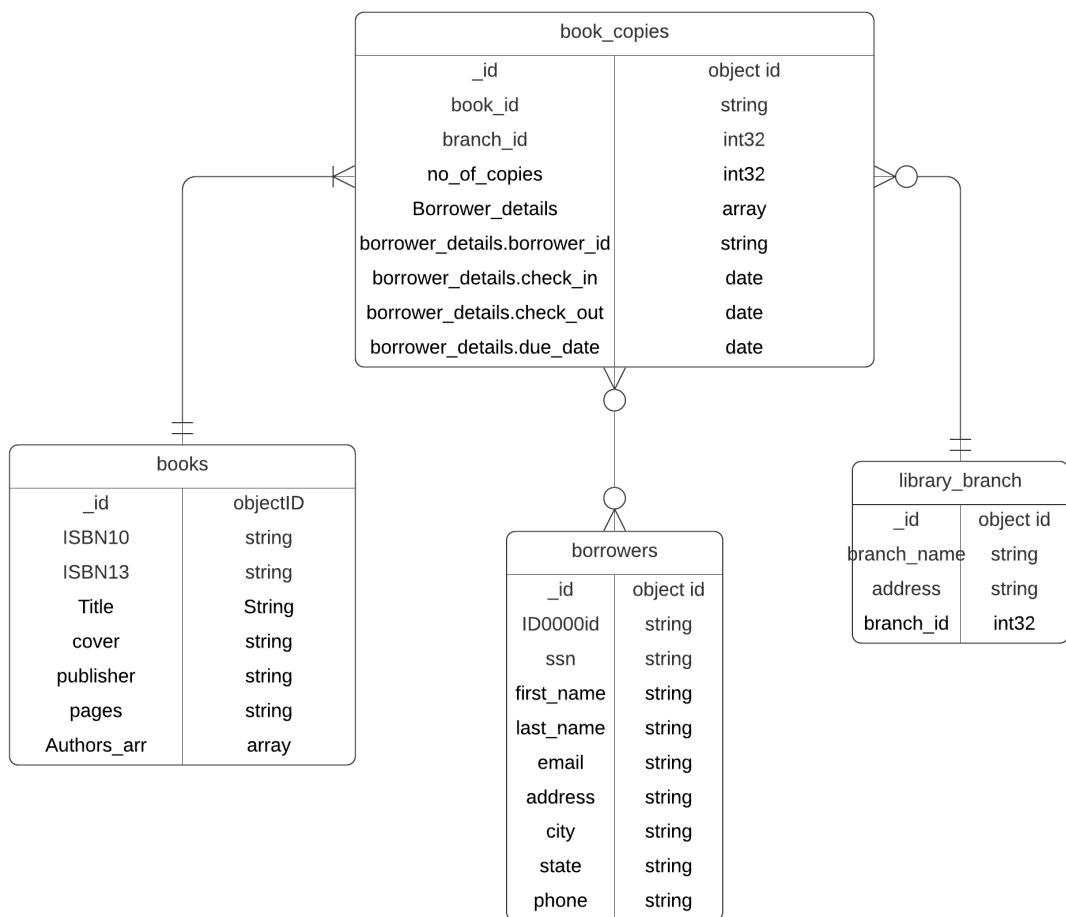


Design and DB Architecture:

A. ER Diagram



Connection String:

```
mongo "mongodb://cluster0-shard-00-00.qevnj.mongodb.net:27017,cluster0-shard-00-01.qevnj.mongodb.net:27017,cluster0-shard-00-02.qevnj.mongodb.net:27017/myFirstDatabase?replicaSet=atlas-10vqlf-shard-0" --ssl --authenticationDatabase admin --username prof_valid --password prof_valid_fall_2021
```

Data Load, data generation:

1. Load dataset files

The screenshot shows the MongoDB Cloud interface. On the left, there's a sidebar with sections for Deployment (highlighted), Data Services (Triggers, Data API PREVIEW), and Security (Database Access, Network Access, Advanced). The main area is titled 'Project 0' and shows the 'Atlas' tab selected. It displays the 'Collections' tab with a table of collections for the 'Project_2' database. The table includes columns for Collection Name, Documents, Documents Size, Documents Avg, Indexes, Index Size, and Index Avg. The data is as follows:

Collection Name	Documents	Documents Size	Documents Avg	Indexes	Index Size	Index Avg
books	25000	6.3MB	265B	1	288KB	288KB
books_copies	125000	9.42MB	79B	2	3.06MB	1.53MB
borrowers	1000	227.16KB	233B	1	24KB	24KB
library_branch	5	537B	108B	1	20KB	20KB

Created data base with name “Project_2” and loaded data sets into Mongo Db using Mongo db import utility.

2. MongoDB Script to generate (create/insert/update):

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

```
db.book_copies.updateOne({"book_id":'0374157065',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000022", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 )}}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0374157065',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000022", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 )}}})  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0393045218',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000023", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 )}}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0393045218',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000023", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 )}}})  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0399135782',"no_of_copies":{$gte:1}},  
{$push:{'Borrower_Details':{ "borrower_id": "ID000024", "check_in": new  
Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3),  
"due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
}
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0399135782',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000024", "ch  
eck_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})  
{  
 acknowledged: true,  
 insertedId: null,  
 matchedCount: 1,  
 modifiedCount: 1,  
 upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0671870432',"no_of_copies":{$gte:1}},  
{$push:{'Borrower_Details':{ "borrower_id": "ID000025", "check_in": new  
Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3),  
"due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0671870432',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000025", "ch  
eck_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})  
{  
 acknowledged: true,  
 insertedId: null,  
 matchedCount: 1,  
 modifiedCount: 1,  
 upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0679425608',"no_of_copies":{$gte:1}},  
{$push:{'Borrower_Details':{ "borrower_id": "ID000026", "check_in": new  
Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 4),  
"due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0679425608',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000026", "ch  
eck_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 4), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})  
{  
 acknowledged: true,  
 insertedId: null,  
 matchedCount: 1,  
 modifiedCount: 1,  
 upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id": "2070423204", "no_of_copies": {$gte:1}}, {$push: {"Borrower_Details": { "borrower_id": "ID000027", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 6), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id": "2070423204", "no_of_copies": {$gte:1}}, {$push: {"Borrower_Details": { "borrower_id": "ID000027", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 6), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
Atlas atlas-10vqlf-shard-0 [primary] Project_2>
```

```
db.book_copies.updateOne({"book_id": "080652121X", "no_of_copies": {$gte:1}}, {$push: {"Borrower_Details": { "borrower_id": "ID000028", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 6), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id": "080652121X", "no_of_copies": {$gte:1}}, {$push: {"Borrower_Details": { "borrower_id": "ID000028", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 6), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

```
db.book_copies.updateOne({"book_id": "0887841740", "no_of_copies": {$gte:1}}, {$push: {"Borrower_Details": { "borrower_id": "ID000029", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 5), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id": "0887841740", "no_of_copies": {$gte:1}}, {$push: {"Borrower_Details": { "borrower_id": "ID000029", "check_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 5), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
Atlas atlas-10vqlf-shard-0 [primary] Project_2>
```

```
db.book_copies.updateOne({"book_id":'1558746218',"no_of_copies":{$gte:1}},  
{$push:{'Borrower_Details':{ "borrower_id": "ID000030", "check_in": new  
Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 4),  
"due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'1558746218',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000030", "ch  
eck_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 4), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}  
Atlas atlas-10vqlf-shard-0 [primary] Project_2> █
```

```
db.book_copies.updateOne({"book_id":'1575663937',"no_of_copies":{$gte:1}},  
{$push:{'Borrower_Details':{ "borrower_id": "ID000031", "check_in": new  
Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 7),  
"due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'1575663937',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000031", "ch  
eck_in": new Date(), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 7), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}  
Atlas atlas-10vqlf-shard-0 [primary] Project_2> █
```

```
db.book_copies.updateOne({"book_id":'0374157065',"no_of_copies":{$gte:1}},  
{$push:{'Borrower_Details':{ "borrower_id": "ID000032", "check_in": new  
Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new  
Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new  
Date(ISODate().getTime() - 1000 * 3600 * 24 * 1) }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0374157065',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000032", "ch  
eck_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3  
600 * 24 * 1) }}})  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}  
Atlas atlas-10vqlf-shard-0 [primary] Project_2> █
```

```
db.book_copies.updateOne({"book_id":'0393045218',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000033", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0393045218',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000033", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0399135782',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000034", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0399135782',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000034", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0671870432',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000035", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0671870432',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000035", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0679425608',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000036", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0679425608',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000036", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{ acknowledged: true,  
insertedId: null,  
matchedCount: 1,  
modifiedCount: 1,  
upsertedCount: 0
```

```
db.book_copies.updateOne({"book_id":'2070423204',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000037", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'2070423204',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000037", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{ acknowledged: true,  
insertedId: null,  
matchedCount: 1,  
modifiedCount: 1,  
upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'080652121X',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000038", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'080652121X',"no_of_copies":{$gte:1}},{$push:{"Borrower_Details":{ "borrower_id": "ID000038", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{ acknowledged: true,  
insertedId: null,  
matchedCount: 1,  
modifiedCount: 1,  
upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'0887841740',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000039", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'0887841740',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000039", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'1558746218',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000040", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'1558746218',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000040", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 3), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

```
db.book_copies.updateOne({"book_id":'1575663937',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000041", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 5), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.updateOne({"book_id":'1575663937',"no_of_copies":{$gte:1}},{$push:{'Borrower_Details':{ "borrower_id": "ID000041", "check_in": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1), "check_out": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 5), "due_date": new Date(ISODate().getTime() - 1000 * 3600 * 24 * 1 }}})}  
{  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}
```

Book Search and Availability:

Showing Availability Status of Book with ISBN 10 “0553584383” having Title“Dead” and at library branch “2”

```
searchISBN = "0553584383" ;
searchTitle = /Dead/;
searchAuthor = /abcd/;
libraryBranchId = 2 ;

db.books.aggregate( [ { "$match" : { "$or" : [ { "Title" : searchTitle,
"$or" : [ { "ISBN10" : searchISBN } , {"ISBN13" : searchISBN } ] } ,
{ "Authors_arr" : searchAuthor } ] } } , { "$lookup" : { "from" :
"library_branch" , "pipeline": [ { "$match":
{ "branch_id":libraryBranchId } } , { "$lookup" : { "from" :
"book_copies" , "pipeline": [ { "$match": { "book_id" : searchISBN,
"branch_id" : libraryBranchId } } , ] , "as" : "book_copies" } } ] ,
"as" : "branch_info" } } , { "$project" : { "Title" : 1 , "Authors_arr" :
1 , "book_id" : 1 , "availability_status" :
"$branch_info.book_copies.no_of_copies" } } ] ) .pretty()
```

```
j
Atlas atlas-10vqlf-shard-0 [primary] Project_2> searchISBN = "0553584383" ;
0553584383
Atlas atlas-10vqlf-shard-0 [primary] Project_2> searchTitle = /Dead/;
/Dead/
Atlas atlas-10vqlf-shard-0 [primary] Project_2> searchAuthor = /abcd/;
/abcd/
Atlas atlas-10vqlf-shard-0 [primary] Project_2> libraryBranchId = 2 ;
2
Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.books.aggregate( [ { "$match" : { "$or" : [ { "Title" : searchTitle, "$or" : [ { "ISBN10" : searchISBN } , {"ISBN13" : searchISBN } ] } ,
{ "Authors_arr" : searchAuthor } ] } } , { "$lookup" : { "from" :
"library_branch" , "pipeline": [ { "$match": { "branch_id":libraryBranchId } } , { "$lookup" : { "from" :
"book_copies" , "pipeline": [ { "$match": { "book_id" : searchISBN,
"branch_id" : libraryBranchId } } , ] , "as" : "book_copies" } } ] ,
"as" : "branch_info" } } , { "$project" : { "Title" : 1 , "Authors_arr" :
1 , "book_id" : 1 , "availability_status" :
"$branch_info.book_copies.no_of_copies" } } ] ).pretty()
{
  "_id": ObjectId("6147925cb38887fa243c23fa"),
  "Title": "Dead Aim",
  "Authors_arr": [ "Iris Johansen" ],
  "availability_status": [ [ 1 ] ]
}
]
Atlas atlas-10vqlf-shard-0 [primary] Project_2>
```

Showing Books having "son" as part of their Title or Author name

```
search = /son/;
```

```
db.books.find( { "$or" : [ { "Title" : search, "$or" : [ { "ISBN10" : searchISBN } , {"ISBN13" : searchISBN } ] }, { "Authors_arr" : search } ] }, { "Title" : 1, "Authors_arr" : 1 } ).pretty()
```

```
    Authors_arr: [ 'Camara Laye', 'James Kirkup', 'Ernest Jones', 'Philippe Tho' ]
}
Type "it" for more
Atlas atlas-10qlf-shard-0 [primary] Project_2> search = /son/
/son
[Atlas atlas-10qlf-shard-0 [primary] Project_2> db.books.find( { "$or" : [ { "Title" : search, "$or" : [ { "ISBN10" : searchISBN } , {"ISBN13" : searchISBN } ] }, { "Authors_arr" : search } ] }, { "Title" : 1, "Authors_arr" : 1 } ).pretty()
[
{
    _id: ObjectId("6147925cb38887fa243c23d5"),
    Title: "Life's Little Instruction Book: 511 Suggestions, Observations, And Reminders On How To Live A Happy And Rewarding Life",
    Authors_arr: [ 'H. Jackson Brown Jr.' ],
},
{
    _id: ObjectId("6147925cb38887fa243c24cb"),
    Title: 'Waiting',
    Authors_arr: [ 'Frank M. Robinson' ],
},
{
    _id: ObjectId("6147925cb38887fa243c2464"),
    Title: 'Roses Are Red (Alex Cross)',
    Authors_arr: [ 'James Patterson' ],
},
{
    _id: ObjectId("6147925cb38887fa243c257a"),
    Title: "The Cat Who Wasn't There",
    Authors_arr: [ 'Lilian Jackson Braun' ],
},
{
    _id: ObjectId("6147925cb38887fa243c2451"),
    Title: 'Private Screening',
    Authors_arr: [ 'Richard North Patterson' ],
},
{
    _id: ObjectId("6147925cb38887fa243c2450"),
    Title: 'Four Blind Mice (Alex Cross)',
    Authors_arr: [ 'James Patterson' ],
},
{
    _id: ObjectId("6147925cb38887fa243c2559"),
    Title: 'Selected Poems Of Emily Dickinson',
    Authors_arr: [ 'Emily Dickinson' ],
},
{
    _id: ObjectId("6147925cb38887fa243c2566"),
    Title: 'Santa & Pete: A Novel Of Christmas Present And Past',
    Authors_arr: [ 'Christopher Moore', 'Pamela Johnson' ],
},
{
    _id: ObjectId("6147925cb38887fa243c242e"),
    Title: 'The Cat Who Came To Breakfast',
    Authors_arr: [ 'Lilian Jackson Braun' ],
},
{
    _id: ObjectId("6147925cb38887fa243c24fa"),
```

Showing Availability Status of Book with ISBN 10 “0345391691” having Title like “Battle” at library branch “1”

```
searchISBN = "0345391691"
searchTitle = /Battle/
searchAuthor = //
libraryBranchId = 1

db.books.aggregate( [ { "$match" : { "$or" : [ { "Title" : searchTitle, "$or" :
[ { "ISBN10" : searchISBN } , {"ISBN13" : searchISBN } ] }, { "Authors_arr" :
searchAuthor } ] } }, { "$lookup" : { "from" : "library_branch", "pipeline":
[ { "$match": { "branch_id":libraryBranchId } }, { "$lookup" : { "from" :
"book_copies", "pipeline": [ { "$match": { "book_id" : searchISBN,
"branch_id" : libraryBranchId } }, "as" : "book_copies" } ] }, "as" :
"branch_info" } }, { "$project" : { "Title" : 1, "Authors_arr" : 1, "book_id" : 1,
"availability_status" : "$branch_info.book_copies.no_of_copies" } } ] ).pretty()
```

```
Atlas atlas-10vqlf-shard-0 [primary] Project_2> searchISBN = "0345391691"
0345391691
Atlas atlas-10vqlf-shard-0 [primary] Project_2> searchTitle = /Battle/
/Battle/
Atlas atlas-10vqlf-shard-0 [primary] Project_2> searchAuthor = //
... libraryBranchId = 1
...
Atlas atlas-10vqlf-shard-0 [primary] Project_2>
[{"_id": ObjectId("6147925ch38887fa243c24b8"), "Title": "The Battle For God", "Authors_arr": ["Karen Armstrong"], "availability_status": [[1]]}]
```

Reports:

Number of books (book copies) per library branch

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

```
Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.aggregate([ { "$group": { "_id" : "$branch_id", "count" : { "$sum": "$no_of_copies" } } } ]) 
[ { _id: 2, count: 19016 },
  { _id: 3, count: 18948 },
  { _id: 4, count: 18781 },
  { _id: 1, count: 18805 },
  { _id: 5, count: 18788 }
]
Atlas atlas-10vqlf-shard-0 [primary] Project_2>
```

Book copies that where returned back late. Include all Book and Book copy attributes, including checkout and check-in attributes. You will need to "join" (lookup) two documents

```
db.book_copies.aggregate([{$match" : {"Borrower_Details.due_date" : { "$lte" : new Date() } }}, {"$lookup": {"from": "books", "localField": "book_id", "foreignField": "ISBN10", "as": "book_info"}}).pretty()
```

```
Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.aggregate([{$match" : {"Borrower_Details.due_date" : { "$lte" : new Date() } }}, {"$lookup": {"from": "books", "localField": "book_id", "foreignField": "ISBN10", "as": "book_info"}}]).pretty()
[
  {
    _id: ObjectId("6188a5283543f7cc2f77c74e"),
    book_id: '0374157065',
    branch_id: 1,
    no_of_copies: 1,
    Borrower_Details: [
      {
        borrower_id: 'ID000022',
        check_in: ISODate("2021-12-07T09:08:01.883Z"),
        check_out: ISODate("2021-12-04T09:08:01.883Z"),
        due_date: ISODate("2021-12-06T09:08:01.883Z")
      },
      {
        borrower_id: 'ID000032',
        check_in: ISODate("2021-12-06T20:40:51.024Z"),
        check_out: ISODate("2021-12-04T20:40:51.026Z"),
        due_date: ISODate("2021-12-06T20:40:51.026Z")
      }
    ],
    book_info: [
      {
        _id: ObjectId("6147925cb38887fa243c238c"),
        ISBN10: '0374157065',
        ISBN13: '9780374157067',
        Title: 'Flu: The Story Of The Great Influenza Pandemic Of 1918 And The Search For The Virus That Caused It',
        Cover: 'http://www.openisbn.com/cover/0374157065_72.jpg',
        Publisher: 'Farrar, Straus And Giroux',
        Pages: '256',
        Authors_arr: [ 'Gina Kolata' ]
      }
    ],
    {
      _id: ObjectId("6188a5283543f7cc2f77c754"),
      book_id: '0393045218',
      branch_id: 2,
      no_of_copies: 1,
      Borrower_Details: [
        {
          borrower_id: 'ID000023',
          check_in: ISODate("2021-12-07T06:32:38.975Z"),
          check_out: ISODate("2021-12-04T06:32:38.975Z"),
          due_date: ISODate("2021-12-06T06:32:38.975Z")
        },
        {
          borrower_id: 'ID000033',
          check_in: ISODate("2021-12-06T21:01:22.045Z"),
          check_out: ISODate("2021-12-04T21:01:22.045Z"),
          due_date: ISODate("2021-12-06T21:01:22.045Z")
        }
      ],
      book_info: [

```

```

        check_in: ISODate("2021-12-07T07:25:49.917Z"),
        check_out: ISODate("2021-11-30T07:25:49.917Z"),
        due_date: ISODate("2021-12-06T07:25:49.917Z")
    },
    {
        borrower_id: 'ID000041',
        check_in: ISODate("2021-12-06T21:21:46.412Z"),
        check_out: ISODate("2021-12-02T21:21:46.412Z"),
        due_date: ISODate("2021-12-06T21:21:46.412Z")
    },
    book_info: [
        {
            _id: ObjectId("6147925cb38887fa243c2399"),
            ISBN10: '1575663937',
            ISBN13: '9781575663937',
            Title: 'Worms Cunning Than Man: A Social History Of Rats And Man',
            Cover: 'http://www.openisbn.com/cover/1575663937_72.jpg',
            Publisher: 'Kensington',
            Pages: '288',
            Authors_arr: [ 'Robert Hendrickson' ]
        }
    ]
},
{
    _id: ObjectId("6188a5283543f7cc2f77c87a"),
    book_id: '2070423204',
    branch_id: 1,
    no_of_copies: 3,
    Borrower_Details: [
        {
            borrower_id: 'ID000027',
            check_in: ISODate("2021-12-07T07:32:20.419Z"),
            check_out: ISODate("2021-12-01T07:32:20.419Z"),
            due_date: ISODate("2021-12-06T07:32:20.419Z")
        },
        {
            borrower_id: 'ID000037',
            check_in: ISODate("2021-12-06T21:12:39.657Z"),
            check_out: ISODate("2021-12-04T21:12:39.657Z"),
            due_date: ISODate("2021-12-06T21:12:39.657Z")
        }
    ],
    book_info: [
        {
            _id: ObjectId("6147925cb38887fa243c23c8"),
            ISBN10: '2070423204',
            ISBN13: '9782070423200',
            Title: 'Leux Dits',
            Cover: 'http://www.openisbn.com/cover/2070423204_72.jpg',
            Publisher: 'Gallimard',
            Pages: '125',
            Authors_arr: [ 'Michel Tournier' ]
        }
    ]
}
]

```

10 books that don't have author attribute populated

```

db.books.find( { "$or": [ { "Authors_arr": { "$exists": false } }, { "Authors_arr": { "$size": 0 } }, { "Authors_arr": null } ] } ).limit(10).pretty()

```

```

Terminal Shell Edit View Window Help
RaniP — mongosh mongodb+srv://cluster0.qevnj.mongodb.net/myFirstDatabase — myFirstDatabase PATH=/usr/local/opt/node@14/bin:/Users/RaniP/opt/anaconda3/bin:/usr/local/bin:/usr...
Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.books.find( { "$or": [ { "Authors_arr": { "$exists": false } }, { "Authors_arr": { "$size": 0 } }, { "Authors_arr": null } ] } ).limit(10).pretty()
[
  {
    _id: ObjectId("6147925cb38887fa243c23d8"),
    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
  },
  {
    _id: ObjectId("6147925eb38887fa243c2ba8"),
    ISBN10: '037383232X',
    ISBN13: '9780373832323',
    Title: 'Sweet Promise',
    Cover: 'http://www.openisbn.com/cover/037383232X_72.jpg',
    Publisher: 'Harlequin',
    Pages: '0',
    Authors_arr: null
  },
  {
    _id: ObjectId("6147925eb38887fa243c2c6f"),
    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
  },
  {
    _id: ObjectId("6147925eb38887fa243c2cd4"),
    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
  },
  {
    _id: ObjectId("6147925eb38887fa243c2e65"),
    ISBN10: '2890377741',
    ISBN13: '9782890377745',
    Title: 'Lame',
    Cover: 'http://www.openisbn.com/cover/2890377741_72.jpg',
    Publisher: 'Quebec Amerique',
    Pages: '243',
    Authors_arr: null
  }
]

```

```

Terminal Shell Edit View Window Help
RaniP — mongosh mongodb+srv://cluster0.qevnj.mongodb.net/myFirstDatabase — myFirstDatabase PATH=/usr/local/opt/node@14/bin:/Users/RaniP/opt/anaconda3/bin:/usr/local/bin:/usr...
{
  _id: ObjectId("61479260b38887fa243c34e1"),
  ISBN10: '2890377741',
  ISBN13: '9782890377745',
  Title: 'Lame',
  Cover: 'http://www.openisbn.com/cover/2890377741_72.jpg',
  Publisher: 'Quebec Amerique',
  Pages: '243',
  Authors_arr: null
},
{
  _id: ObjectId("61479261b38887fa243c34e1"),
  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
},
{
  _id: ObjectId("61479261b38887fa243c3ed7"),
  ISBN10: '1568652895',
  ISBN13: '9781568652894',
  Title: 'Homecoming',
  Cover: 'http://www.openisbn.com/cover/1568652895_72.jpg',
  Publisher: 'Harper 1997/97',
  Pages: '384',
  Authors_arr: null
},
{
  _id: ObjectId("61479262b38887fa243c4053"),
  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
},
{
  _id: ObjectId("61479262b38887fa243c452a"),
  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
},
{
  _id: ObjectId("61479263b38887fa243c4a67"),
  ISBN10: '034910171X',
  ISBN13: '9780349101712',

```

Bonus points question

Creating index:

```
db.book_copies.createIndex( { "book_id": 1 }, { sparse: true, } )
```

```
[Atlas atlas-10vqlf-shard-0 [primary] Project_2> db.book_copies.createIndex( { "book_id": 1 }, { sparse: true, } )
book_id_1
Atlas atlas-10vqlf-shard-0 [primary] Project_2> ]
```

```
db.books.aggregate( [ { "$lookup": { "from": "book_copies",
"localField" : "ISBN10", "foreignField" : "book_id", "as": "book_copies" } },
{ "$project": { "book_copies._id": 0,
"book_copies.book_id": 0 } },
{ "$merge": { "into": "Books_auth_copies", "on": "_id" } } ],
{ "bypassDocumentValidation": true, } )
```

The screenshot shows the MongoDB Cloud interface. On the left, the sidebar includes links for Mail, Course Homepage, Data API (PREVIEW), Triggers, Database Access, Network Access, and Advanced. The main area displays the Project_2 database, which contains the following collections:

- Databases:** Data Lake, book_copies, books, borrowers, library_branch, sample_airbnb, sample_analytics, sample_geospatial, sample_mflix, sample_restaurants, sample_supplies, sample_training, sample_weatherdata.
- DATA SERVICES:** Triggers, Data API (PREVIEW).
- SECURITY:** Database Access, Network Access, Advanced.

The book_copies collection is currently selected. The interface shows a query results table with 1-20 of many documents. One document is expanded, showing fields like _id, Authors_arr, Cover, ISBN10, ISBN13, Pages, Publisher, Title, and book_copies (an array of objects). The book_copies array contains five objects, each with branch_id and no_of_copies values.

Mail - Pinnamaneni, Nirmala F | Course Homepage - BUAN 6 | 32811424 | Data | Cloud: MongoDB Cloud | (11) WhatsApp

cloud.mongodb.com/v2/618c2cfa9df0311c8342f24e#metrics/replicaSet/618c3b5dfbaab31176add9d8/explorer/Project_2

Apps YouTube GMAIL Yahoo Mail https://app.ieltsni... British Council IEL... Ramco Airtel MyDocs Portal - L... Netflix

University of Texas a... Access Manager Billing All Clusters Get Help Nirmala Rani

Project 0 Atlas Realm Charts VISUALIZE YOUR DATA REFRESH

DEPLOYMENT

Databases

Data Lake

DATA SERVICES

Triggers

Data API PREVIEW

SECURITY

Database Access

Network Access

Advanced

DATABASES: 10 COLLECTIONS: 29

+ Create Database NAMESPACES

Lab-7 Project_2

Books_auth_copies
book_copies
books
borrowers
library_branch

sample_airbnb
sample_analytics
sample_geospatial
sample_mflix
sample_restaurants

DATABASE SIZE: 27.57MB INDEX SIZE: 4.91MB TOTAL COLLECTIONS: 5

CREATE COLLECTION

Collection Name	Documents	Documents Size	Documents Avg	Indexes	Index Size	Index Avg
Books_auth_copies	25000	11.62MB	488B	1	504KB	504KB
book_copies	125000	9.42MB	80B	2	4.09MB	2.05MB
books	25000	6.3MB	265B	1	288KB	288KB
borrowers	1000	227.16KB	233B	1	24KB	24KB
library_branch	5	537B	108B	1	20KB	20KB

