

LIBRARY MANAGEMENT SYSTEM

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ABOUT ME

I HAVE COMPLETED MY BACHELOR OF COMPUTER ENGINEERING(BE) FROM SAVITRIBAI PHULE PUNE UNIVERSITY. DURING MY ACADEMIC JOURNEY, I WORKED WITH PYTHON AND EXPLORED VARIOUS ASPECTS OF DATA MANIPULATION, WHICH SPARKED MY INTEREST IN THE FIELD OF DATA SCIENCE. THIS CURIOSITY LED ME TO PURSUE FURTHER LEARNING AND HANDS-ON PROJECTS IN DATA ANALYSIS AND VISUALIZATION.

OBJECTIVE AND PROBLEM STATEMENT



To design and analyze a Library Management System database that tracks book inventory, loans, and branch activity, and to extract insights using SQL and Python visualizations for better decision-making.

TABLES IN MY DATABASE



tbl_book_copies

	book_copies_CopiesID	book_copies_BookID	book_copies_BranchID	book_copies_No_Of_Copies
1	1	1	5	
2	2	1	5	
3	3	1	5	
4	4	1	5	
5	5	1	5	
6	6	1	5	
7	7	1	5	
8	8	1	5	
9	9	1	5	
10	10	1	5	
11	11	1	5	

tbl_book

	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

tbl_book_authors

	book_author_AuthorID	book_author_BookID	book_authors_AuthorName
	1	1	Patrick Rothfuss
	2	2	Stephen King
	3	3	Stephen King
	4	4	Frank Herbert
	5	5	J.R.R. Tolkien

tbl_book_loans

	book_loans_LoansID	book_loans_BookID	book_loans_BranchID	book_loans_CardNo	book_loans_DateOut	book_loans_DueDate	DateOut	DueDate
1		1	1	100	01-01-2018	02-02-2018	2018-01-01	2018-02-02
2		2	1	100	01-01-2018	02-02-2018	2018-01-01	2018-02-02
3		3	1	100	01-01-2018	02-02-2018	2018-01-01	2018-02-02
4		4	1	100	01-01-2018	02-02-2018	2018-01-01	2018-02-02
5		5	1	102	01-03-2018	02-03-2018	2018-01-03	2018-02-03
6		6	1	102	01-03-2018	02-03-2018	2018-01-03	2018-02-03
7		7	1	102	01-03-2018	02-03-2018	2018-01-03	2018-02-03
8		8	1	102	01-03-2018	02-03-2018	2018-01-03	2018-02-03
9		9	1	102	01-03-2018	02-03-2018	2018-01-03	2018-02-03
10		11	1	102	01-03-2018	02-03-2018	2018-01-03	2018-02-03
11		12	2	105	12-12-2017	01-12-2018	2017-12-12	2018-01-12
12		10	2	105	12-12-2017	01-12-2017	2017-12-12	2017-01-12

tbl_borrowers

borrower_CardNo	borrower_BorrowerName	borrower_BorrowerAddress	borrower_BorrowerPhone
100	Joe Smith	1321 4th Street, New York, NY 10014	212-312-1234
101	Jane Smith	1321 4th Street, New York, NY 10014	212-931-4124
102	Tom Li	981 Main Street, Ann Arbor, MI 48104	734-902-7455
103	Angela Thompson	2212 Green Avenue, Ann Arbor, MI 48104	313-591-2122
104	Harry Eminace	121 Park Drive, Ann Arbor, MI 48104	412-512-5522
105	Tom Haverford	23 75th Street, New York, NY 10014	212-631-3418
106	Haley Jackson	231 52nd Avenue New York, NY 10014	212-419-9935
107	Michael Horford	653 Glen Avenue, Ann Arbor, MI 48104	734-998-1513
NULL	NULL	NULL	NULL

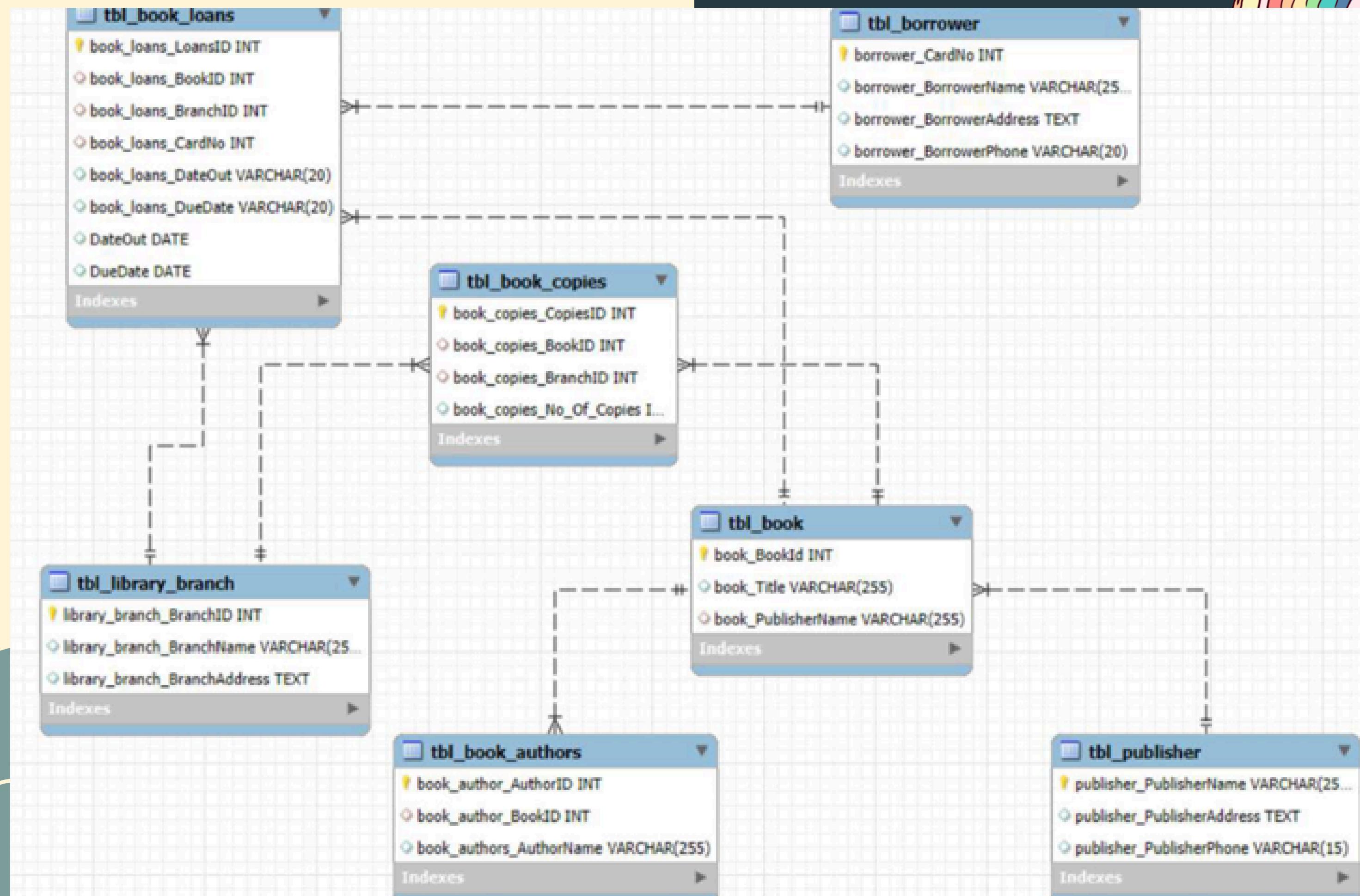
tbl_library_branch

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

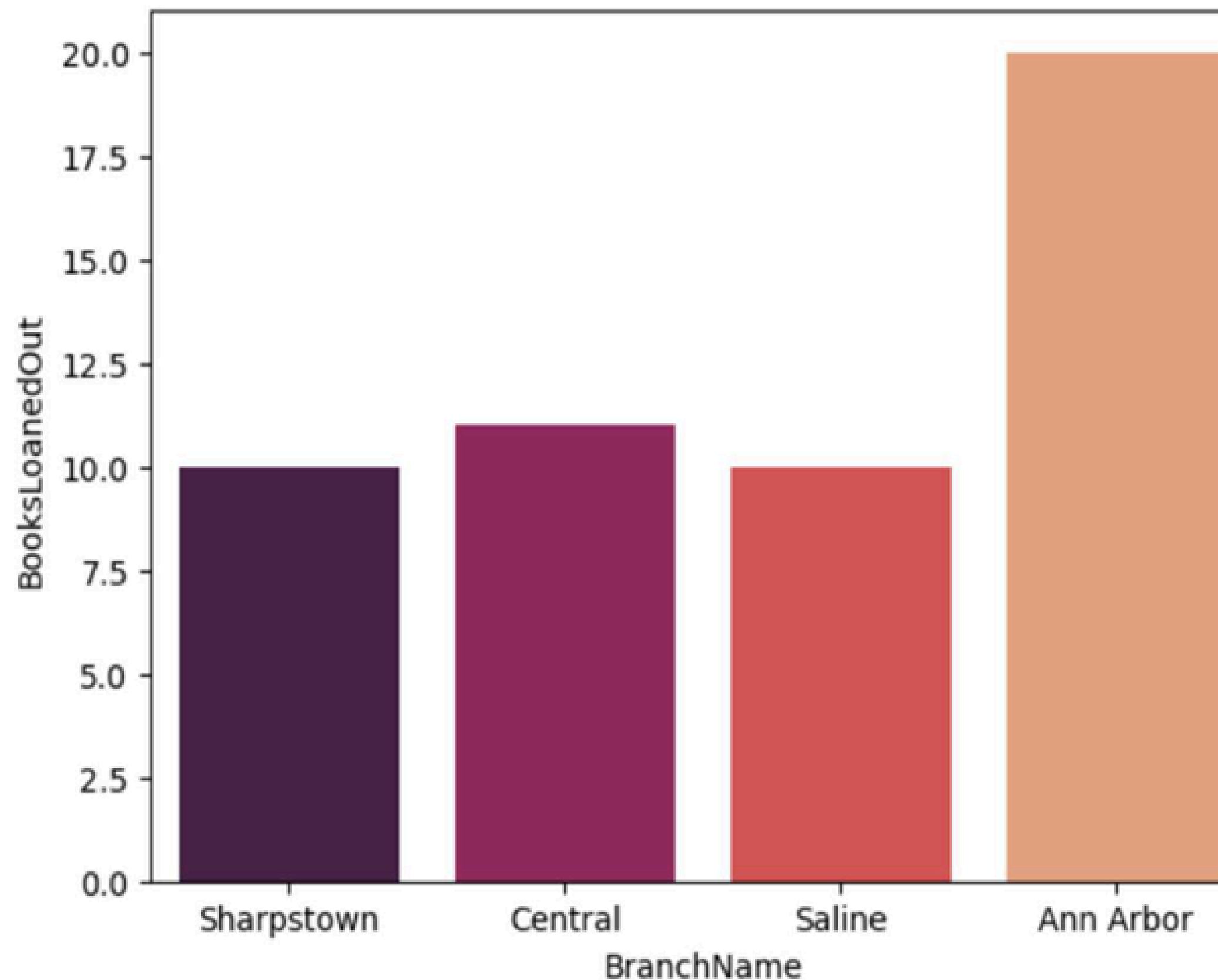
tbl_publisher

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
Chaldo & 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
George Allen & Unwin	83 Alexander Ln, Crows Nest NSW 2065, Australia	-8466
Harcourt Brace Jovanovich	3 Park Ave, New York, NY 10016	212-420-5800
Harper and Row	HarperCollins Publishers, 195 Broadway, New Y...	212-207-7000
Pan Books	175 Fifth Avenue, New York, NY 10010	646-307-5745
Picador USA	175 Fifth Avenue, New York, NY 10010	646-307-5745
Scholastic	557 Broadway, New York, NY 10012	800-724-6527

ER DIAGRAM



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

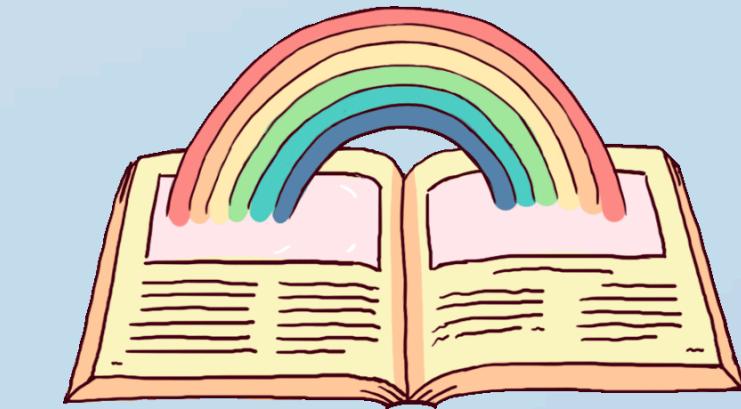


QUERY :

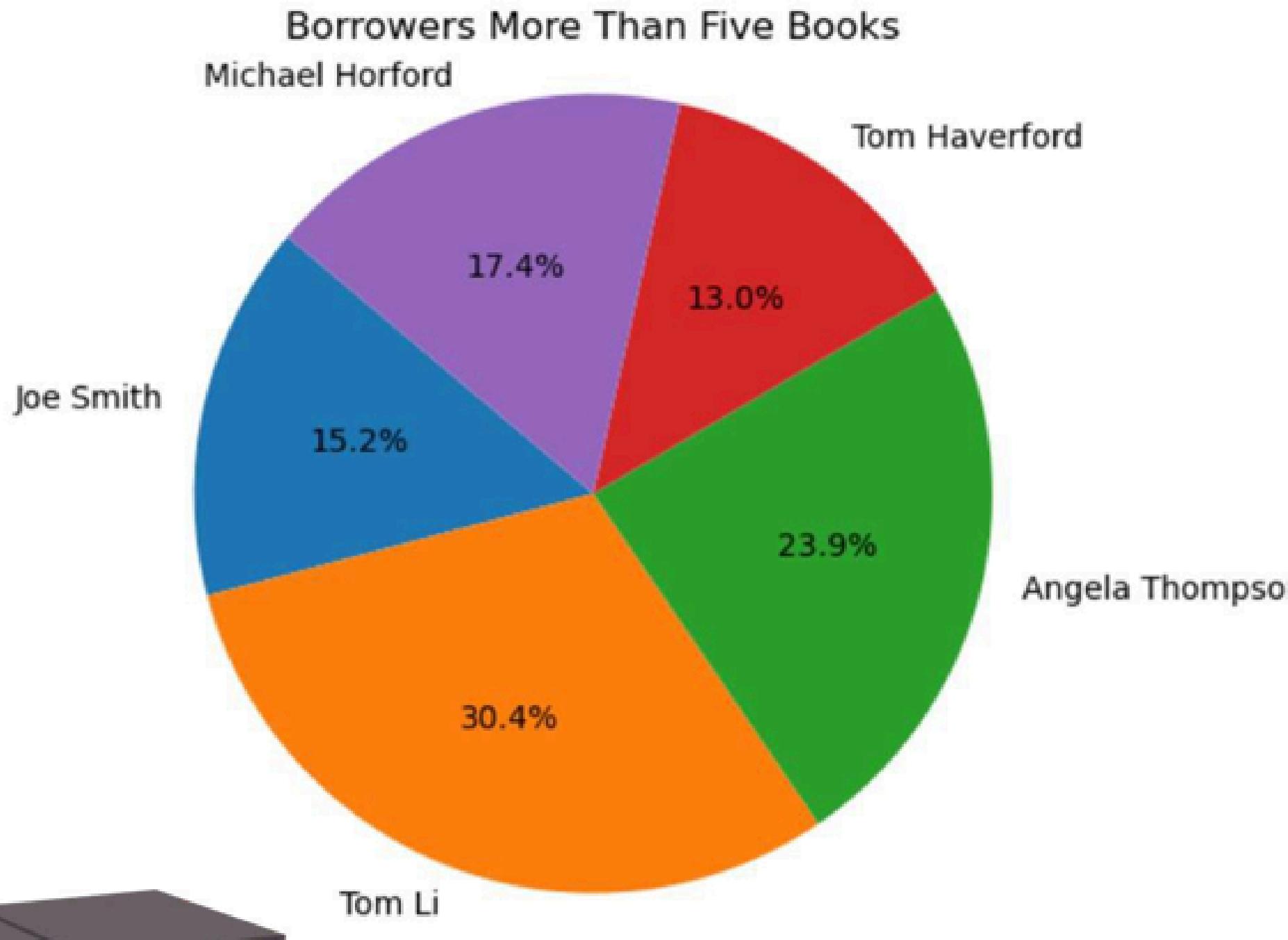
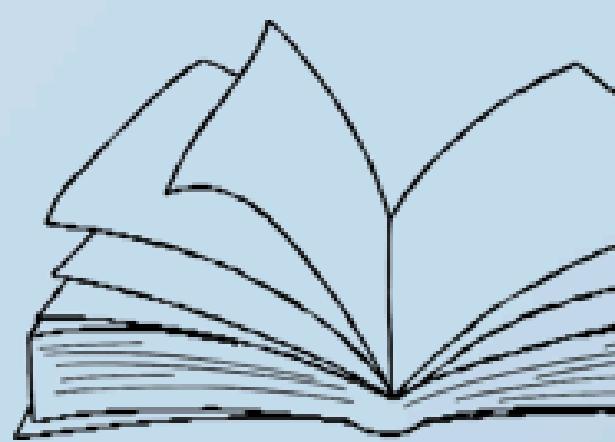
```
SELECT lb.library_branch_BranchName , count(*) books_loaned_out  
FROM  
tbl_book_loans bl  
JOIN  
tbl_library_branch lb  
ON bl.book_loans_BranchID = lb.library_branch_BranchID  
GROUP BY lb.library_branch_BranchName;
```

OUTPUT :

library_branch_BranchName	books_loaned_out
Sharpstown	10
Central	11
Saline	10
Ann Arbor	20



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



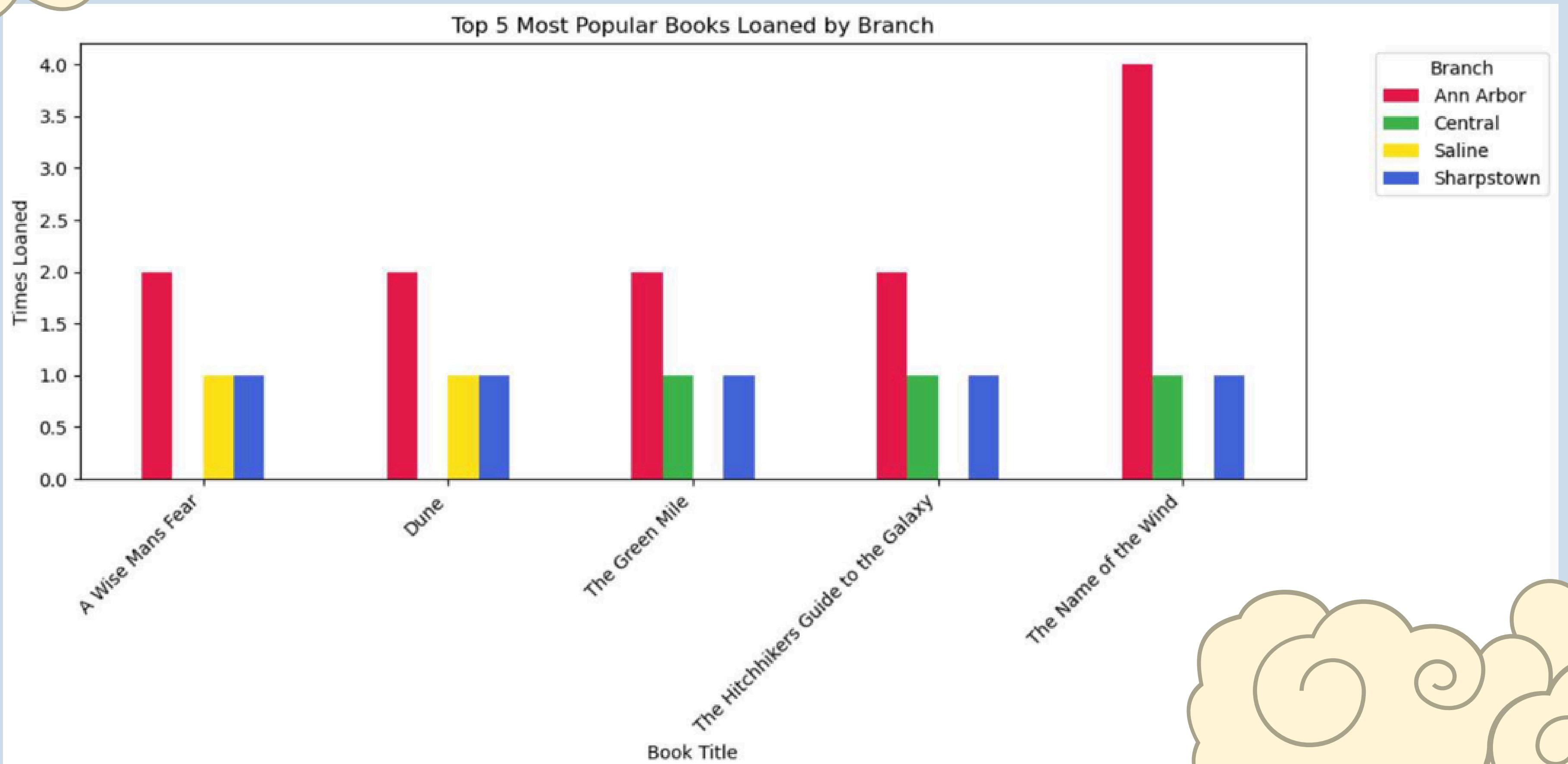
QUERY :

```
SELECT br.borrower_BorrowerName , br.borrower_BorrowerAddress ,  
count(*) book_count_more_than_five  
FROM  
tbl_book_loans bl  
JOIN  
tbl_borrower br  
ON bl.book_loans_CardNo = br.borrower_CardNo  
GROUP BY br.borrower_BorrowerName , br.borrower_BorrowerAddress  
HAVING book_count_more_than_five > 5;
```

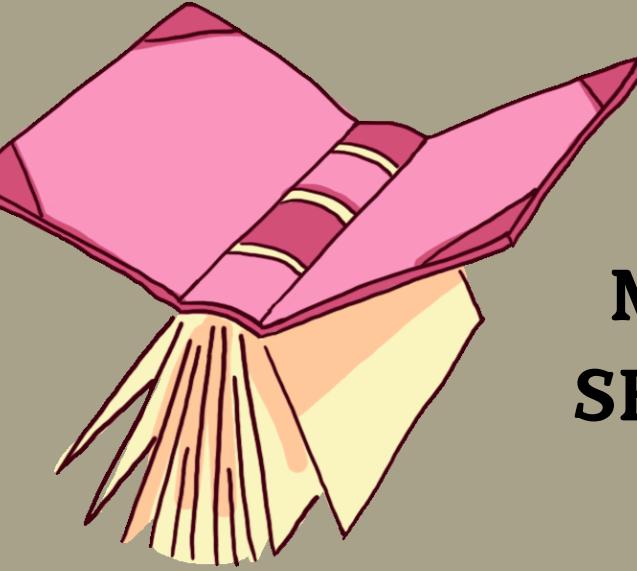
OUTPUT :

borrower_BorrowerName	borrower_BorrowerAddress	book_count_more_than
Joe Smith	1321 4th Street, New York, NY 10014	7
Tom Li	981 Main Street, Ann Arbor, MI 48104	14
Angela Thompson	2212 Green Avenue, Ann Arbor, MI 48104	11
Tom Haverford	23 75th Street, New York, NY 10014	6
Michael Horford	653 Glen Avenue, Ann Arbor, MI 48104	8

TOP 5 Most Popular Books Loaned By Branch



FINAL BUSINESS INSIGHTS



HIGH LOAN ACTIVITY IN JANUARY 2018

MOST BOOK LOANS OCCURRED IN JANUARY 2018, SUGGESTING A STRONG SEASONAL BORROWING PATTERN ALIGNED WITH ACADEMIC OR CALENDAR CYCLES.

LOAN ACTIVITY IS INCONSISTENT ACROSS MONTHS POST-JANUARY MONTHS LIKE FEBRUARY 2019 SHOW LOW ENGAGEMENT, POSSIBLY DUE TO OPERATIONAL CHANGES, DATA GAPS, OR LACK OF NEW INVENTORY.

BRANCH-WISE PERFORMANCE VARIES CERTAIN BRANCHES LIKE ANN ARBOR CONSISTENTLY SHOW HIGHER LOAN VOLUMES, WHILE OTHERS LIKE SHARPSTOWN, CENTRAL OR SALINE REMAIN UNDERUTILIZED.



CONCLUSION

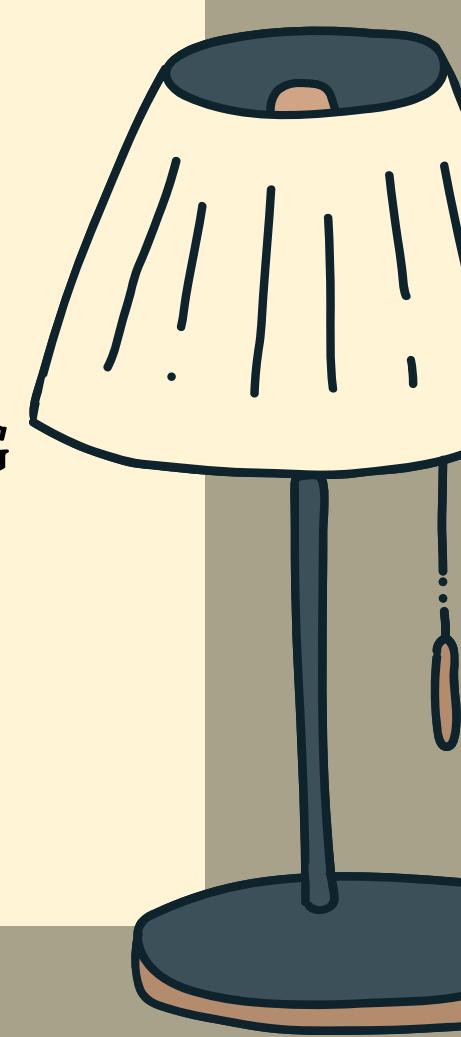


- This project analyzed a library management database using SQL and Python to uncover patterns in book loans, branch activity, and author popularity. Key insights like seasonal borrowing trends and branch-wise performance helped identify areas for inventory optimization and improved user engagement.

CHALLENGES



WHILE IMPORTING DATA INTO THE TBL_BOOK_LOANS TABLE, THE DATEOUT AND DUEDATE COLUMNS FAILED TO IMPORT DUE TO INCONSISTENT DATE FORMATS (E.G., MM/DD/YY). TO RESOLVE THIS, I INITIALLY CHANGED THE COLUMN DATA TYPE TO VARCHAR TO ALLOW SUCCESSFUL IMPORT OF RAW DATE STRINGS.



AFTER IMPORTING THE DATA, I USED THE STR_TO_DATE() FUNCTION IN MYSQL TO CONVERT THE STRING VALUES INTO PROPER DATE FORMAT AND STORED THEM IN NEW DATE COLUMNS

AND SOME DIFFICULTIES FACED WHILE MERGING TWO OR MORE TABLES USING JOIN .

QUESTIONS



THANK YOU