

# Introduction

## Project Overview

This project will implement a library database to manage the borrowing of books and other loanable items, as well as the membership of patrons in the library. This database is built to be easily modified and built upon, with multiple different loanable items being easily able to be added. Additionally, the database will allow for numerous queries to manipulate, visualize, and delete the data.

## Scope

The project will consist of relations containing books, with numerous attributes; relations containing library patrons, with books they are renting as well as their individual attributes; other loanable items, like movies or music, and their attributes; and library administrators, and their attributes and privileged functions.

## Glossary

**Query:** A request made to the database to generate, update, or delete data from a given relation.

**Administrator:** Someone with elevated privileges, and is generally responsible for managing the physical library through the database.

**Librarian:** Someone who helps members borrow/return books, updates member information, and maintains day-to-day services at the library through the database.

**Library Member/Patron:** A person who goes to the library with the intention of renting a book or other loanable item, who can loan out certain items, and can return those rented items.

## Relational Schema Mapping

**Relation Name:** Book

**Origin Entity/Relationship:** Book

**Relation Schema:**

Book(BookID, Title, AuthorID, ISBN, PublicationYear, Genre, Availability, TotalCopies, PublisherID)

**Primary Key:** BookID

**Foreign Key(s):** AuthorID references Author, PublisherID references Publisher

**Functional Dependencies:** N/A

**Relation Name:** User

**Origin Entity/Relationship:** User

**Relation Schema:**

User(UserID, First\_Name, Last\_Name, DoB, Email, Phone\_Number, User\_Type, Status, Outstanding\_Fees)

**Primary Key:** UserID

**Foreign Key(s):** N/A

**Functional Dependencies:** N/A

**Relation Name:** Author

**Origin Entity/Relationship:** Author

**Relation Schema:**

Author(AuthorID, Name, DoB)

**Primary Key:** AuthorID

**Foreign Key(s):** N/A

**Functional Dependencies:** N/A

**Relation Name:** Publisher

**Origin Entity/Relationship:** Publisher

**Relation Schema:**

Publisher(PublisherID, Name, Location)

**Primary Key:** PublisherID

**Foreign Key(s):** N/A

**Functional Dependencies:** N/A

**Relation Name:** Loan

**Origin Entity/Relationship:** Loan

**Relation Schema:**

Loan(LoanID, UserID, Issued, Due, Returned)

**Primary Key:** LoanID

**Foreign Key(s):** UserID references User

**Functional Dependencies:** N/A

**Relation Name:** Administrator

**Origin Entity/Relationship:** Administrator

**Relation Schema:**

Administrator(AdminID, UserID)

**Primary Key:** AdminID

**Foreign Key(s):** UserID references User

**Functional Dependencies:** N/A

**Relation Name:** Librarian  
**Origin Entity/Relationship:** Librarian  
**Relation Schema:**  
Librarian(LibrarianID, UserID)  
**Primary Key:** LibrarianID  
**Foreign Key(s):** UserID references User  
**Functional Dependencies:** N/A

**Relation Name:** LoanContains  
**Origin Entity/Relationship:** Loan CONTAINS Book  
**Relation Schema:**  
LoanContains(BookID, LoanID)  
**Primary Key:** BookID  
**Foreign Key(s):** BookID references Book, LoanID references Loan  
**Functional Dependencies:** N/A

**Relation Name:** AddsBook  
**Origin Entity/Relationship:** Administrator ADDS Book  
**Relation Schema:**  
AddsBook(BookID, AdminID)  
**Primary Key:** BookID  
**Foreign Key(s):** BookID references Book, AdminID references Administrator  
**Functional Dependencies:** N/A

**Relation Name:** DeletesBook  
**Origin Entity/Relationship:** Administrator DELETES Book  
**Relation Schema:**  
DeletesBook(BookID, AdminID)  
**Primary Key:** BookID  
**Foreign Key(s):** BookID references Book, AdminID references Administrator  
**Functional Dependencies:** N/A

**Relation Name:** AddsUser  
**Origin Entity/Relationship:** Administrator ADDS User  
**Relation Schema:**  
AddsUser(UserID, AdminID)  
**Primary Key:** UserID  
**Foreign Key(s):** UserID references User, AdminID references Administrator  
**Functional Dependencies:** N/A

**Relation Name:** DeletesUser

**Origin Entity/Relationship:** Administrator DELETES User

**Relation Schema:**

DeletesBook(UserID, AdminID)

**Primary Key:** UserID

**Foreign Key(s):** UserID references User, AdminID references Administrator

**Functional Dependencies:** N/A

**Relation Name:** ChecksIn

**Origin Entity/Relationship:** Librarian CHECKS IN Book

**Relation Schema:**

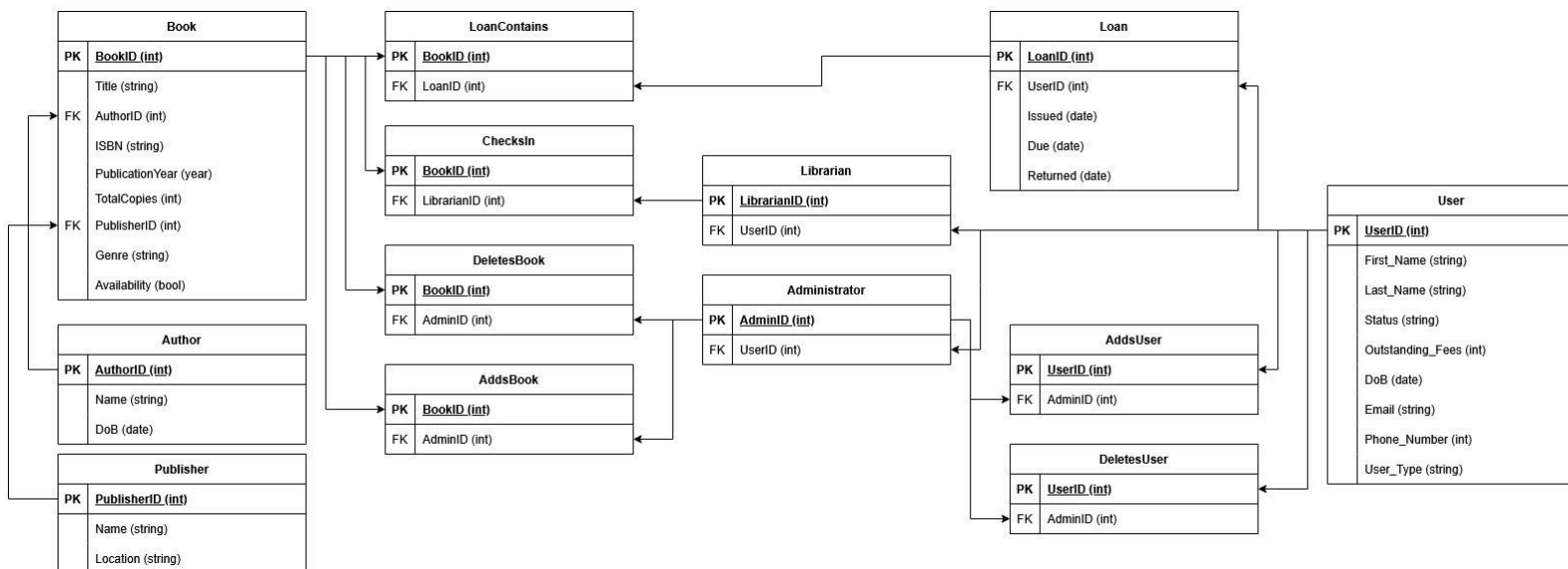
ChecksIn(BookID, LibrarianID)

**Primary Key:** BookID

**Foreign Key(s):** BookID references Book, LibrarianID references Librarian

**Functional Dependencies:** N/A

## Relational Schema Diagram



# Schema Data Dictionary

## Book

Attribute Name	Data Type	Description
BookID	INT	The unique ID of the book. PK.
Title	VARCHAR	The title of the book.
AuthorID	INT	The id of the author of the book. FK in author.
ISBN	CHAR(13)	The ISBN of the book.
PublicationYear	YEAR	The year the book was published.
Genre	VARCHAR	The genre of the book.
Availability	BOOLEAN	Whether or not the book is available to loan.
TotalCopies	INT	The number of available copies of the book.
PublisherID	INT	The id of the publisher of the book. FK in publisher.

## User

Attribute Name	Data Type	Description
UserID	INT	The unique ID of the user. PK.
First_Name	VARCHAR	The first name of the user.
Last_Name	VARCHAR	The last name of the user.
DoB	DATE	The user's date of birth.
Email	VARCHAR	The user's email address. Unique.
Phone_Number	INT	The user's phone number.
User_Type	VARCHAR	The user's type, which defines their privileges.
Status	VARCHAR	The user's membership status.
Outstanding_Fees	INT	The total sum of outstanding fees.

### Author

Attribute Name	Data Type	Description
AuthorID	INT	The unique ID of the author. PK.
Name	VARCHAR	The name of the author.
DoB	DATE	The author's date of birth.

### Publisher

Attribute Name	Data Type	Description
PublisherID	INT	The unique ID of the publisher. PK.
Name	VARCHAR	The name of the publisher.
Location	VARCHAR	The publisher's physical location.

### Loan

Attribute Name	Data Type	Description
LoanID	INT	The unique ID of the loan. PK.
UserID	INT	The unique ID of the user the loan belongs to. FK in user.
Issued	DATE	The date the loan was issued.
Due	DATE	The date the loan is due.
Returned	DATE	The date the loan was returned.

### Administrator

Attribute Name	Data Type	Description
AdminID	INT	The unique ID of the administrator. PK.
UserID	INT	The unique ID of the user that is an admin. FK in user.

### Librarian

Attribute Name	Data Type	Description
LibrarianID	INT	The unique ID of the librarian. PK.
UserID	INT	The unique ID of the user that is a librarian. FK in user.

### LoanContains

Attribute Name	Data Type	Description
BookID	INT	The unique ID of a book. FK in book. PK.
LoanID	INT	The ID of a loan. FK in loan.

### AddsBook

Attribute Name	Data Type	Description
BookID	INT	The unique ID of a book. FK in book. PK.
AdminID	INT	The ID of an admin. FK in admin.

### DeletesBook

Attribute Name	Data Type	Description
BookID	INT	The unique ID of a book. FK in book. PK.
AdminID	INT	The ID of an admin. FK in admin.

### AddsUser

Attribute Name	Data Type	Description
UserID	INT	The unique ID of a user. FK in user.
AdminID	INT	The ID of an admin. FK in admin.

### DeletesUser

Attribute Name	Data Type	Description
UserID	INT	The unique ID of a user. FK in user. PK.
AdminID	INT	The ID of an admin. FK in admin.

**ChecksIn**

Attribute Name	Data Type	Description
BookID	INT	The unique ID of a book. FK in book. PK.
LibrarianID	INT	The ID of a librarian. FK in librarian.