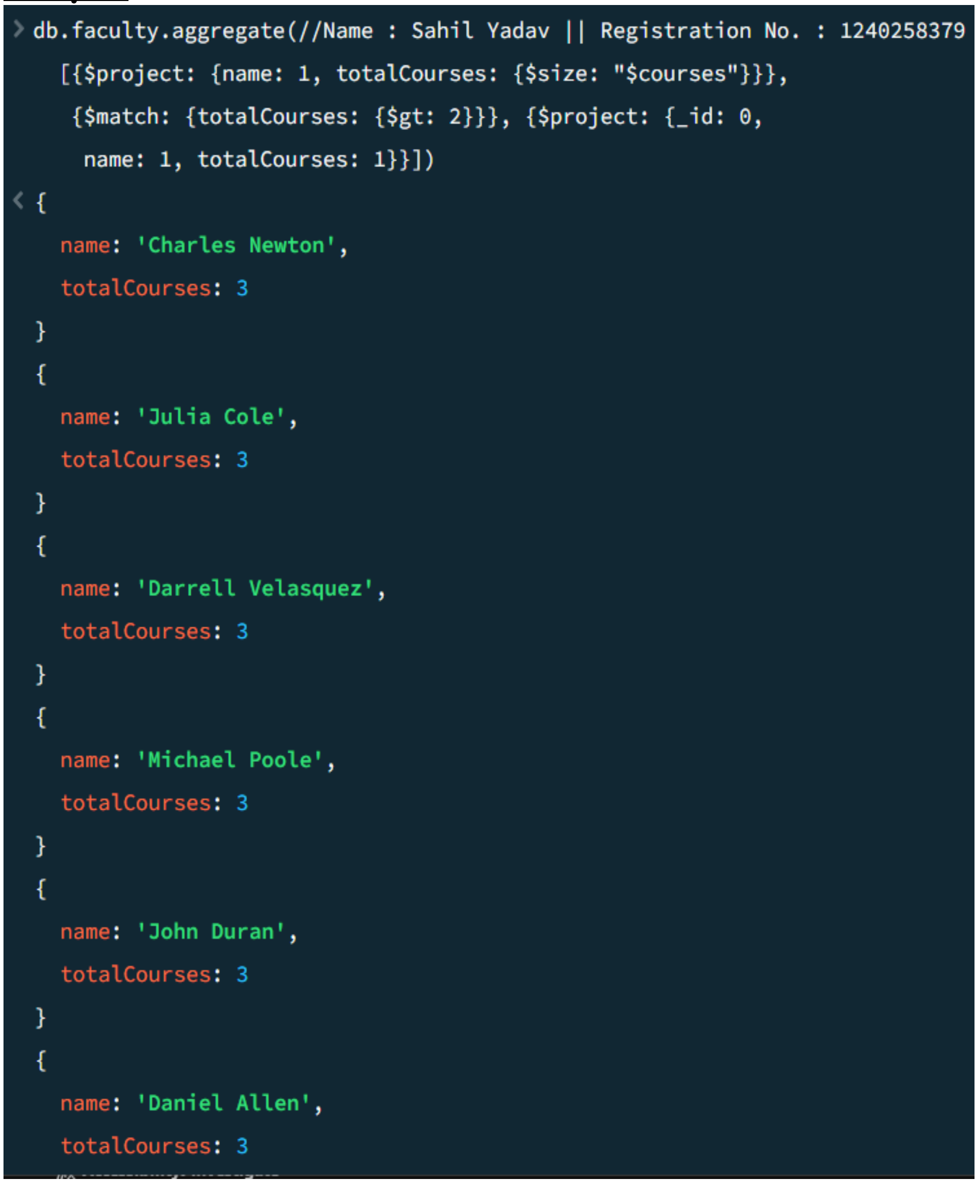
```
> db.student.find({//Name : Sahil Yadav || Registration No. : 1240258379
    "attendance": { "$gt": 85 }, "skills": { "$all":
    ["MongoDB", "Python"] } },{"name": 1,"department": 1,"_id": 0})
< {
    name: 'Daniel Brown',
    department: 'Electrical'
  }
  {
    name: 'Mr. Darius Newman',
    department: 'Mechanical'
  }
  {
    name: 'Ronald Trevino',
    department: 'Electrical'
  }
```

Definition– *This query will only give names and departments of students who have more than 85% attendance & they* are skilled in both MongoDB and Python.

Q2. Show all faculty who are teaching more than 2 courses. Display their names and the total number of courses they teach.

Query— *db.faculty.aggregate([{$project: {name: 1, totalCourses: {$size: "$courses"}}}, {$match: {totalCourses: {$gt: 2}}}, {$project: {_id: 0, name: 1, totalCourses: 1}}])*

Output --



```
> db.faculty.aggregate(//Name : Sahil Yadav || Registration No. : 1240258379
    [{$project: {name: 1, totalCourses: {$size: "$courses"}}},
     {$match: {totalCourses: {$gt: 2}}}, {$project: {_id: 0,
      name: 1, totalCourses: 1}}])
< {
    name: 'Charles Newton',
    totalCourses: 3
  }
  {
    name: 'Julia Cole',
    totalCourses: 3
  }
  {
    name: 'Darrell Velasquez',
    totalCourses: 3
  }
  {
    name: 'Michael Poole',
    totalCourses: 3
  }
  {
    name: 'John Duran',
    totalCourses: 3
  }
  {
    name: 'Daniel Allen',
    totalCourses: 3
```

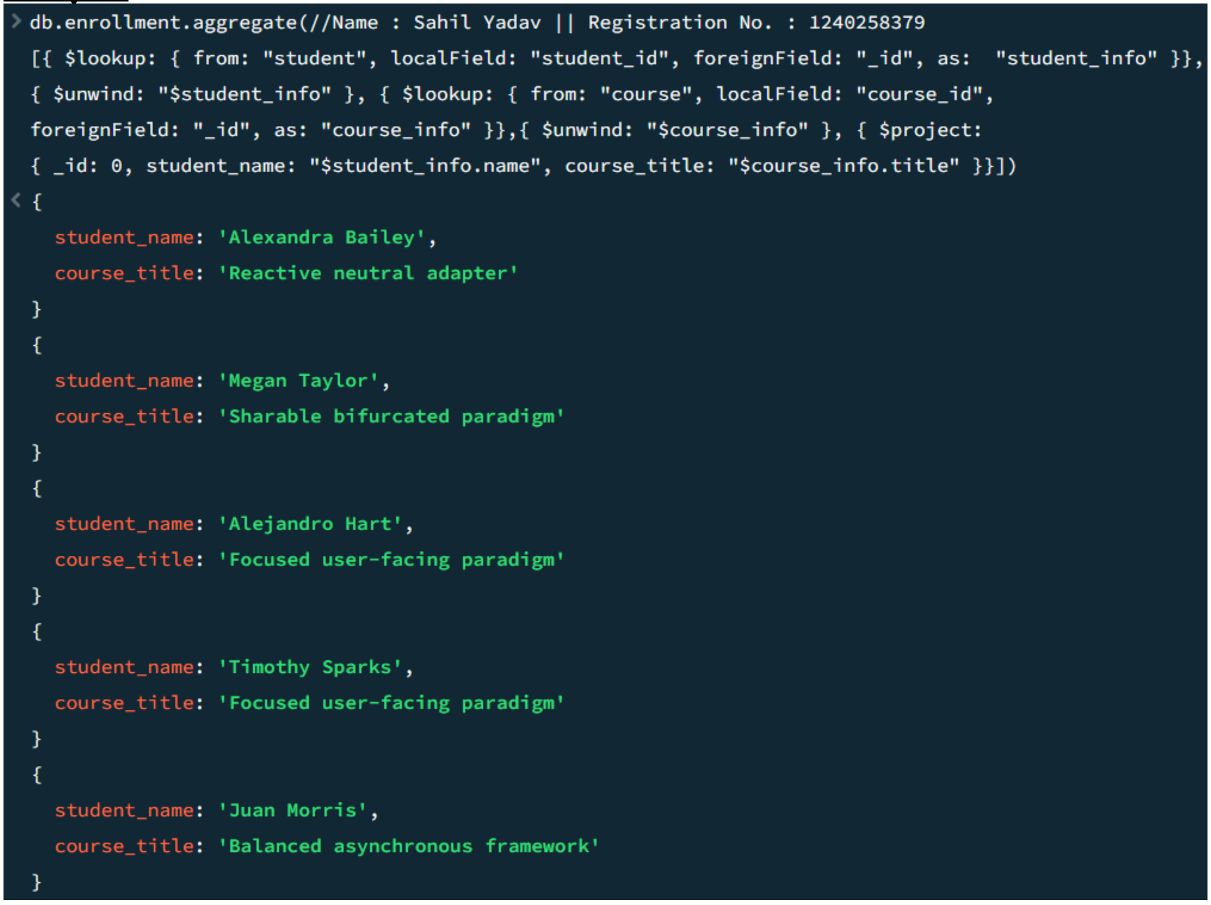
Definition-- This query will return all faculty name who are <2 courses and show only their names & total number of courses they teach.

2. Joins ($lookup) and Aggregations

Q3. Write a query to show each student's name along with the course titles they are enrolled in (use $lookup between enrollments, students, and courses).

Query-- *db.enrollment.aggregate([{ $lookup: { from: "student", localField: "student_id", foreignField: "_id", as: "student_info" }}, { $unwind: "$student_info" }, { $lookup: { from: "course", localField: "course_id", foreignField: "_id", as: "course_info" }},*

Output—



```
> db.enrollment.aggregate(//Name : Sahil Yadav || Registration No. : 1240258379
  [{ $lookup: { from: "student", localField: "student_id", foreignField: "_id", as:  "student_info" }},
  { $unwind: "$student_info" }, { $lookup: { from: "course", localField: "course_id",
  foreignField: "_id", as: "course_info" }},{ $unwind: "$course_info" }, { $project:
  { _id: 0, student_name: "$student_info.name", course_title: "$course_info.title" }}])
< {
    student_name: 'Alexandra Bailey',
    course_title: 'Reactive neutral adapter'
  }
  {
    student_name: 'Megan Taylor',
    course_title: 'Sharable bifurcated paradigm'
  }
  {
    student_name: 'Alejandro Hart',
    course_title: 'Focused user-facing paradigm'
  }
  {
    student_name: 'Timothy Sparks',
    course_title: 'Focused user-facing paradigm'
  }
  {
    student_name: 'Juan Morris',
    course_title: 'Balanced asynchronous framework'
  }
```

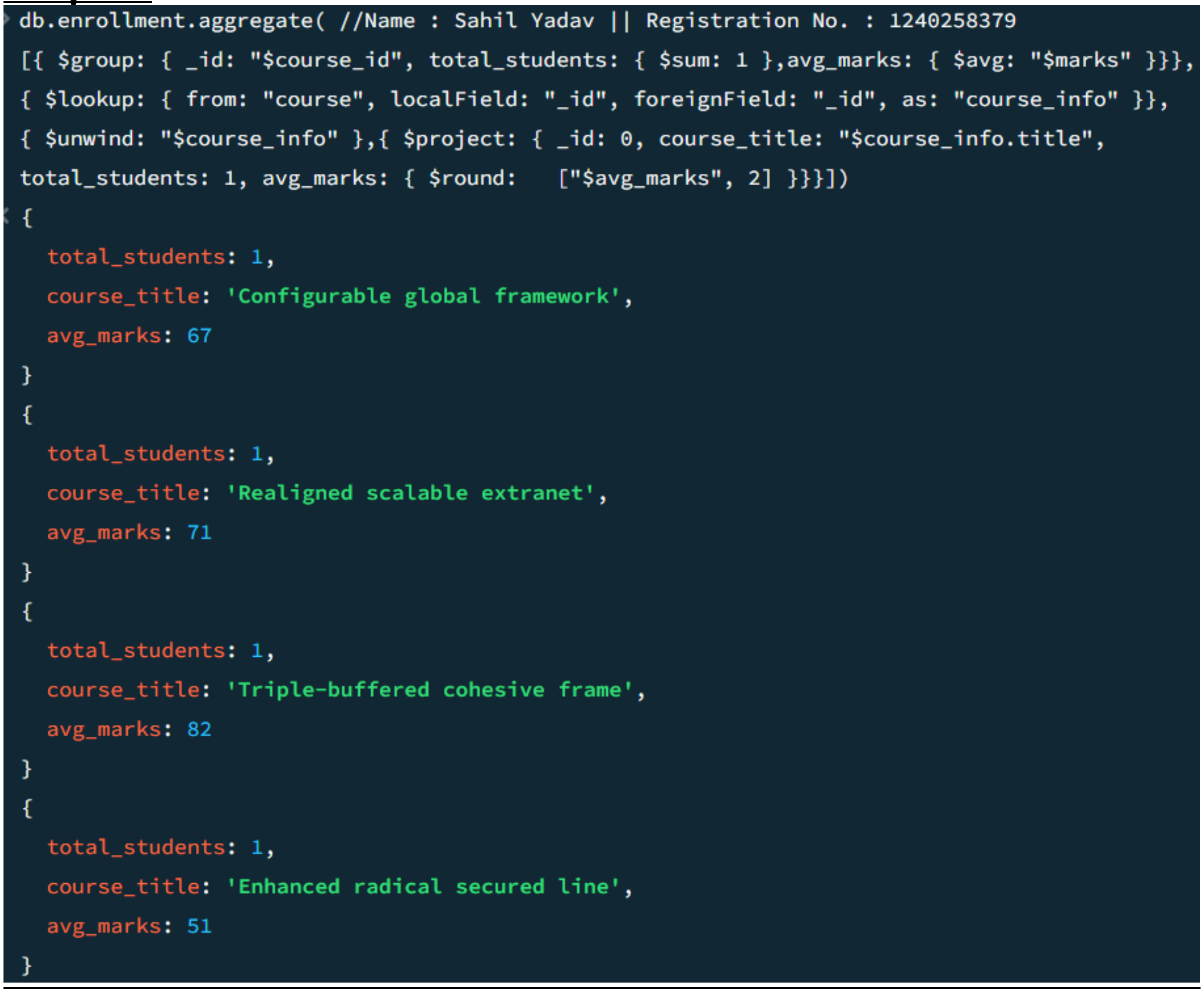
Definition– This query will show each student's name along with the course title they are enrolled in with using $lookup between enrollment, student, and course.

Q4. For each course, display the course title, number of students enrolled, and average marks(use $group).

Query-- *db.enrollment.aggregate([{ $group: { _id: "$course_id", total_students: { $sum: 1 }, avg_marks: { $avg: "$marks" }}}, { $lookup: { from: "course", localField: "_id", foreignField: "_id", as: "course_info" }},{ $unwind: "$course_info" },*

{ $project: { _id: 0, course_title: "$course_info.title", total_students: 1, avg_marks: { $round: ["$avg_marks", 2] }}}])

Output--



```
db.enrollment.aggregate( //Name : Sahil Yadav || Registration No. : 1240258379
[{ $group: { _id: "$course_id", total_students: { $sum: 1 },avg_marks: { $avg: "$marks" }}},
{ $lookup: { from: "course", localField: "_id", foreignField: "_id", as: "course_info" }},
{ $unwind: "$course_info" },{ $project: { _id: 0, course_title: "$course_info.title",
total_students: 1, avg_marks: { $round:   ["$avg_marks", 2] }}}])
{
  total_students: 1,
  course_title: 'Configurable global framework',
  avg_marks: 67
}
{
  total_students: 1,
  course_title: 'Realigned scalable extranet',
  avg_marks: 71
}
{
  total_students: 1,
  course_title: 'Triple-buffered cohesive frame',
  avg_marks: 82
}
{
  total_students: 1,
  course_title: 'Enhanced radical secured line',
  avg_marks: 51
}
```

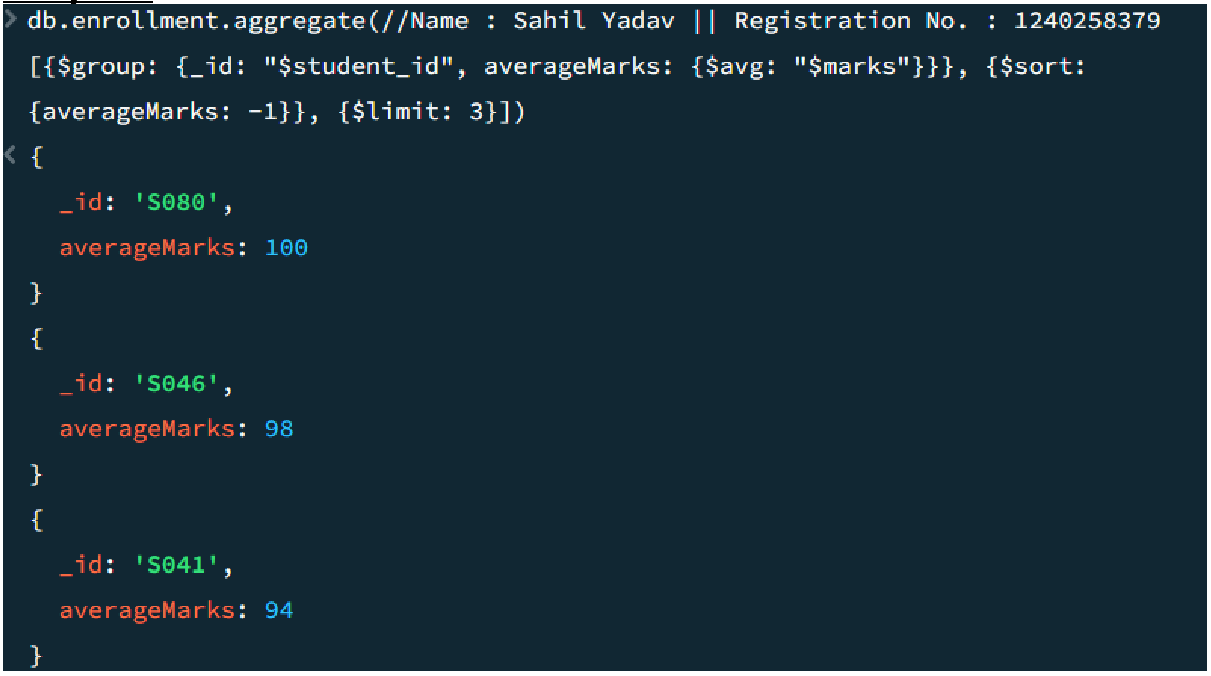
Definition-- This questions query will show the course title, number of students enrolled and average marks for each course given in the data.

3. Grouping, Sorting, and Limiting

Q5. Find the top 3 students with the highest average marks across all enrolled courses.

Query— *db.enrollment.aggregate([{$group: {_id: "$student_id", averageMarks: {$avg: "$marks"}}}, {$sort: {averageMarks: -1}}, {$limit: 3}])*

Output--



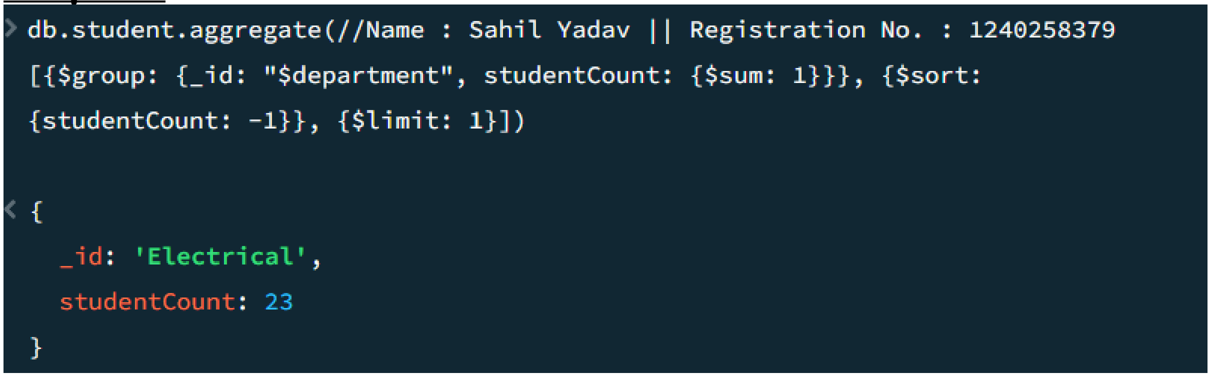
```
> db.enrollment.aggregate(//Name : Sahil Yadav || Registration No. : 1240258379
  [{$group: {_id: "$student_id", averageMarks: {$avg: "$marks"}}}, {$sort:
  {averageMarks: -1}}, {$limit: 3}])
< {
    _id: 'S080',
    averageMarks: 100
  }
  {
    _id: 'S046',
    averageMarks: 98
  }
  {
    _id: 'S041',
    averageMarks: 94
  }
```

Definition-- This Query will return highest average marks of top 3 students in the given collection across all enrolled courses.

Q6. Count how many students are in each department. Display the department with the highest number of students.

Query-- *db.student.aggregate([{$group: {_id: "$department", studentCount: {$sum: 1}}}, {$sort: {studentCount: -1}}, {$limit: 1}])*

Output—



```
> db.student.aggregate(//Name : Sahil Yadav || Registration No. : 1240258379
  [{$group: {_id: "$department", studentCount: {$sum: 1}}}, {$sort:
  {studentCount: -1}}, {$limit: 1}])

< {
    _id: 'Electrical',
    studentCount: 23
  }
```

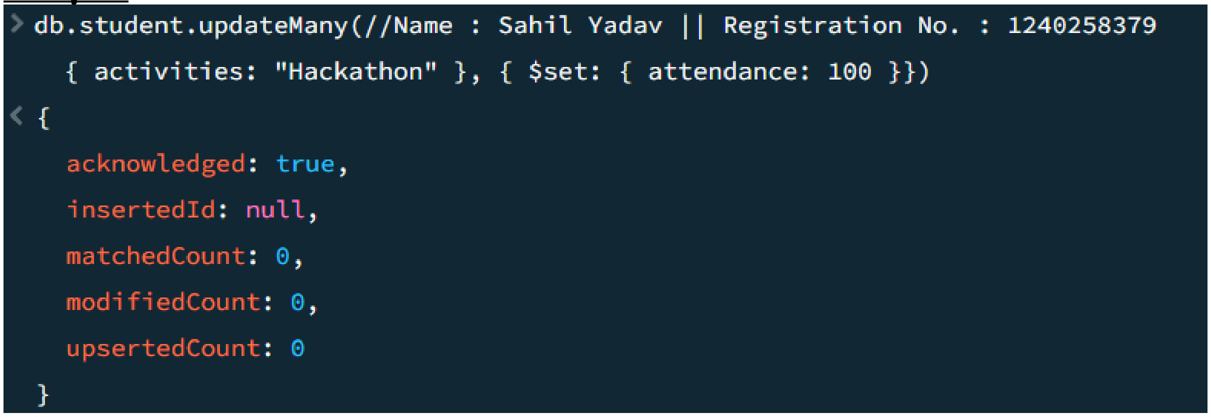
Definition—Firstly this query count how many students are in each department, one by one and then display that department which is highest number of students.

4. Update, Upsert, and Delete

Q7. Update attendance to 100% for all students who won any "Hackathon".

Query-- *db.student.updateMany({ activities: "Hackathon" }, { $set: { attendance: 100 }})*

Output--



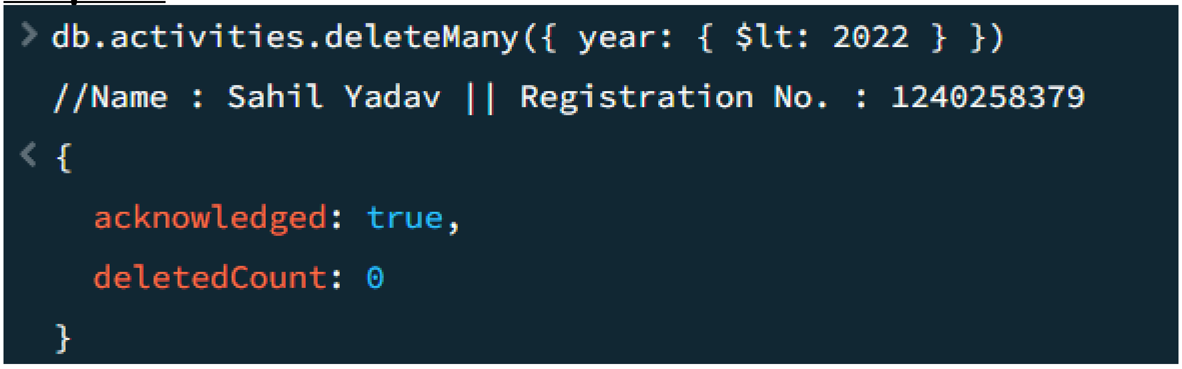
```
> db.student.updateMany(//Name : Sahil Yadav || Registration No. : 1240258379
    { activities: "Hackathon" }, { $set: { attendance: 100 }})
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 0,
    modifiedCount: 0,
    upsertedCount: 0
  }
```

Definition--This query is use to update attendance of only those students who won any "Hackathon" by changing to 100% .

Q8. Delete all student activity records where the activity year is before 2022.

Query-- *db.activities.deleteMany({ year: { $lt: 2022 } })*

Output—



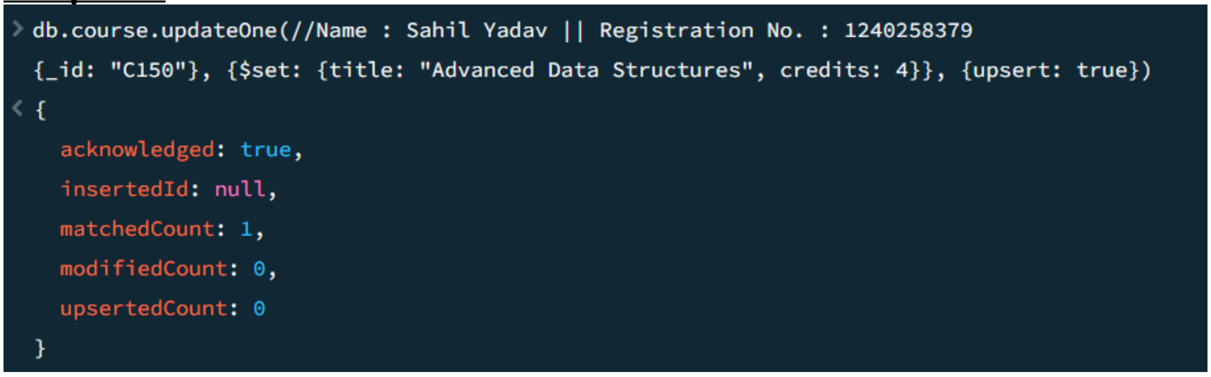
```
> db.activities.deleteMany({ year: { $lt: 2022 } })
  //Name : Sahil Yadav || Registration No. : 1240258379
< {
    acknowledged: true,
    deletedCount: 0
  }
```

Definition-- This query will delete all the records where the activity year is before 2022 of collection name activities.

Q9. **Upsert a course record for "Data Structures" with ID "C150" and credits 4—if it doesn't exist, insert it; otherwise update its title to "Advanced Data Structures".**

Query-- ***db.course.updateOne({_id: "C150"}, {$set: {title: "Advanced Data Structures", credits: 4}}, {upsert: true})***

Output—



```
> db.course.updateOne(//Name : Sahil Yadav || Registration No. : 1240258379
  {_id: "C150"}, {$set: {title: "Advanced Data Structures", credits: 4}}, {upsert: true})
< {
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 0,
    upsertedCount: 0
  }
```

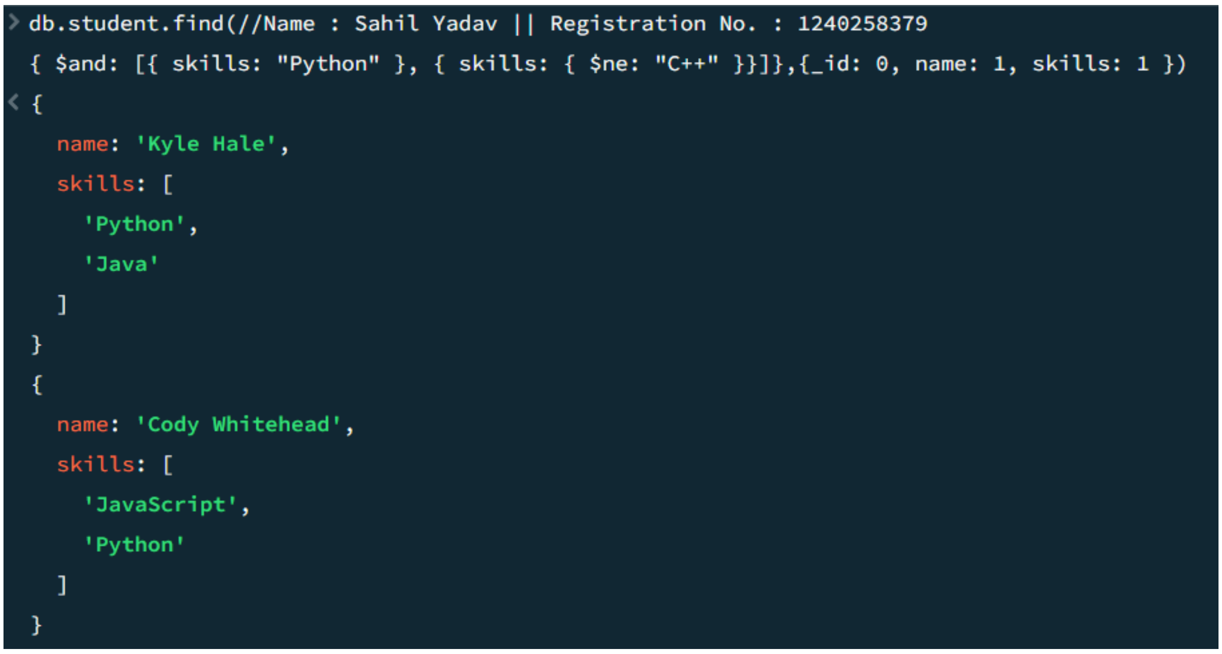
Definition-- This query will upsert a course record for "Data Structures" with ID "C150" and credits 4, if it doesn't exist.

5.Array & Operator Usage

Q10. Find all students who have "Python" as a skill but not "C++".

Query-- ***db.student.find({ $and: [{ skills: "Python" }, { skills: { $ne: "C++" }}]},{_id: 0, name: 1, skills: 1 })***

Output—



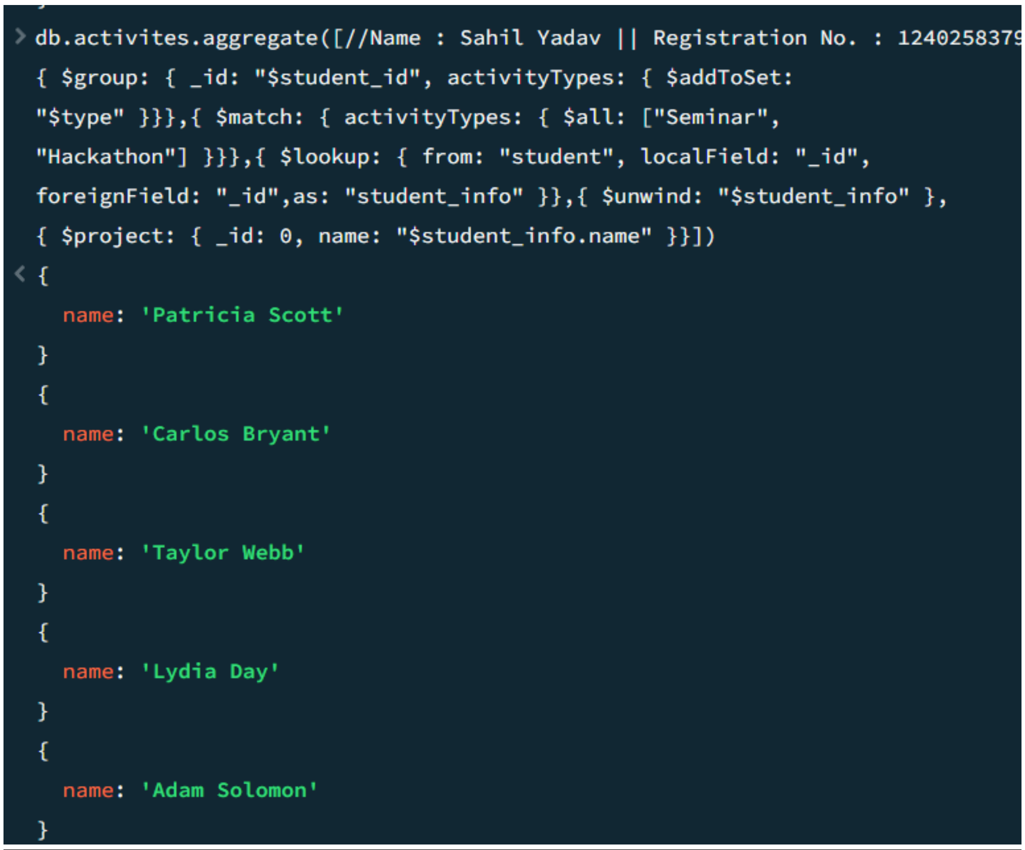
```
> db.student.find(//Name : Sahil Yadav || Registration No. : 1240258379
  { $and: [{ skills: "Python" }, { skills: { $ne: "C++" }}]},{_id: 0, name: 1, skills: 1 })
< {
    name: 'Kyle Hale',
    skills: [
      'Python',
      'Java'
    ]
  }
  {
    name: 'Cody Whitehead',
    skills: [
      'JavaScript',
      'Python'
    ]
  }
```

Definition– This query will give the user all students name & skills who have "Python" as a skill but not "C++".

Q11. Return names of students who participated in "Seminar" and "Hackathon" both.

Query-- *db.activites.aggregate([{ $group: { _id: "$student_id", activityTypes: { $addToSet: "$type" }}},{ $match: { activityTypes: { $all: ["Seminar", "Hackathon"] }}}, { $lookup: { from: "student", localField: "_id", foreignField: "_id",as: "student_info" }},{ $unwind: "$student_info" }, { $project: { _id: 0, name: "$student_info.name" }}])*

Output—



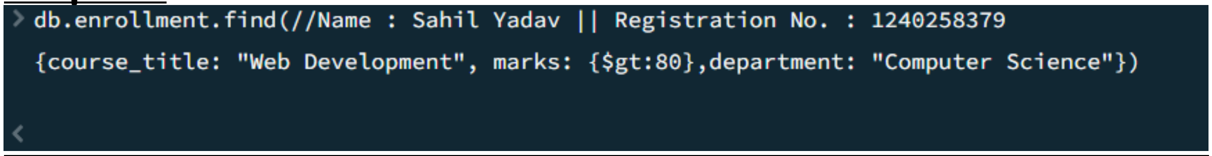
```
> db.activites.aggregate([//Name : Sahil Yadav || Registration No. : 124025837
  { $group: { _id: "$student_id", activityTypes: { $addToSet:
  "$type" }}},{ $match: { activityTypes: { $all: ["Seminar",
  "Hackathon"] }}},{ $lookup: { from: "student", localField: "_id",
  foreignField: "_id",as: "student_info" }},{ $unwind: "$student_info" },
  { $project: { _id: 0, name: "$student_info.name" }}])
< {
    name: 'Patricia Scott'
  }
  {
    name: 'Carlos Bryant'
  }
  {
    name: 'Taylor Webb'
  }
  {
    name: 'Lydia Day'
  }
  {
    name: 'Adam Solomon'
  }
```

Definition– This query will return names of students who participated in “Seminar” and “Hackathon” both.

Q12. Find students who scored more than 80 in "Web Development" only if they belong to the "Computer Science" department.

Query— *db.enrollment.find({course_title: "Web Development", marks: {$gt:80},department: "Computer Science"})*

Output—



```
> db.enrollment.find(//Name : Sahil Yadav || Registration No. : 1240258379
  {course_title: "Web Development", marks: {$gt:80},department: "Computer Science"})

<
```

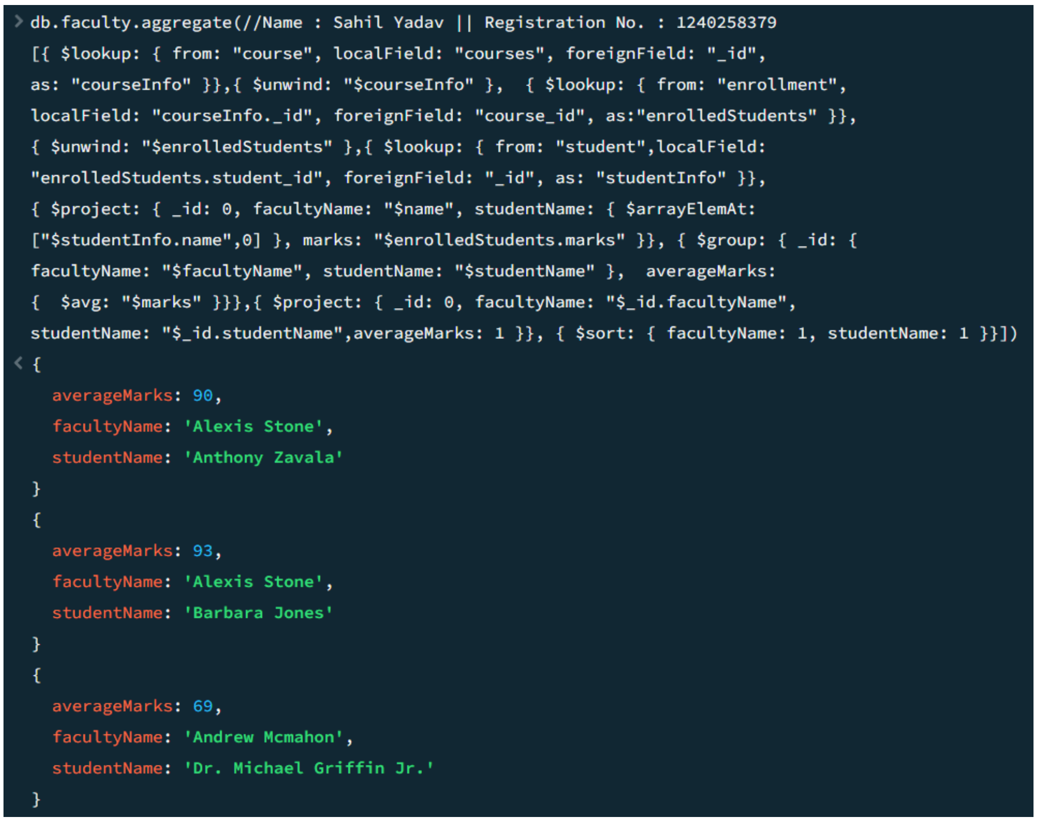
Definition– This Query will find the students who scored more than 80 in “Web Development” only if they belong to the “Computer Science” department.

7. Advanced Aggregation (Challenge Level)

Q13. For each faculty member, list the names of all students enrolled in their courses along with average marks per student per faculty.

Query--
```
db.faculty.aggregate( [{ $lookup: { from: "course",
localField: "courses", foreignField: "_id", as: "courseInfo" }},
{ $unwind: "$courseInfo" },  { $lookup: { from: "enrollment",
localField: "courseInfo._id", foreignField: "course_id",
as:"enrolledStudents" }}, { $unwind: "$enrolledStudents" },
{ $lookup: { from: "student",localField:
"enrolledStudents.student_id", foreignField: "_id",
as: "studentInfo" }},{ $project: { _id: 0, facultyName: "$name",
studentName: { $arrayElemAt:["$studentInfo.name",0] },
marks: "$enrolledStudents.marks" }}, { $group: { _id: {
facultyName: "$facultyName", studentName:
"$studentName" },  averageMarks: {  $avg: "$marks" }}},{
$project: { _id: 0, facultyName: "$_id.facultyName",
studentName: "$_id.studentName",averageMarks: 1 }}, {
$sort: { facultyName: 1, studentName: 1 }}])
```

Output--



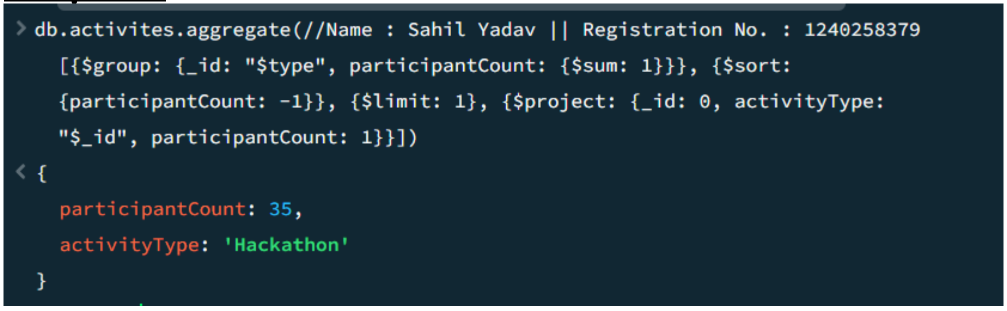
```
> db.faculty.aggregate(//Name : Sahil Yadav || Registration No. : 1240258379
  [{ $lookup: { from: "course", localField: "courses", foreignField: "_id",
  as: "courseInfo" }},{ $unwind: "$courseInfo" },  { $lookup: { from: "enrollment",
  localField: "courseInfo._id", foreignField: "course_id", as:"enrolledStudents" }},
  { $unwind: "$enrolledStudents" },{ $lookup: { from: "student",localField:
  "enrolledStudents.student_id", foreignField: "_id", as: "studentInfo" }},
  { $project: { _id: 0, facultyName: "$name", studentName: { $arrayElemAt:
  ["$studentInfo.name",0] }, marks: "$enrolledStudents.marks" }}, { $group: { _id: {
  facultyName: "$facultyName", studentName: "$studentName" },  averageMarks:
  {  $avg: "$marks" }}},{ $project: { _id: 0, facultyName: "$_id.facultyName",
  studentName: "$_id.studentName",averageMarks: 1 }}, { $sort: { facultyName: 1, studentName: 1 }}])
< {
    averageMarks: 90,
    facultyName: 'Alexis Stone',
    studentName: 'Anthony Zavala'
  }
  {
    averageMarks: 93,
    facultyName: 'Alexis Stone',
    studentName: 'Barbara Jones'
  }
  {
    averageMarks: 69,
    facultyName: 'Andrew Mcmahon',
    studentName: 'Dr. Michael Griffin Jr.'
  }
```

Definition– This Query will list the names of all students enrolled in their courses along with average marks per students per faculty for each faculty.

Q14. Show the most popular activity type (e.g., Hackathon, Seminar, etc.) by number of student participants.

Query-- *db.activites.aggregate([{$group: {_id: "$type", participantCount: {$sum: 1}}}, {$sort: {participantCount: -1}}, {$limit: 1}, {$project: {_id: 0, activityType: "$_id", participantCount: 1}}])*

Output—



```
> db.activites.aggregate(//Name : Sahil Yadav || Registration No. : 1240258379
    [{$group: {_id: "$type", participantCount: {$sum: 1}}}, {$sort:
    {participantCount: -1}}, {$limit: 1}, {$project: {_id: 0, activityType:
    "$_id", participantCount: 1}}])
< {
    participantCount: 35,
    activityType: 'Hackathon'
  }
```

Definition– This query will show most popular activity by number of student participants.