Aggregation Operators

Aggregation operations process data records and return computed results. Aggregation operations group values from multiple documents together, and can perform a variety of operations on the grouped data to return a single result.

Syntax

db.collection.aggregate(<AGGREGATE OPERATION>

Types

Expression Type	Description	Syntax
Accumulators	Perform calculations on entire groups of documents	
* $sum	Calculates the sum of all values in a numeric field within a group.	"$fieldName": { $sum: "$fieldName" }
* $avg	Calculates the average of all values in a numeric field within a group.	"$fieldName": { $avg: "$fieldName" }
* $min	Finds the minimum value in a field within a group.	"$fieldName": { $min: "$fieldName" }
* $max	Finds the maximum value in a field within a group.	"$fieldName": { $max: "$fieldName" }
* $push	Creates an array containing all unique or duplicate values from a field	"$arrayName": { $push: "$fieldName" }
* $addToSet	Creates an array containing only unique values from a field within a group.	"$arrayName": { $addToSet: "$fieldName" }
* $first	Returns the first value in a field within a group (or entire collection).	"$fieldName": { $first: "$fieldName" }
* $last	Returns the last value in a field within a group (or entire collection).	"$fieldName": { $last: "$fieldName" }

Average GPA of All Students

The average GPA of all students in MongoDB is calculated using an aggregation query that groups all documents in the `students` collection and computes the mean of the `gpa` field. This is achieved by using the `$avg` operator within a `$group` stage, setting `_id` to `null` to consider the entire collection.

```
test> use db
switched to db db
db> db.students.aggregate([
... {$group:{_id:null,averageGPA:{$avg:"$gpa"}}}
... ]);
[ { _id: null, averageGPA: 3.2268699186991867 } ]
db>
```

The MongoDB aggregation query calculates the average GPA of all students in the `students` collection. By using the `db.students.aggregate` method, it executes an aggregation pipeline with a single `$group` stage. In this stage, setting `_id` to `null` groups all documents together, ensuring the operation considers the entire collection. The `averageGPA` field computes the average value of the `gpa` field across all documents using the `$avg` operator. The output is a single document with `_id: null` (indicating no specific grouping) and `averageGPA: 3.2268699186991867`, representing the average GPA of the students.

Minimum and Maximum Age:

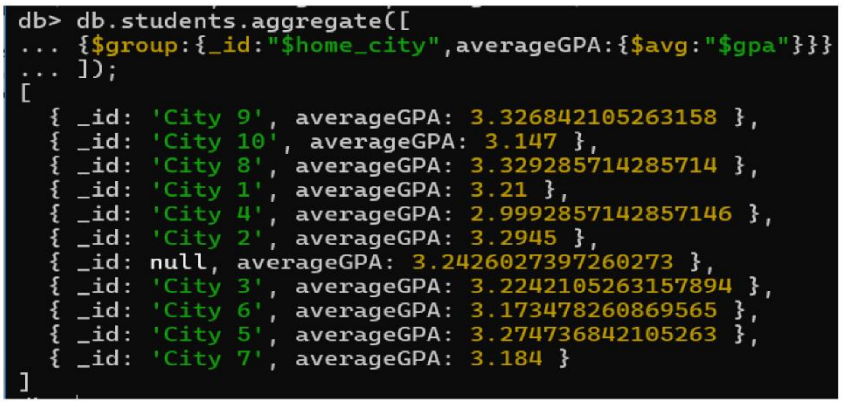
The minimum and maximum age in MongoDB can be calculated using an aggregation query that groups all documents in a collection and computes the minimum and maximum values of the `age` field. This is achieved by using the `$min` and `$max` operators within a `$group` stage, setting `_id` to `null` to consider the entire collection.

```
db> db.students.aggregate([
... {$group:{_id:null,minAge:{$min:"$age"},maxAge:{$max:"$age"}}}
... ]);
[ { _id: null, minAge: 18, maxAge: 25 } ]
db>
```

- Similar to the previous example, it uses `$group` to group all documents.
- `minAge`: Uses the `$min` operator to find the minimum value in the "age" field.
- `maxAge`: Uses the `$max` operator to find the maximum value in the "age" field.

Average GPA for all home cities:

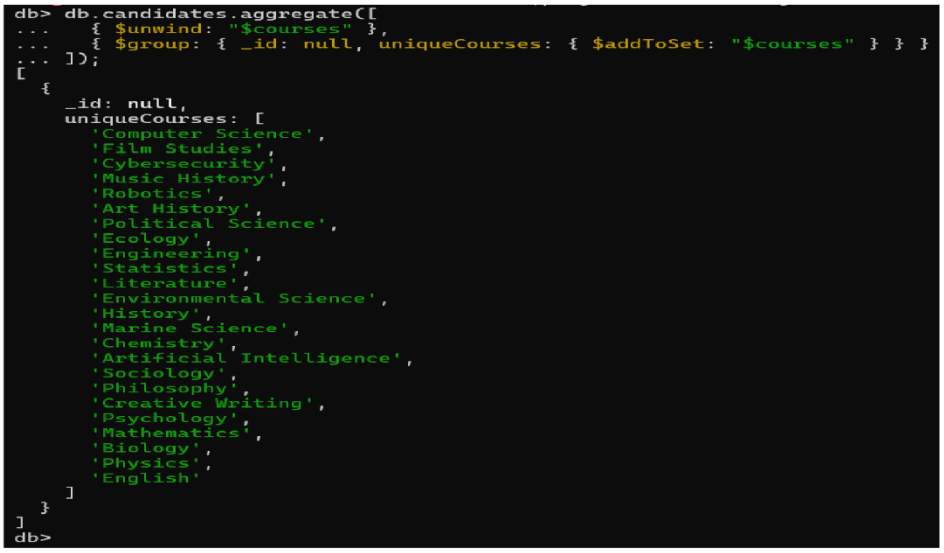
The average GPA for all home cities in MongoDB can be calculated using an aggregation query that groups documents by the `homeCity` field and computes the mean of the `gpa` field for each group. This is done by using the `$group` stage with `_id` set to `$homeCity` and the `$avg` operator applied to the `gpa` field.



The MongoDB aggregation query calculates the average GPA for students from each home city in the `students` collection. Using the `db.students.aggregate` method, it executes an aggregation pipeline with a `$group` stage that groups documents by the `home_city` field (`_id: "$home_city"`). Within each group, the `averageGPA` field is computed using the `$avg` operator applied to the `gpa` field. The output is an array of documents where each document represents a home city (e.g., 'City 9', 'City 10') and its corresponding average GPA, along with a document where `_id` is `null` representing students with no specified home city, showing the average GPA across all such groups.

Collect Unique Courses Offered (Using $addToSet):

Collecting unique courses offered using `$addToSet` in MongoDB involves aggregating documents and gathering unique values from the `courses` field across all documents. This aggregation is achieved by using the `$group` stage with `$addToSet` to accumulate unique course names into a set within each group, ensuring no duplicates are included in the final aggregation result.



The MongoDB aggregation query unwinds the `courses` array field in the `candidates` collection, ensuring each document is replicated for every course it lists. Then, it groups all documents together (denoted by `_id: null`) and applies the `$addToSet` operator to collect unique course names from all documents into the `uniqueCourses` array. This results in a single document output where `uniqueCourses` contains an array listing all distinct courses found across all candidates, ensuring each course appears only once regardless of how many candidates have it listed.