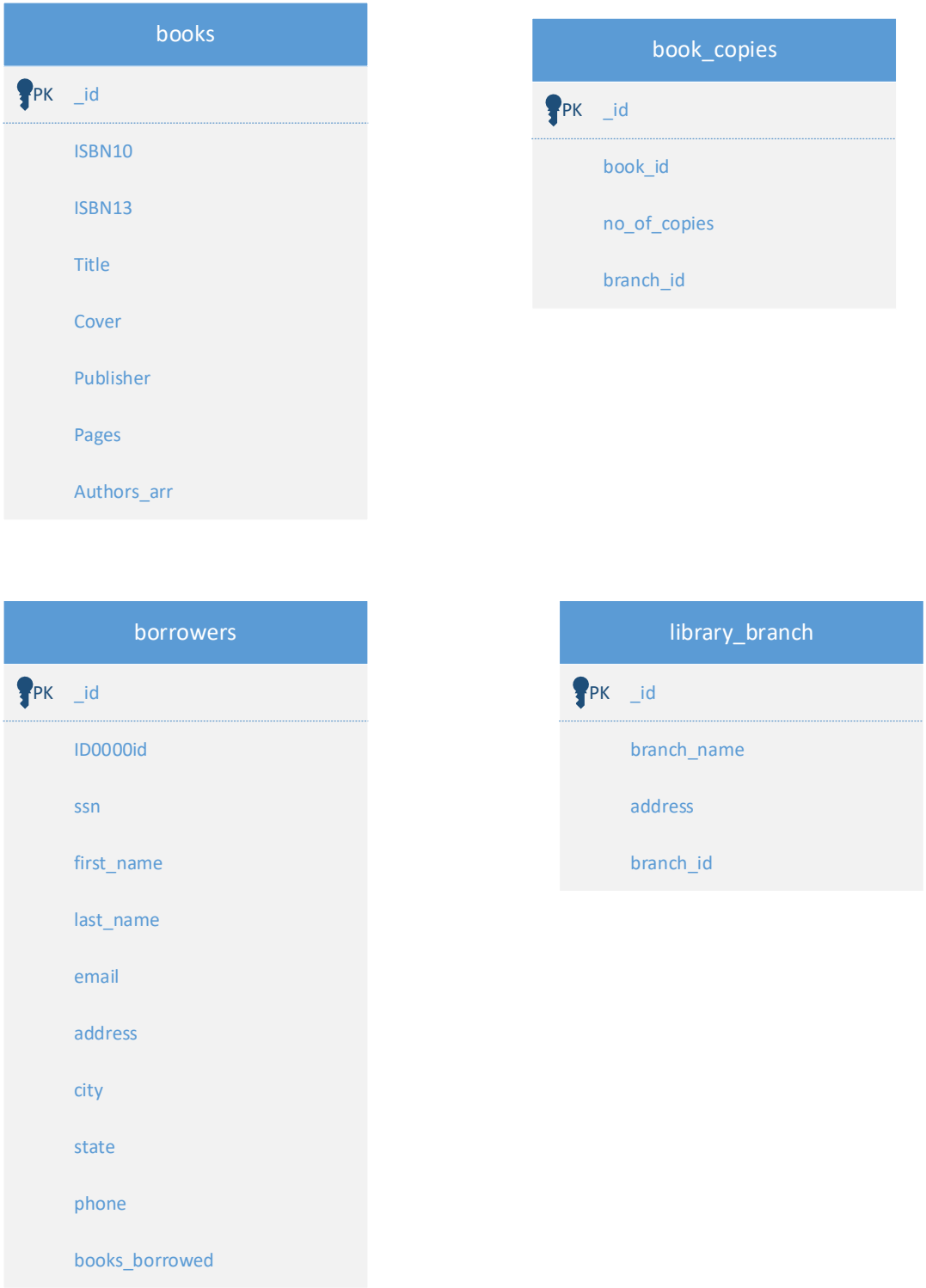
Design and DB Architecture:

ER Diagram:

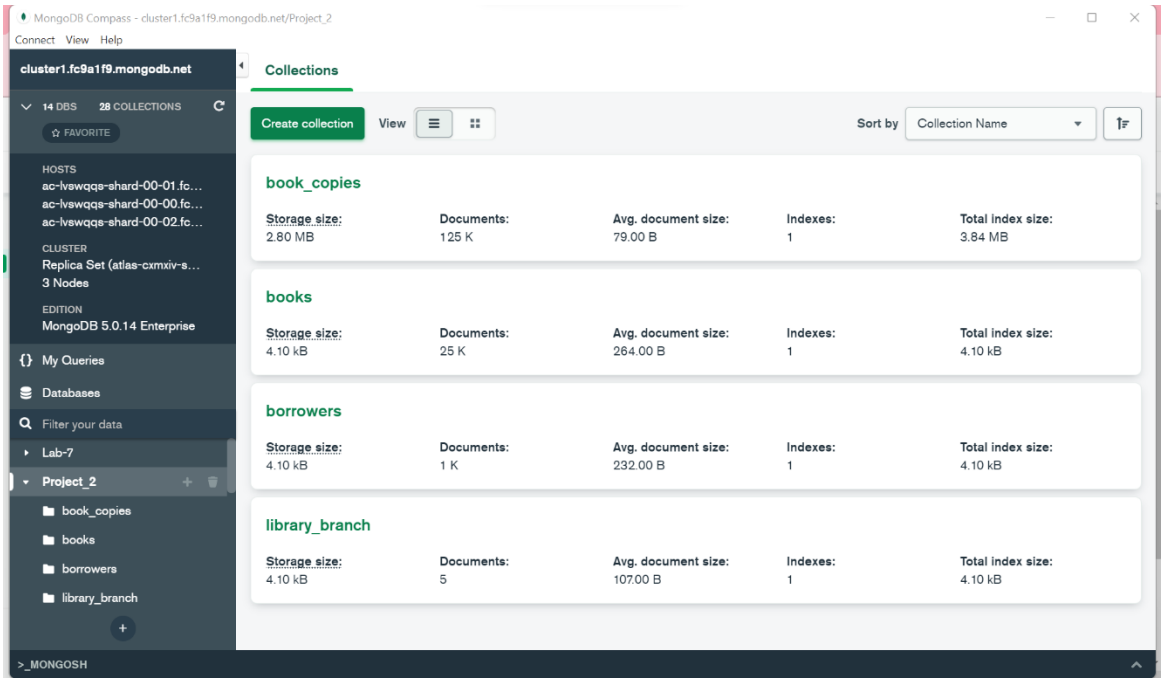


Amritha Rajarajan

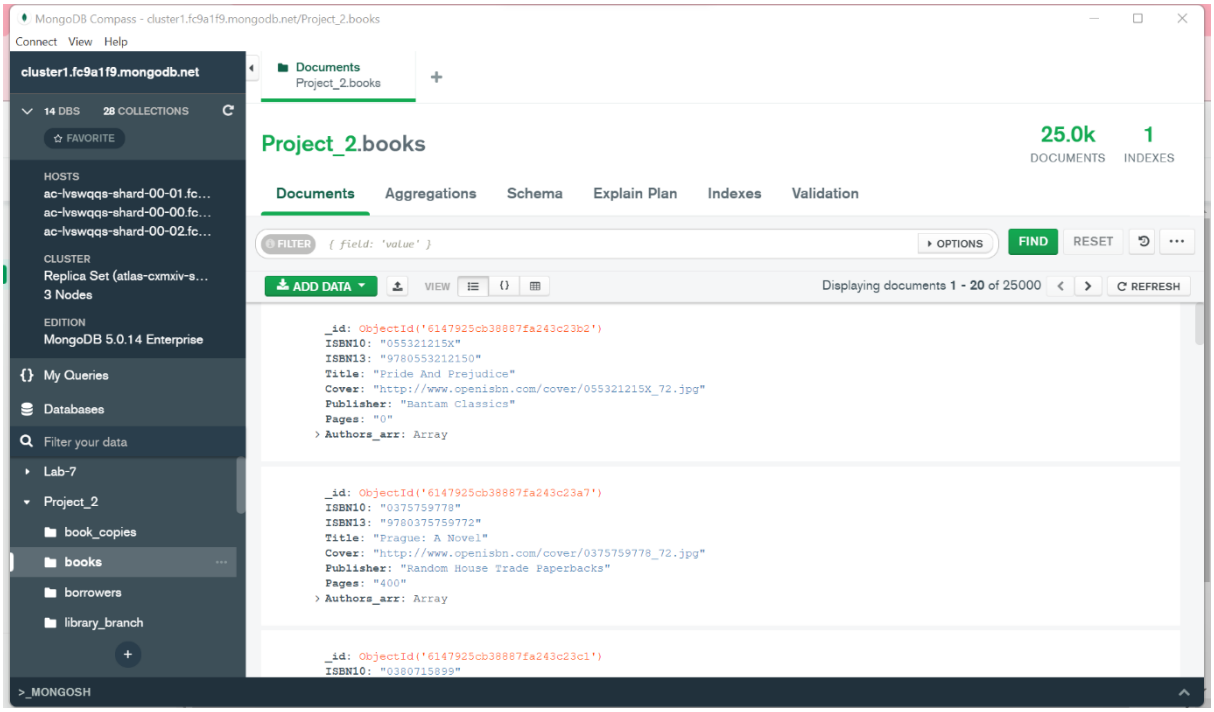
Data Load and Data Generation:

1. Load data files:

Database “Project_2” and collections:



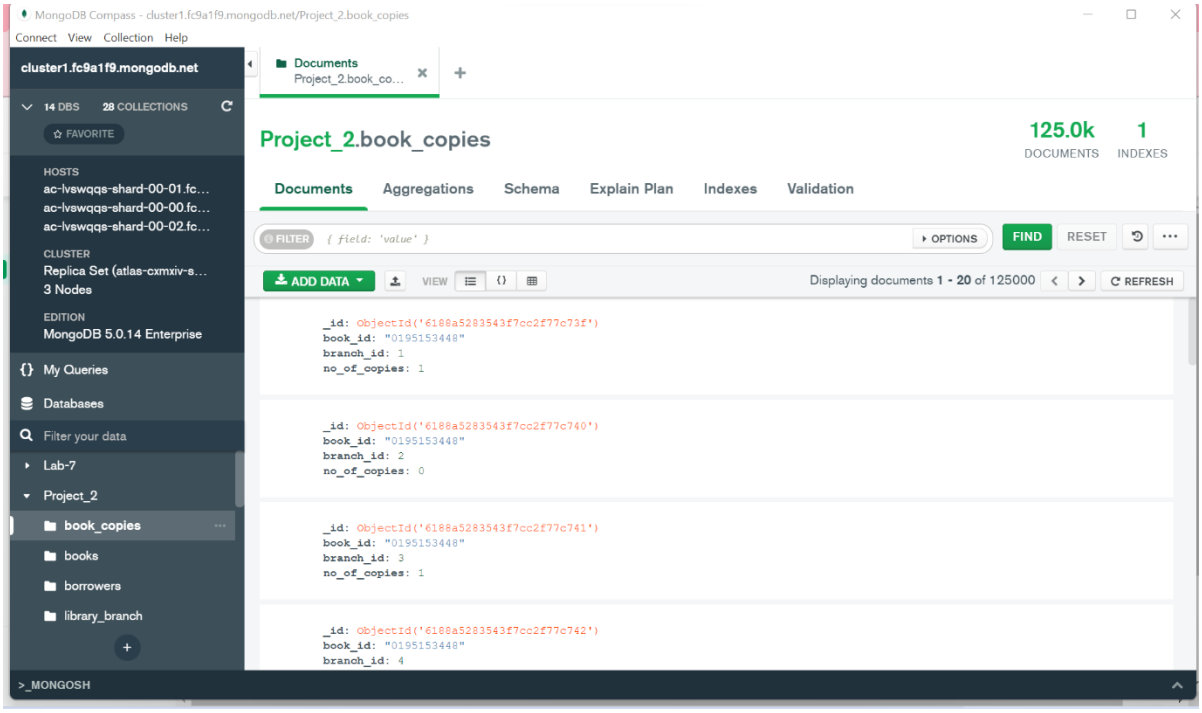
Data load into books collection:




```
Microsoft Windows [Version 10.0.22000.1219]
(c) Microsoft Corporation. All rights reserved.

C:\Users\19452>mongosh "mongodb+srv://cluster1.fc9a1f9.mongodb.net/myFirstDatabase" --apiVersion 1 --username AXR210176
Enter password: ************
Current Mongosh Log ID: 6392b3d60106b9d7c72e15c6
Connecting to:          mongodb+srv://<credentials>@cluster1.fc9a1f9.mongodb.net/myFirstDatabase?appName=mongosh+1.6.0
Using MongoDB:          5.0.14 (API Version 1)
Using Mongosh:          1.6.0

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

Atlas atlas-cxmxiv-shard-0 [primary] myFirstDatabase> use Project_2
switched to db Project_2
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.books.find()
[
  {
    _id: ObjectId("6147925cb38887fa243c23b2"),
    ISBN10: '055321215X',
    ISBN13: '9780553212150',
    Title: 'Pride And Prejudice',
    Cover: 'http://www.openisbn.com/cover/055321215X_72.jpg',
    Publisher: 'Bantam Classics',
    Pages: '0',
    Authors_arr: [ 'Jane Austen' ]
  },
  {
    _id: ObjectId("6147925cb38887fa243c23a7"),
    ISBN10: '0375759778',
    ISBN13: '9780375759772',
    Title: 'Prague: A Novel',
    Cover: 'http://www.openisbn.com/cover/0375759778_72.jpg',
    Publisher: 'Random House Trade Paperbacks',
    Pages: '400',
    Authors_arr: [ 'Arthur Phillips' ]
  },
  {
    _id: ObjectId("6147925cb38887fa243c23c1"),
    ISBN10: '0380715899',
    ISBN13: '9780380715893',
    Title: 'Soldier Of The Great War',
    Cover: 'http://www.openisbn.com/cover/0380715899_72.jpg',
    Publisher: 'Avon Books',
    Pages: '736',
```

Amritha Rajarajan

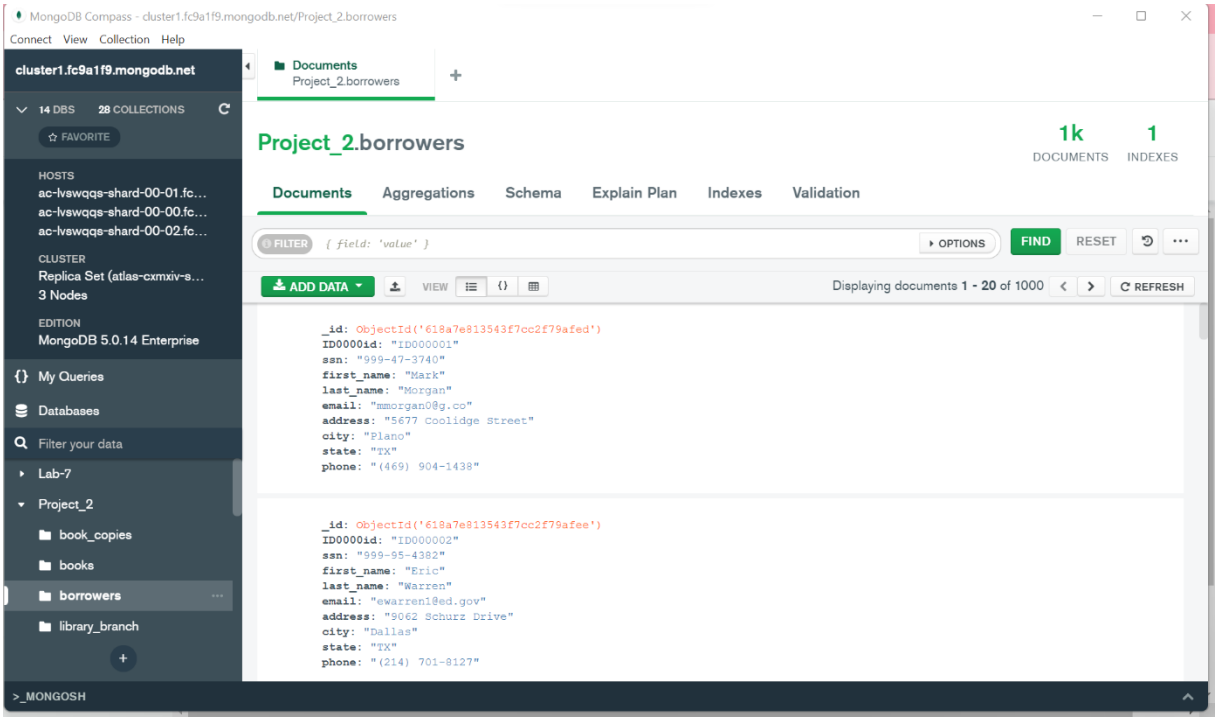
Data load into book_copies collection:




```
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.book_copies.find()
[   Pages: '198',
  { Authors_arr: [ "Louis L'Amour" ]
    _id: ObjectId("6188a5283543f7cc2f77c73f"),
    book_id: '0195153448',
    branch_id: 1,("6147925cb38887fa243c23f9"),
    no_of_copies: 18080',
  },ISBN13: '9780451208088',
  { Title: 'The Short Forever (Stone Barrington)',
    _id: ObjectId("6188a5283543f7cc2f77c740"),208080_72.jpg',
    book_id: '0195153448',
    branch_id: 2,
    no_of_copies: 0'Stuart Woods' ]
  },
  {
    _id: ObjectId("6188a5283543f7cc2f77c741"),
    book_id: '0195153448',
    branch_id: 3,553584387',
    no_of_copies: 1m',
  },Cover: 'http://www.openisbn.com/cover/0553584383_72.jpg',
  { Publisher: 'Bantam',
    _id: ObjectId("6188a5283543f7cc2f77c742"),
    book_id: '0195153448',ohansen' ]
    branch_id: 4,
    no_of_copies: 1
  },_id: ObjectId("6147925cb38887fa243c23fc"),
  { ISBN10: '0812575954',
    _id: ObjectId("6188a5283543f7cc2f77c743"),
    book_id: '0195153448',
```

Amritha Rajarajan

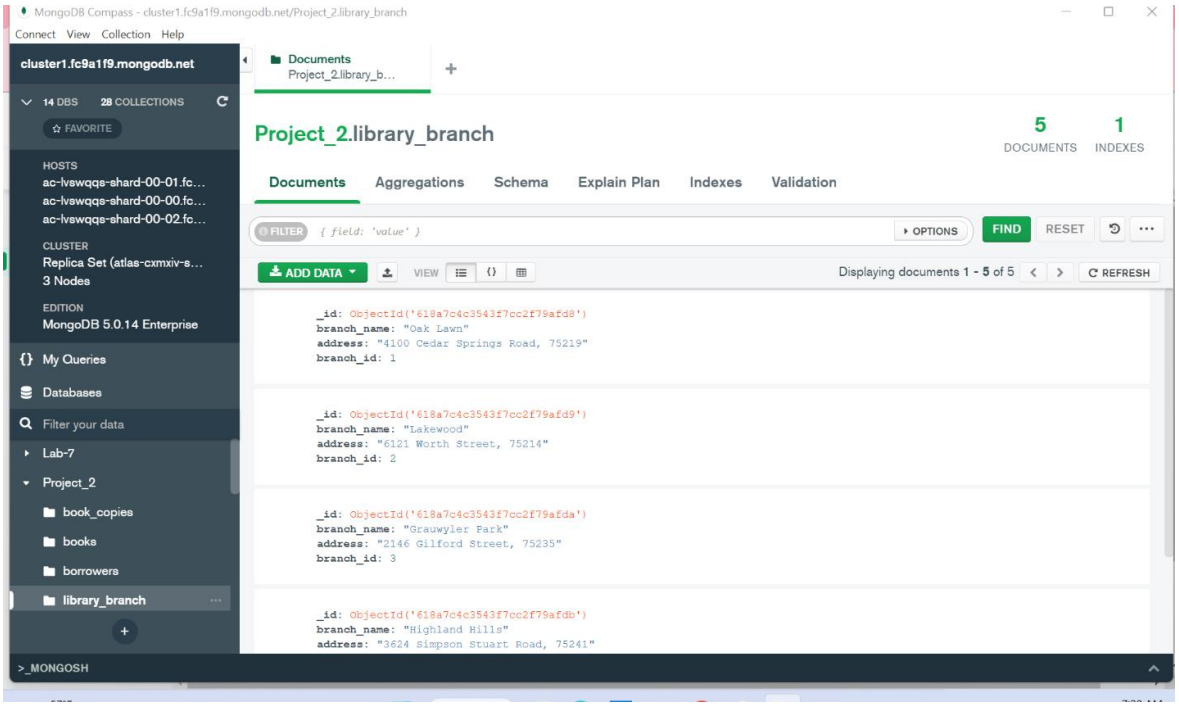
Data load into borrowers collection:




```
Type "it" for more
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.borrowers.find()
[
  {
    _id: ObjectId("618a7e813543f7cc2f79afed"),
    ID0000id: 'ID000001',
    ssn: '999-47-3740',
    first_name: 'Mark',
    last_name: 'Morgan',
    email: 'mmorgan0@g.co',
    address: '5677 Coolidge Street',
    city: 'Plano',
    state: 'TX',
    phone: '(469) 904-1438'
  },
  {
    _id: ObjectId("618a7e813543f7cc2f79afee"),
    ID0000id: 'ID000002',
    ssn: '999-95-4382',
    first_name: 'Eric',
    last_name: 'Warren',
    email: 'ewarren1@ed.gov',
    address: '9062 Schurz Drive',
    city: 'Dallas',
    state: 'TX',
    phone: '(214) 701-8127'
  },
  {
    _id: ObjectId("618a7e813543f7cc2f79afef"),
    ID0000id: 'ID000003',
    ssn: '999-51-5268',
    first_name: 'Robert',
    last_name: 'Harper',
    email: 'rharper2@angelfire.com',
    address: '7786 Sachs Place',
    city: 'Plano',
    state: 'TX',
    phone: '(214) 875-5911'
```

Amritha Rajarajan

Data load into library_branch collection:

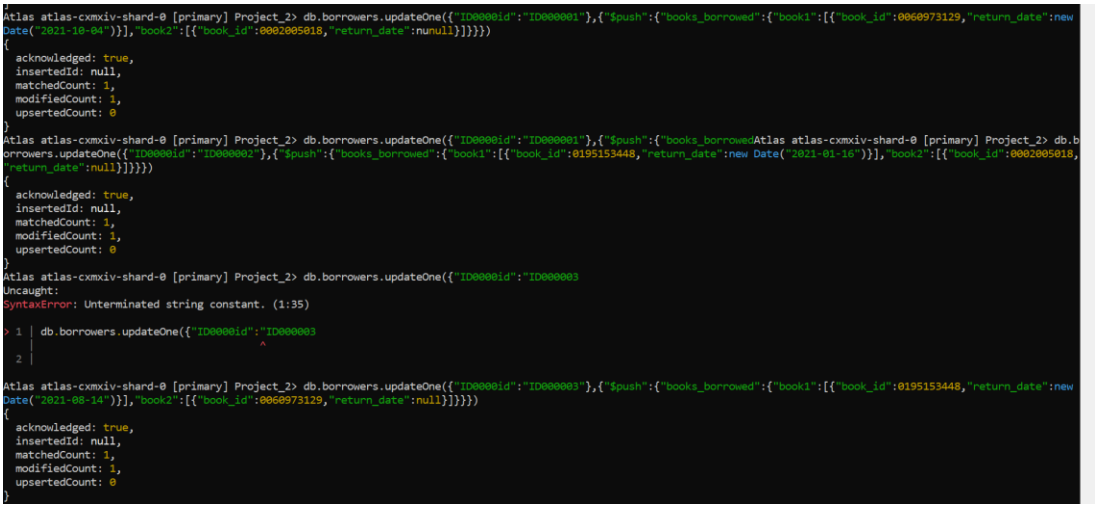


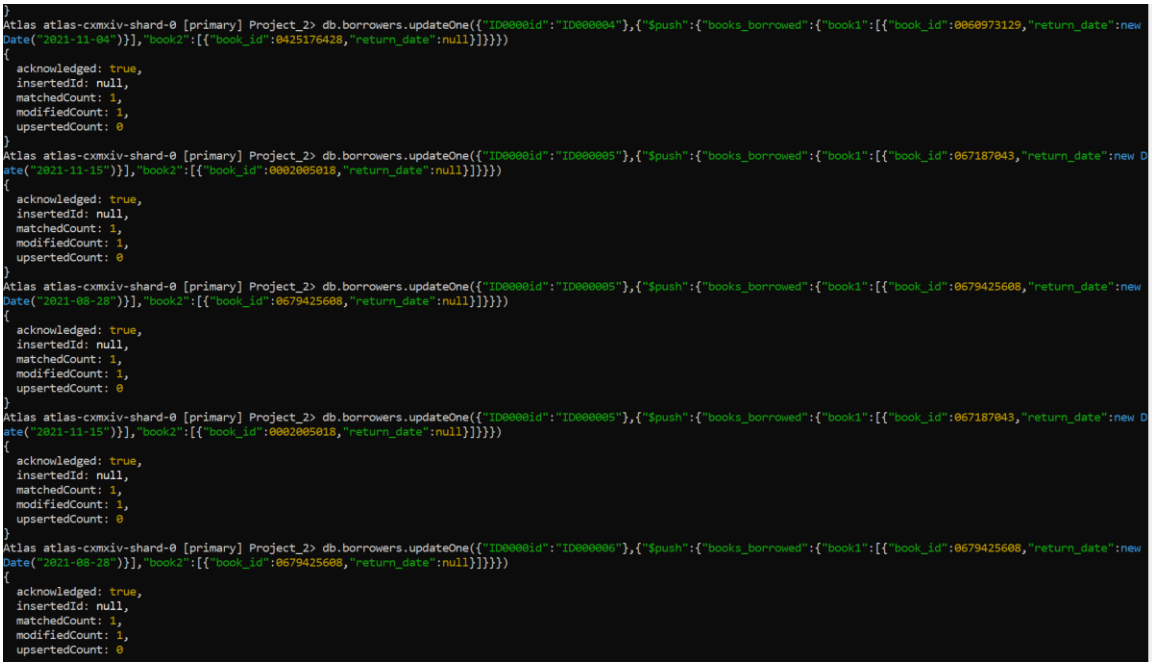

```
Type "it" for more
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.library_branch.find()
[
  {
    _id: ObjectId("618a7c4c3543f7cc2f79afd8"),
    branch_name: 'Oak Lawn',
    address: '4100 Cedar Springs Road, 75219',
    branch_id: 1
  },
  {
    _id: ObjectId("618a7c4c3543f7cc2f79afd9"),
    branch_name: 'Lakewood',
    address: '6121 Worth Street, 75214',
    branch_id: 2
  },
  {
    _id: ObjectId("618a7c4c3543f7cc2f79afda"),
    branch_name: 'Grauwyler Park',
    address: '2146 Gilford Street, 75235',
    branch_id: 3
  },
  {
    _id: ObjectId("618a7c4c3543f7cc2f79afdb"),
    branch_name: 'Highland Hills',
    address: '3624 Simpson Stuart Road, 75241',
    branch_id: 4
  },
  {
    _id: ObjectId("618a7c4c3543f7cc2f79afdc"),
    branch_name: 'Audelia Road',
    address: '10045 Audelia Road, 75238',
    branch_id: 5
  }
]
Atlas atlas-cxmxiv-shard-0 [primary] Project_2>
```

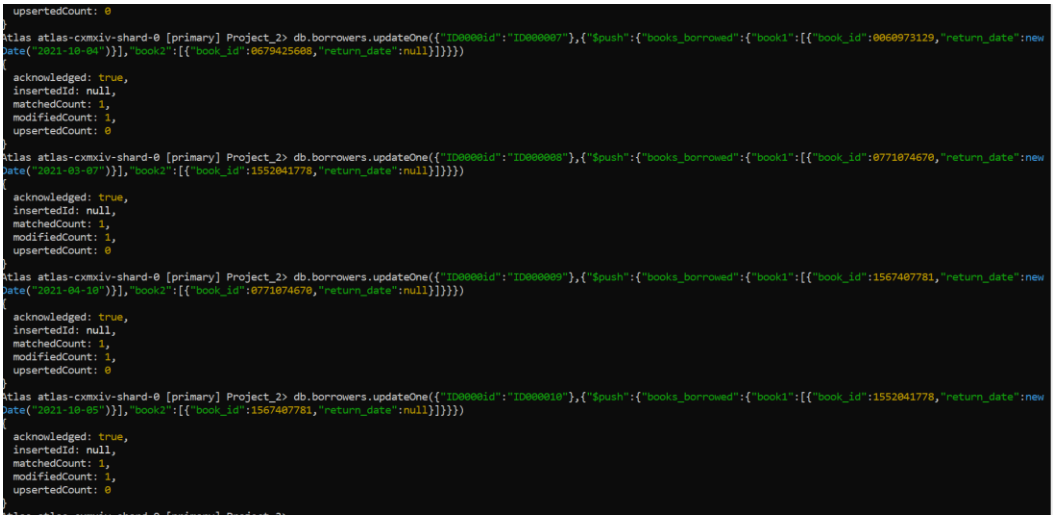
2. MongoDB script:

1. Exactly 20 books check-outs for exactly 10 different borrowers and exactly 10 different books. Same borrower should not check out same book more than once

```
db.borrowers.updateOne({"ID0000id":"ID000001"},{"$push":{"books_borrowed":{"book1":[{"book_id":
0060973129,"return_date":new Date("2021-10-04")}],"book2":[{"book_id":0002005018,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000002"},{"$push":{"books_borrowed":{"book1":[{"book_id":01951534
4 8,"return_date":new Date("2021-01-16")}],"book2":[{"book_id":0002005018,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000003"},{"$push":{"books_borrowed":{"book1":[{"book_id":
0195153448,"return_date":new  Date("2021-08-14")}],"book2":[{"book_id":0060973129,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000004"},{"$push":{"books_borrowed":{"book1":[{"book_id":
0060973129,"return_date":new  Date("2021-11-04")}],"book2":[{"book_id":0425176428,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000005"},{"$push":{"books_borrowed":{"book1":[{"book_id":06718704
3 2,"return_date":new Date("2021-11-15")}],"book2":[{"book_id":0002005018,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000006"},{"$push":{"books_borrowed":{"book1":[{"book_id":
0679425608,"return_date":new  Date("2021-08-28")}],"book2":[{"book_id":0679425608,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000007"},{"$push":{"books_borrowed":{"book1":[{"book_id":
0060973129,"return_date":new  Date("2021-10-04")}],"book2":[{"book_id":0679425608,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000008"},{"$push":{"books_borrowed":{"book1":[{"book_id":
0771074670,"return_date":new Date("2021-03- 07")}],"book2":[{"book_id":1552041778,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000009"},{"$push":{"books_borrowed":{"book1":[{"book_id":
1567407781,"return_date":new Date("2021-04- 10")}],"book2":[{"book_id":0771074670,"return_date":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000010"},{"$push":{"books_borrowed":{"book1":[{"book_id":
1552041778,"return_date":new Date("2021-10- 05")}],"book2":[{"book_id":1567407781,"return_date":null}]}}})
```



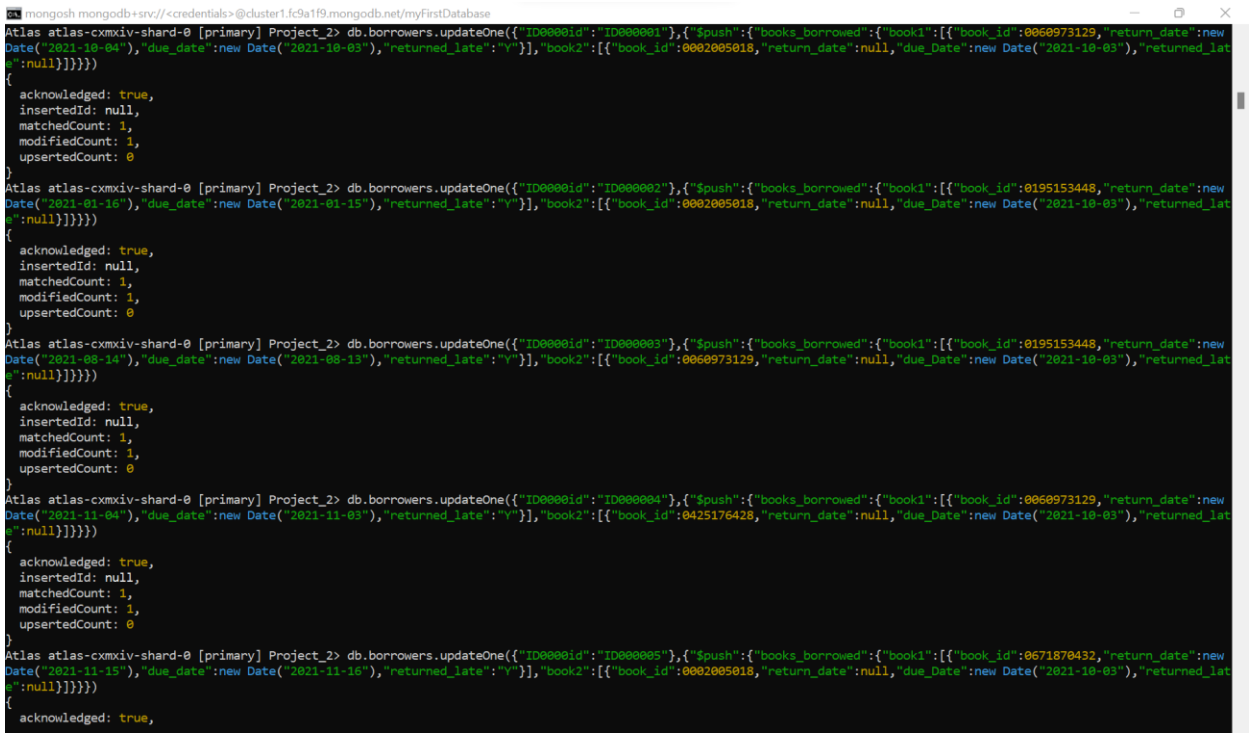


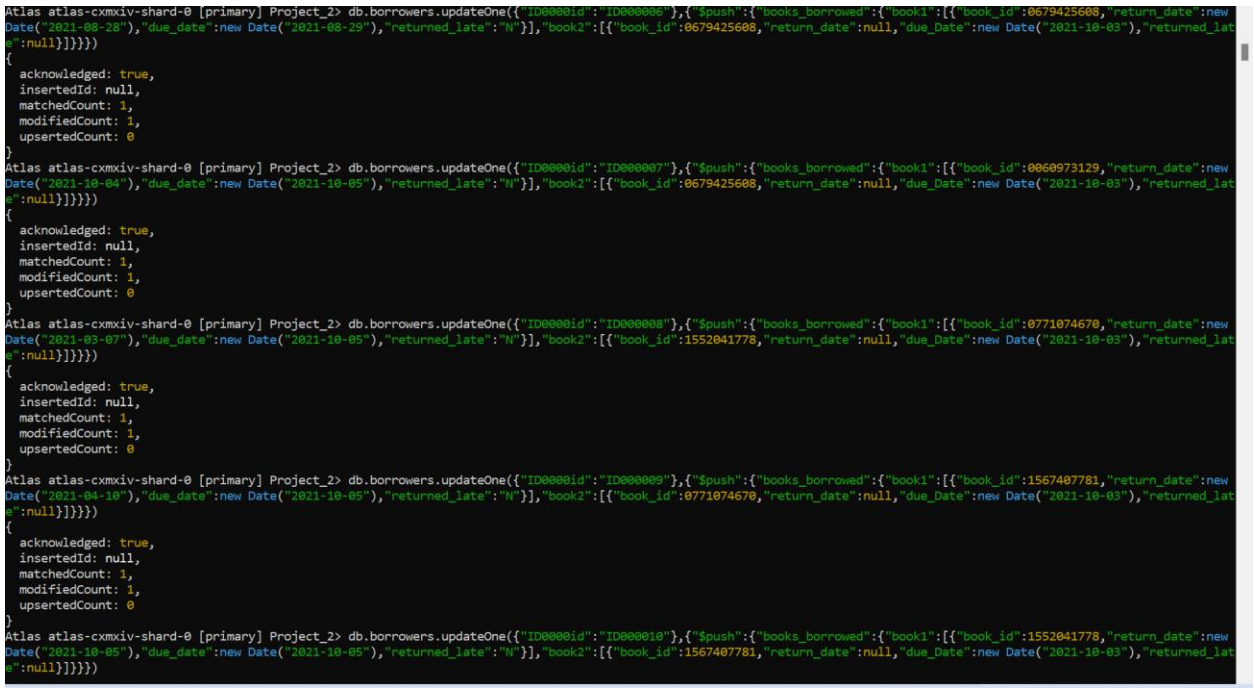


Amritha Rajarajan

```
db.borrowers.updateOne({"ID0000id":"ID000001"},{"$set":{"books_borrowed":{"book1":[{"book
_id": 0060973129,"return_date":new Date("2021-10-04"),"due_date":new Date("2021-10-
03"),"returned_late":"Y"
}],"book2":[{"book_id":0002005018,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})


db.borrowers.updateOne({"ID0000id":"ID000002"},{"$set":{"books_borrowed":{"book1":[{"book_i
d":0195153448," return_date":new Date("2021-01-16"),"due_date":new Date("2021-01-
15"),"returned_late":"Y"
}],"book2":[{"book_id":0002005018,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})


db.borrowers.updateOne({"ID0000id":"ID000003"},{"$set":{"books_borrowed":{"book1":[{"book
_id": 0195153448,"return_date":new Date("2021-08-14"),"due_date":new Date("2021-08-
13"),"returned_late":"Y"
}],"book2":[{"book_id":0060973129,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})

db.borrowers.updateOne({"ID0000id":"ID000004"},{"$set":{"books_borrowed":{"book1":[{"book
_id": 0060973129,"return_date":new Date("2021-11-04"),"due_date":new Date("2021-11-
03"),"returned_late":"Y"
}],"book2":[{"book_id":0425176428,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})


db.borrowers.updateOne({"ID0000id":"ID000005"},{"$set":{"books_borrowed":{"book1":[{"book_i
d":0671870432," return_date":new Date("2021-11-15"),"due_date":new Date("2021-11-
16"),"returned_late":"Y"
}],"book2":[{"book_id":0002005018,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})


db.borrowers.updateOne({"ID0000id":"ID000006"},{"$set":{"books_borrowed":{"book1":[{"book
_id": 0679425608,"return_date":new Date("2021-08-28"),"due_date":new Date("2021-08-
29"),"returned_late":"N"
}],"book2":[{"book_id":0679425608,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})
```

```
db.borrowers.updateOne({"ID0000id":"ID000007"},{"$set":{"books_borrowed":{"book1":[{"book
_id": 0060973129,"return_date":new Date("2021-10-04"),"due_date":new Date("2021-10-
05"),"returned_late":"N"
}],"book2":[{"book_id":0679425608,"return_date":null,"due_date":new Date("2021-10-
03"),"returned_late":null}]}}})


db.borrowers.updateOne({"ID0000id":"ID000008"},{"$set":{"books_borrowed":{"book1":[{"book_i
d"
: 0771074670,"return_date":new Date("2021-03-07"),"due_date":new Date("2021-10-
05"),"returned_late":"N"}],"book2":[{"book_id":1552041778,"return_date":null,"due_date":n
ew Date("2021-10-03"),"returned_late":null}]}}})



db.borrowers.updateOne({"ID0000id":"ID000009"},{"$set":{"books_borrowed":{"book1":[{"book_i
d"
: 1567407781,"return_date":new Date("2021-04-10"),"due_date":new Date("2021-10-
05"),"returned_late":"N"}],"book2":[{"book_id":0771074670,"return_date":null,"due_date":n
ew Date("2021-10-03"),"returned_late":null}]}}})



db.borrowers.updateOne({"ID0000id":"ID000010"},{"$set":{"books_borrowed":{"book1":[{"book_i
d"
: 1552041778,"return_date":new Date("2021-10-05"),"due_date":new Date("2021-10-
05"),"returned_late":"N"}],"book2":[{"book_id":1567407781,"return_date":null,"due_date":n
ew Date("2021-10-03"),"returned_late":null}]}}})
```





Amritha Rajarajan

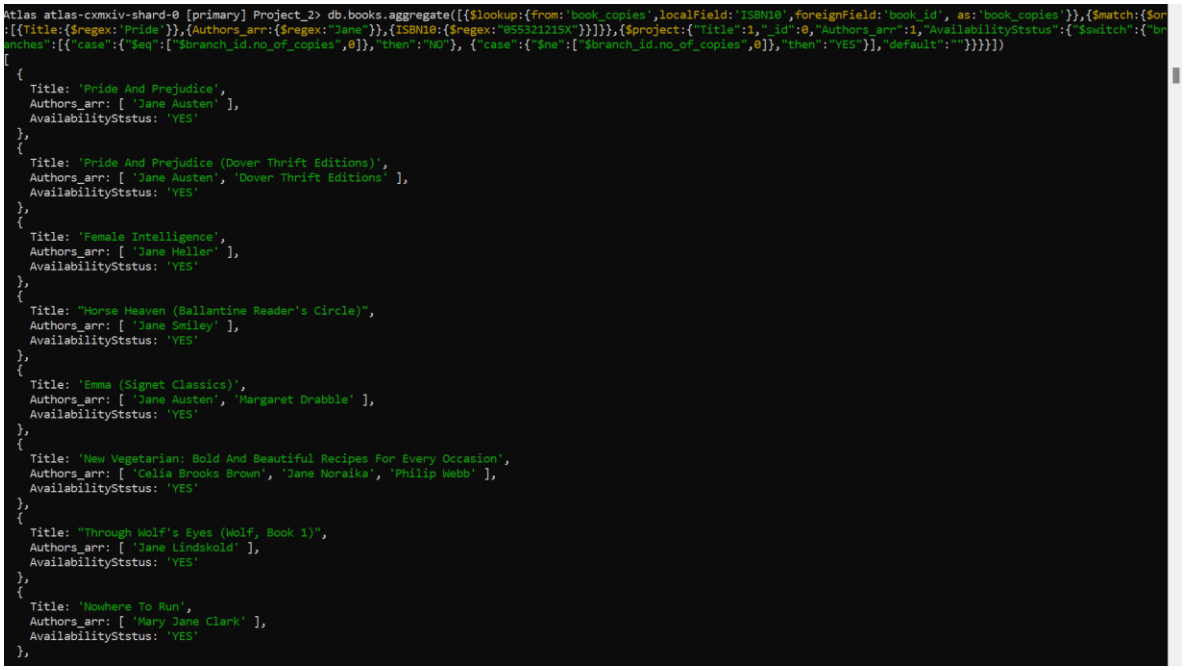
2. Exactly 10 of the above checkouts should have returned the book.

```
db.borrowers.find({"books_borrowed.book1.return_date":{$ne:null,$exists:true}}).
count()
```

```
}
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.borrowers.find({"books_borrowed.book1.return_date":{$ne:null,$exists:
true}}).count()
10
Atlas atlas-cxmxiv-shard-0 [primary] Project_2>
```

Book Search and Availability:

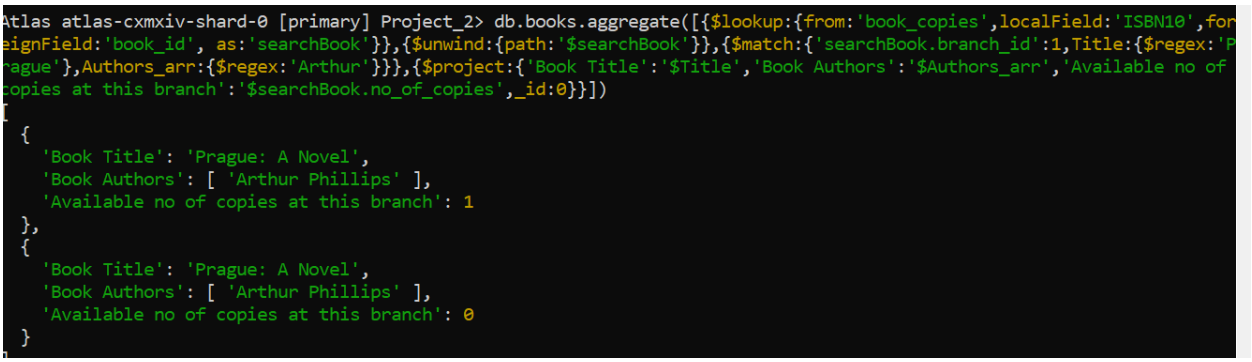
```
db.books.aggregate([{ $lookup: { from: 'book_copies', localField: 'ISBN10', foreignField: 'book_id', as: 'book_copies' } }, { $match: { $or: [{ Title: { $regex: 'Pride' } }, { Authors_arr: { $regex: "Jane" } }, { ISBN10: { $regex: "055321215X" } }] } }, { $project: { "Title": 1, "_id": 0, "Authors_arr": 1, "AvailabityStatus": { "$switch": { "branches": [{ "case": { "$eq": ["$branch_id.no_of_copies", 0] }, "then": "NO" }, { "case": { "$ne": ["$branch_id.no_of_copies", 0] }, "then": "YES" }], "default": "" } } } }])
```




```
db.books.aggregate([{ $lookup: { from: 'book_copies', localField: 'ISBN10', foreignField: 'book_id',as: 'searchBook' } }, { $unwind: { path: '$searchBook' } }, { $match: { ISBN10: '055321215X', 'searchBook.branch_id': 1, Title: { $regex: 'Pride' }, Authors_arr: { $regex: 'Jane' } } }, { $project: { 'Book Title': '$Title', 'Book Authors': '$Authors_arr', 'Available no of copies at this branch': '$searchBook.no_of_copies', _id: 0 } }])
```

Amritha Rajarajan

```
db.books.aggregate([{ $lookup: { from: 'book_copies', localField: 'ISBN10', foreignField: 'book_id', as: 'searchBook'} }, { $unwind: { path: '$searchBook' } }, { $match: { 'searchBook.branch_id': 1, Title: { $regex: 'Prague' }, Authors_arr: { $regex: 'Arthur' } } }, { $project: { 'Book Title': '$Title', 'Book Authors': '$Authors_arr', 'Available noof copies at this branch': '$searchBook.no_of_copies', _id: 0 } }])
```



```
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.books.aggregate([{$lookup:{from:'book_copies',localField:'ISBN10',for
eignField:'book_id', as:'searchBook'}},{$unwind:{path:'$searchBook'}},{$match:{'searchBook.branch_id':1,Title:{$regex:'P
rague'},Authors_arr:{$regex:'Arthur'}}},{$project:{'Book Title':'$Title','Book Authors':'$Authors_arr','Available no of
copies at this branch':'$searchBook.no_of_copies',_id:0}}])
[
  {
    'Book Title': 'Prague: A Novel',
    'Book Authors': [ 'Arthur Phillips' ],
    'Available no of copies at this branch': 1
  },
  {
    'Book Title': 'Prague: A Novel',
    'Book Authors': [ 'Arthur Phillips' ],
    'Available no of copies at this branch': 0
  }
```

```
db.books.aggregate([{ $lookup: { from: 'book_copies', localField: 'ISBN10', foreignField: 'book_id', as: 'searchBook' } }, { $unwind: { path: '$searchBook' } }, { $match: { ISBN10: '0553584383', 'searchBook.branch_id':1, Title: { $regex: 'Dead' }, Authors_arr: { $regex: 'Iris' } } }, { $project: { 'Book Title': '$Title', 'Book Authors': '$Authors_arr', 'Available no of copies at this branch': '$searchBook.no_of_copies', _id: 0 } }])
```

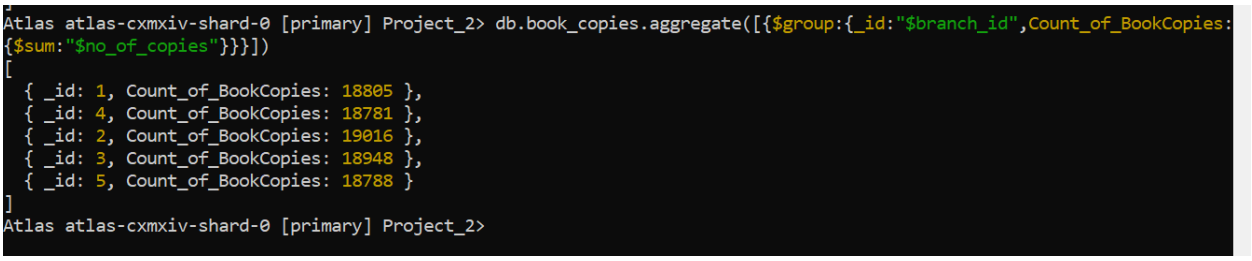
```
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.books.aggregate([{$lookup:{from:'book_copies',localField:'ISBN10',for
eignField:'book_id', as:'searchBook'}},{$unwind:{path:'$searchBook'}},{$match:{ISBN10:'0553584383','searchBook.branch_id
':1,Title:{$regex:'Dead'},Authors_arr:{$regex:'Iris'}}},{$project:{'Book Title':'$Title','Book Authors':'$Authors_arr','
Available no of copies at this branch':'$searchBook.no_of_copies',_id:0}}])
[
  {
    'Book Title': 'Dead Aim',
    'Book Authors': [ 'Iris Johansen' ],
    'Available no of copies at this branch': 1
  }
]
Atlas atlas-cxmxiv-shard-0 [primary] Project_2>
```

Amritha Rajarajan

Reports:

- MongoDB Script to fetch the Number of books (book copies) per library branch.

```
db.book_copies.aggregate([{ $group: { _id: "$branch_id", Count_of_BookCopies: { $sum:"$no_of_copies" } } }])
```



- MongoDB Script to fetch Book copies that were returned back late.

```
db.borrowers.aggregate([{ $match: { 'books_borrowed.book1.returned_late': 'Y' } }, { $lookup: { from: 'book_copies', localField: 'books_borrowed.book1.book_id', foreignField: 'book_id', as: 'book_copies' } }, {$unwind: '$book_copies' }, { $lookup: { from: 'books', localField: 'books_borrowed.book1.book_id',foreignField: 'ISBN10', as: 'bookDetails' } }, { $project: { 'books_borrowed.book2': 0 } }])
```

- MongoDB Script to fetch 10 books that don’t have author attribute populated

```
db.books.find({ "Authors_arr": { "$eq": null } }, { "_id": 0}). limit(10)
```

```
Atlas atlas-cxmxiv-shard-0 [primary] Project_2> db.books.find({"Authors_arr":{"$eq":null}},{"_id":0}).limit(10)
[
  {
    ISBN10: '1569871213',
    ISBN13: '9781569871218',
    Title: 'Black Beauty (Illustrated Classics)',
    Cover: 'http://www.openisbn.com/cover/1569871213_72.jpg',
    Publisher: 'Landoll',
    Pages: '240',
    Authors_arr: null
  },
  {
    ISBN10: '037383232X',
    ISBN13: '9780373832323',
    Title: 'Sweet Promise',
    Cover: 'http://www.openisbn.com/cover/037383232X_72.jpg',
    Publisher: 'Harlequin',
    Pages: '0',
    Authors_arr: null
  },
  {
    ISBN10: '0880841109',
    ISBN13: '9780880841108',
    Title: "The Children's Response: Beyond Tpr Toward Writing (American English)",
    Cover: 'http://www.openisbn.com/cover/0880841109_72.jpg',
    Publisher: 'Alemany Press',
    Pages: '88',
    Authors_arr: null
  },
  {
    ISBN10: '0553279912',
    ISBN13: '9780553279917',
    Title: 'A Is For Alibi',
    Cover: 'http://www.openisbn.com/cover/0553279912_72.jpg',
    Publisher: 'Bantam Crime Line',
    Pages: '0',
    Authors_arr: null
  },
  {
    ISBN10: '2890377741',
    ISBN13: '9782890377745',
    Title: 'Lame',
    Cover: 'http://www.openisbn.com/cover/2890377741_72.jpg',
```

```
},
{
  ISBN10: '0007101953',
  ISBN13: '9780007101955',
  Title: "At Ruby's",
  Cover: 'http://www.openisbn.com/cover/0007101953_72.jpg',
  Publisher: 'HarperCollins Publishers',
  Pages: '311',
  Authors_arr: null
},
{
  ISBN10: '1568652895',
  ISBN13: '9781568652894',
  Title: 'Homecoming',
  Cover: 'http://www.openisbn.com/cover/1568652895_72.jpg',
  Publisher: 'Harper 1997/97',
  Pages: '384',
  Authors_arr: null
},
{
  ISBN10: '0880384433',
  ISBN13: '9780880384438',
  Title: 'Dueltrack (Car Wars Adventure Game Book)',
  Cover: 'http://www.openisbn.com/cover/0880384433_72.jpg',
  Publisher: 'T S R',
  Pages: '192',
  Authors_arr: null
},
{
  ISBN10: '1555472419',
  ISBN13: '9781555472412',
  Title: 'Just Before Daybreak',
  Cover: 'http://www.openisbn.com/cover/1555472419_72.jpg',
  Publisher: 'Critics Choice Paperbacks/Lorevan Publishing',
  Pages: '292',
  Authors_arr: null
},
{
  ISBN10: '034910171X',
  ISBN13: '9780349101712',
  Title: 'Canal Dreams',
  Cover: 'http://www.openisbn.com/cover/034910171X_72.jpg',
  Publisher: 'Abacus',
  Pages: '0',
  Authors_arr: null
```