



INNOVATION. AUTOMATION. ANALYTICS

**PROJECT ON**

**Library Management System**

# **LIBRARY** **MANAGEMENT SYSTEM**

## INTRODUCTION:

- The Library Management System is a structured SQL-based database project developed to efficiently manage and organize the operations of a library. **It eliminates the need for manual record-keeping by storing data related to books, authors, publishers, borrowers, library branches, book copies, and book loans in a systematic manner.** This system helps track book availability, manage book loans and returns, and maintain borrower information accurately. By using SQL queries, relationships, and joins, the project allows easy retrieval of important information such as book distribution across branches, book availability, borrower activity, and author-wise book details.

## OBJECTIVE

- The main objective of this project is to create an efficient SQL-based system to manage library data, including books, authors, borrowers, publishers, library branches, and book loans. The goal is to automate manual processes and provide quick access to information such as book availability, borrower details, and loan history. This project Shows the use of SQL for real-world data management.



# Database structure

Table Name	Purpose
publisher	Stores publisher information
book	Stores book details & publisher
book_authors	Stores author details of books
library_branch	Contains branch details
book_copies	Number of book copies in each branch
borrower	Library users/borrowers
book_loans	Records issued books with due date

## ➤ Key Relationships:

- publisher → book → One publisher can publish many books
- book → book\_authors → One book can have multiple authors
- book → book\_copies → Each book has several copies at different branches
- library\_branch → book\_loans → Books issued from different branches
- borrower → book\_loans → Borrowers take books from branches

## Table Book

Result Grid	Filter Rows:	Edit:	Export/Import:
book_BookID	book_Title	book_PublisherName	
1	The Name of the Wind	DAW Books	
2	It	Viking	
3	The Green Mile	Signet Books	
4	Dune	Chilton Books	
5	The Hobbit	George Allen & Unwin	
6	Eragon	Alfred A. Knopf	



Result Grid	Filter Rows:	Edit:	Export/Import:
book_authors_AuthorID	book_authors_BookID	book_authors_AuthorName	
1	NULL	Patrick Rothfuss	
2	NULL	Stephen King	
3	NULL	Stephen King	
4	NULL	Frank Herbert	
5	NULL	J.R.R. Tolkien	
6	NULL	Christopher Paolini	

Table book\_authors

book_copies_CopiesID	book_copies_BookID	book_copies_BranchID	book_copies_No_Of_Copies
1	NULL	1	5
2	NULL	1	5
3	NULL	1	5
4	NULL	1	5
5	NULL	1	5
6	NULL	1	5

Table book\_copies



library_branch_BranchID	library_branch_BranchName	library_branch_BranchAddress
1	Sharpstown	32 Corner Road
2	Central	491 3rd Street
3	Saline	40 State Street
4	Ann Arbor	101 South University
NULL	NULL	NULL

Table library\_branch



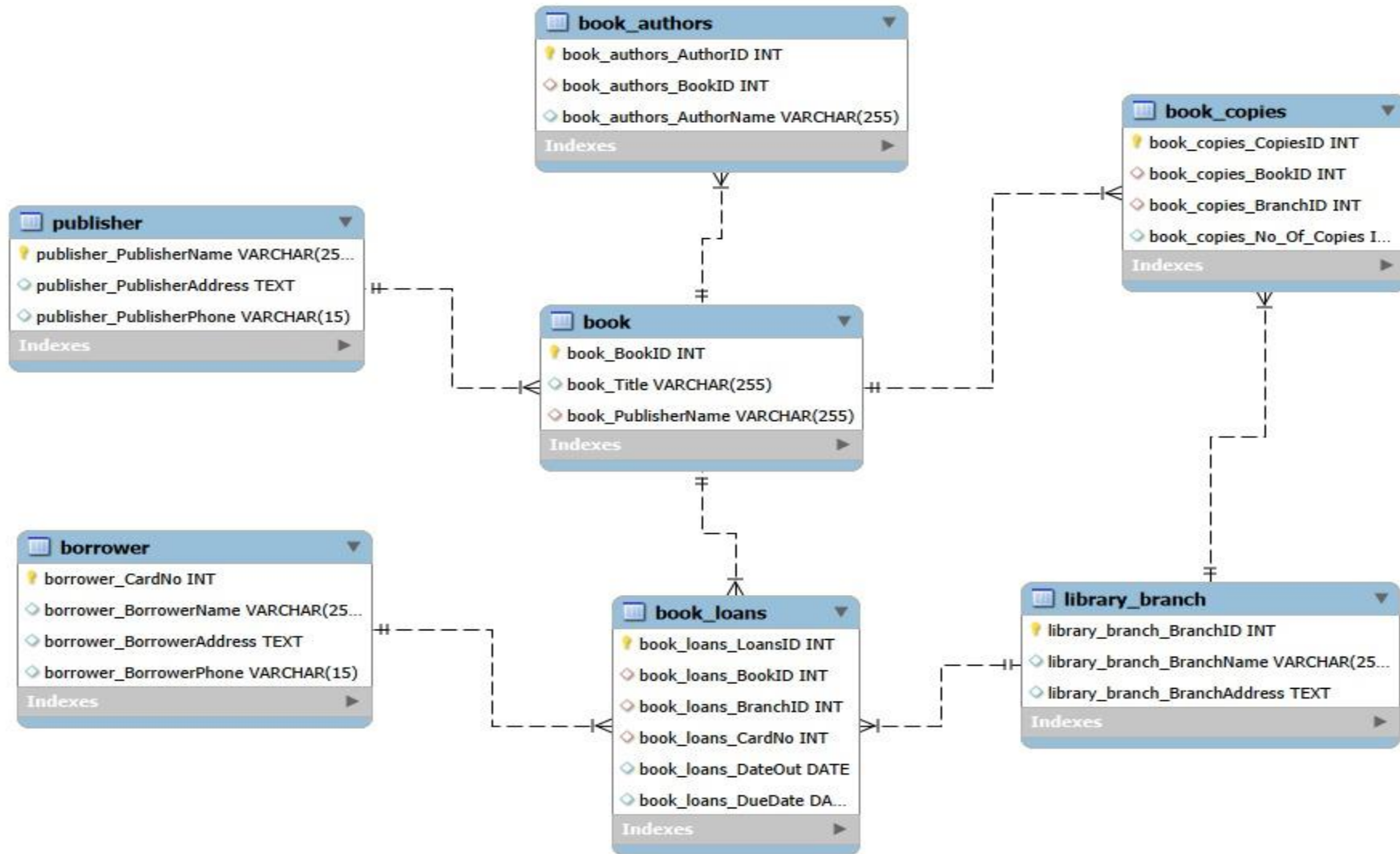
book_loans_LoansID	book_loans_BookID	book_loans_BranchID	book_loans_CardNo	book_loans_DateOut	book_loans_DueDate
1	NULL	1	100	0001-01-18	0002-02-18
2	NULL	1	100	0001-01-18	0002-02-18
3	NULL	1	100	0001-01-18	0002-02-18
4	NULL	1	100	0001-01-18	0002-02-18

Table book\_loans

publisher_PublisherName	publisher_PublisherAddress	publisher_PublisherPhone
Alfred A. Knopf	The Knopf Doubleday Group Domestic Rights, 1...	212-940-7390
Bantam	375 Hudson Street, New York, NY 10014	212-366-2000
Bloomsbury	Bloomsbury Publishing Inc., 1385 Broadway, St...	212-419-5300
Chalto & Windus	375 Hudson Street, New York, NY 10014	212-366-2000
Chilton Books	Not Available	Not Available
DAW Books	375 Hudson Street, New York, NY 10014	212-366-2000

Table publisher

# ER - Diagram



# Task Questions

1. How many copies of the book titled "The Lost Tribe" are owned by the library branch whose name is "Sharpstown"?

```
select book_copies_no_of_Copies FROM `book_copies`  
where book_copies_CopiesID = (SELECT book_BookID  
from book WHERE book_Title = 'The Lost Tribe')  
and book_copies_BranchID = (SELECT library_branch_BranchID  
from `library_branch` WHERE library_branch_BranchName = 'Sharpstown');
```

Result Grid			Filter Rows: <input type="text"/>	Export: 	Wrap Cell Content: 
	book_copies_no_of_Copies				
▶	5				





2. How many copies of the book titled "The Lost Tribe" are owned by each library branch?

```
SELECT library_branch_BranchName, book_copies_No_Of_Copies
FROM `book_copies`
JOIN `book` ON book_copies_copiesID = book_BookID
JOIN `library_branch` ON book_copies_BranchID = library_branch_BranchID
WHERE book_Title = 'The Lost Tribe';
```

Result Grid			Filter Rows:	Export:	Wrap Cell Content:
	library_branch_BranchName	book_copies_No_Of_Copies			
▶	Sharpstown	5			

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3. Retrieve the names of all borrowers who do not have any books checked out.

```
select borrower_BorrowerName from borrower
left join `book_loans` on borrower_CardNo = book_loans_CardNo
where book_loans_loansID is null;
```

Result Grid	Filter Rows:	Export:	Wrap Cell Content:
borrower_BorrowerName			
▶ Jane Smith			
Angela Thompson			
Haley Jackson			



4. For each book that is loaned out from the "Sharpstown" branch and whose Due Date is 2/3/18, retrieve the book title, the borrower's name, and the borrower's address.

```
SELECT book_Title, borrower_borrowername, borrower_borroweraddress
FROM `book_loans`
JOIN book ON book_loans.book_loans_loansID = book.book_bookID
JOIN borrower ON book_loans.book_loans_CardNo = borrower.borrower_CardNo
JOIN `library_branch` ON book_loans.book_loans_BranchID = library_branch.library_branch_BranchID
WHERE library_branch.library_branch_BranchName = 'Sharpstown'
AND book_loans_DueDate = '0002-02-18';
```

Result Grid			
Filter Rows: <input type="text"/>			
Export: <input type="button" value=""/>			
Wrap Cell Content: <input type="button" value=""/>			
	book_Title	borrower_borrowername	borrower_borroweraddress
▶	The Name of the Wind	Joe Smith	1321 4th Street, New York, NY 10014
	It	Joe Smith	1321 4th Street, New York, NY 10014
	The Green Mile	Joe Smith	1321 4th Street, New York, NY 10014
	Dune	Joe Smith	1321 4th Street, New York, NY 10014



5. For each library branch, retrieve the branch name and the total number of books loaned out from that branch.



```
SELECT library_branch_BranchName,  
COUNT('book_loans_LoansID')  
FROM `library_branch`  
JOIN `book_loans` ON library_branch_BranchID = book_loans_BranchID  
GROUP BY library_branch_BranchName;
```

Result Grid			Filter Rows:	Export:	Wrap Cell Content:
	library_branch_BranchName	COUNT('book_loans_LoansID')			
▶	Sharpstown	10			
	Central	5			
	Saline	5			



6. Retrieve the names, addresses, and number of books checked out for all borrowers who have more than five books checked out.

```
SELECT borrower_BorrowerName, borrower_BorrowerAddress,  
COUNT('book_loans_copiesID')  
FROM borrower  
JOIN `book_loans` ON borrower_CardNo = book_loans_CardNo  
GROUP BY borrower_CardNo, borrower_BorrowerName, borrower_BorrowerAddress  
HAVING COUNT(book_loans_loansID) > 5;
```

Result Grid			
Filter Rows: <input type="text"/>			
Export: 			
Wrap Cell Content: 			
	borrower_BorrowerName	borrower_BorrowerAddress	COUNT('book_loans_copiesID')
▶	Tom Li	981 Main Street, Ann Arbor, MI 48104	7





7. For each book authored by "Stephen King", retrieve the title and the number of copies owned by the library branch whose name is "Central".

```
SELECT book_Title, book_copies_No_Of_Copies
FROM book_authors
JOIN book ON book_authors_authorID = book_bookid
JOIN `book_copies` ON book_bookID = book_copies_copiesid
JOIN `library_branch` ON book_copies_copiesID = library_branch_Branchid
WHERE book_authors_AuthorName = 'Stephen King'
AND library_branch_BranchName = 'Central';
```

Result Grid		Filter Rows:	Export:	Wrap Cell Content:
	book_Title	book_copies_No_Of_Copies		
►	It	5		



# Insights

- Some books are available only at one branch
- Inactive borrowers were identified
- Sharpstown branch has maximum book loans
- Authors and publishers are well-connected through relationships
- Structured data helps faster book tracking and management



## Conclusion

- This SQL project successfully demonstrates how a database can manage real-world library operations. Using SQL joins, constraints, groupings, and subqueries, efficient data retrieval and management becomes possible. The system improves organization, saves manual effort, and can be extended into a full web-based application in the future.



# Challenges

- Understanding foreign keys & relationships Handling
- JOIN queries initially was difficult
- Ensuring data accuracy in CSV files
- Problem-solving through real-world use cases improved SQL skills
- Learned database design + query optimization



THANK  
YOU

