CS 415 – Design of Database Systems

Final Project Step 3

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Short Description of Web Application (Edit Description from Step 1 and 2)

We have developed a desktop application that enables users to keep track of the books they are currently reading, have already completed, or would like to read. The application also allows users to perform queries by clicking on functional buttons, which display the query results. Users can choose from eight available queries, and each of them displays the query results on a separate window, along with the query itself in text to inform the user about the query that was executed. The queries are performed on a mySQL database that stores data related to ‘Users’, ‘Books,’ ‘Authors’, ‘Publishers’, ‘Bookstores’, and the relationships between them, include ‘Sells’ and ‘Reading’.

The reading table in the database allows users to rate the books they have already completed. Additionally, users can view a list of websites and prices where they can purchase a new book they are interested in reading by executing those queries. Finally, users who create a profile are inserted into a database, allowing their data to be stored for long-term use and accessed through login. Users can find this application and database useful, as they can carry this list with them wherever they go, enabling them to pull up the list when shopping for books or discussing books with friends. Updates to the application would add some of the features mentioned above.

Data Procurement

ID values for authors, publishers, Users, and Stores were randomly generated starting at an ID of 1 and incrementing by 1 for the remaining tupples.

Names, Usernames, Emails, Passwords for Users were auto generated using the website https://www.mockaroo.com/. Date of births were randomly generated using excel and the age was calculated based on the date of birth.

Read Status, Book Rating, and Book Price for Reading and Sells tables were randomly generated using formulas in excel.

Attributes with Real Data Set

Books:	ISBN	Title	Genre	Date Published

Authors:	Name

Publishers:	Name	City

Stores:	Name	Store Website URL

Attributes with Fake Data Set

Books:	authorID	publisherID

Authors:	authID	publisherID

Publishers	PublisherID

Users:	User ID	Name	Age	Username	Email	Password	Date of Birth

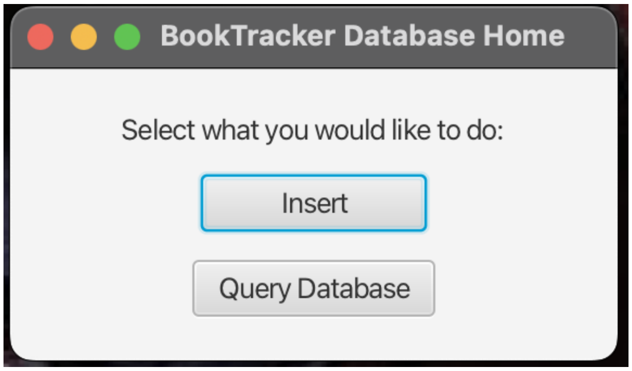
Stores	storeID

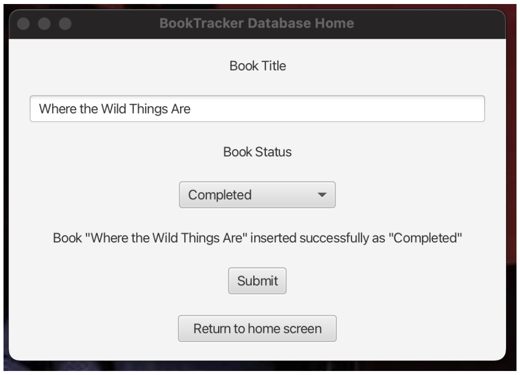
Reading:	userID	authorID	Read Status	Book Rating

Sells:	storeID	authorID	Book Price

Screenshot of Running Desktop Application

The desktop application was developed with JavaFX for the final project. Below you can see the application main menu which allows users to select whether they want to insert into the database the book they want to track or whether they want to access the query database. Below you can also see the insertion screen and query menu for user interaction.





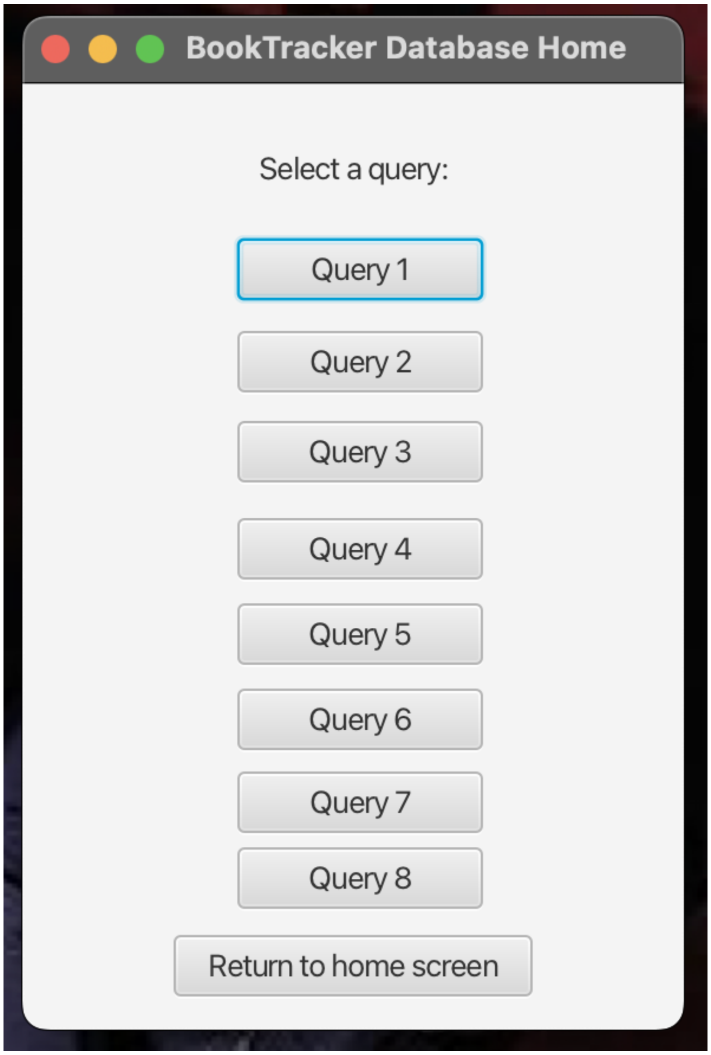
Book Title

Where the Wild Things Are

Book Status

Completed

Book "Where the Wild Things Are" inserted successfully as "Completed"

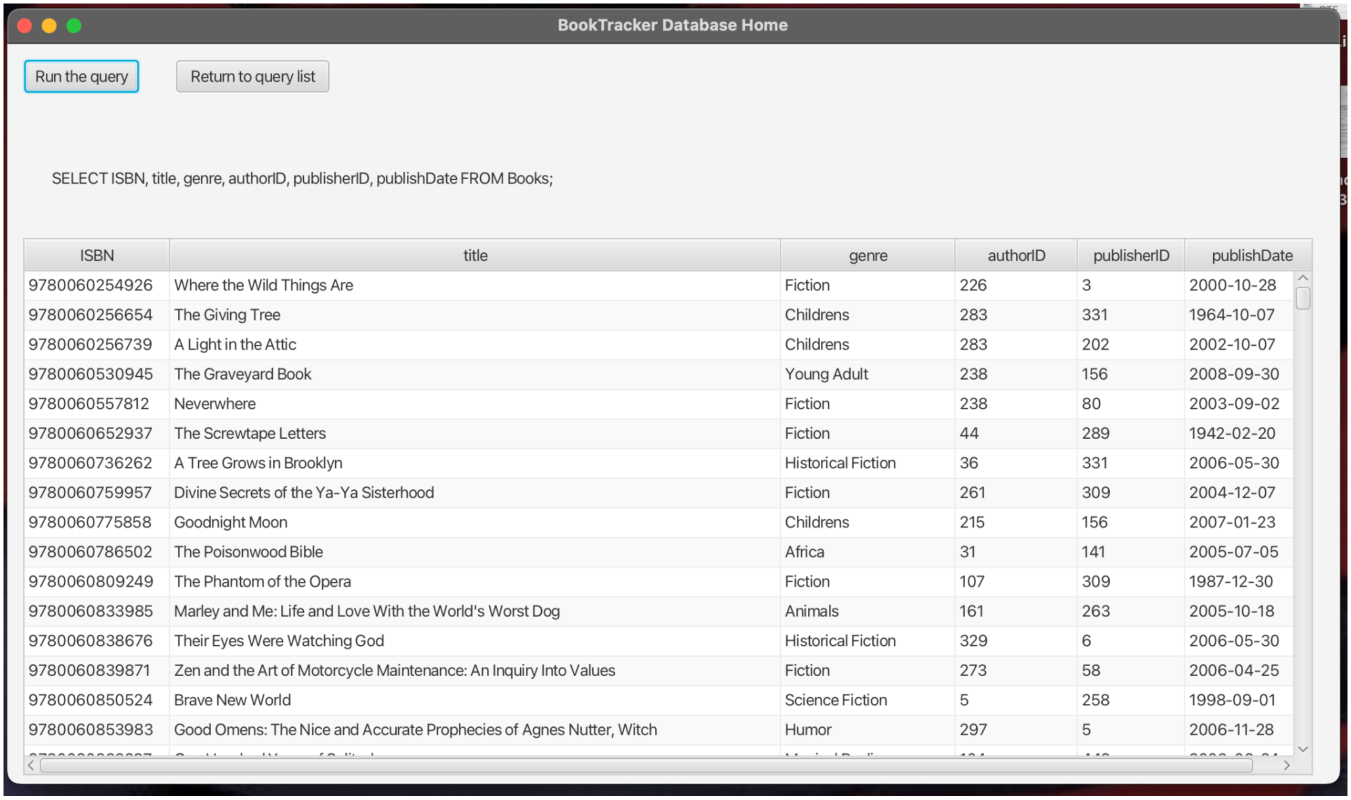


Screenshots for each of the 8 SQL Queries and Outputs

Below are screenshots of the the results of each of the 8 queries, 1 query per page. The table of the resulting query is shown along with the SQL code for that query.

Query 1

Display all the information that is in the Books database.

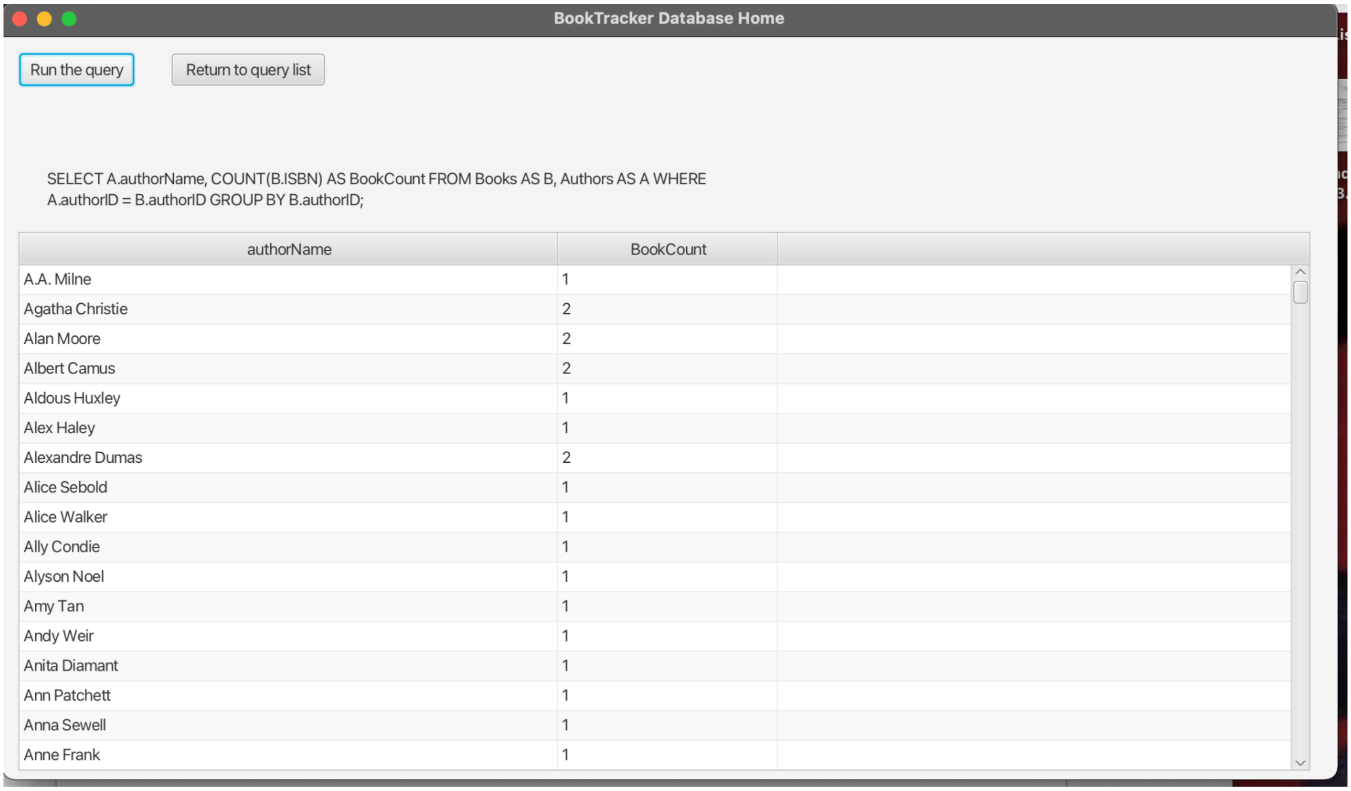


```
SELECT ISBN, title, genre, authorID, publisherID, publishDate FROM Books;
```

ISBN	title	genre	authorID	publisherID	publishDate
9780060254926	Where the Wild Things Are	Fiction	226	3	2000-10-28
9780060256654	The Giving Tree	Childrens	283	331	1964-10-07
9780060256739	A Light in the Attic	Childrens	283	202	2002-10-07
9780060530945	The Graveyard Book	Young Adult	238	156	2008-09-30
9780060557812	Neverwhere	Fiction	238	80	2003-09-02
9780060652937	The Screwtape Letters	Fiction	44	289	1942-02-20
9780060736262	A Tree Grows in Brooklyn	Historical Fiction	36	331	2006-05-30
9780060759957	Divine Secrets of the Ya-Ya Sisterhood	Fiction	261	309	2004-12-07
9780060775858	Goodnight Moon	Childrens	215	156	2007-01-23
9780060786502	The Poisonwood Bible	Africa	31	141	2005-07-05
9780060809249	The Phantom of the Opera	Fiction	107	309	1987-12-30
9780060833985	Marley and Me: Life and Love With the World's Worst Dog	Animals	161	263	2005-10-18
9780060838676	Their Eyes Were Watching God	Historical Fiction	329	6	2006-05-30
9780060839871	Zen and the Art of Motorcycle Maintenance: An Inquiry Into Values	Fiction	273	58	2006-04-25
9780060850524	Brave New World	Science Fiction	5	258	1998-09-01
9780060853983	Good Omens: The Nice and Accurate Prophecies of Agnes Nutter, Witch	Humor	297	5	2006-11-28

Query 2

Display the names of authors with the number of books they have written

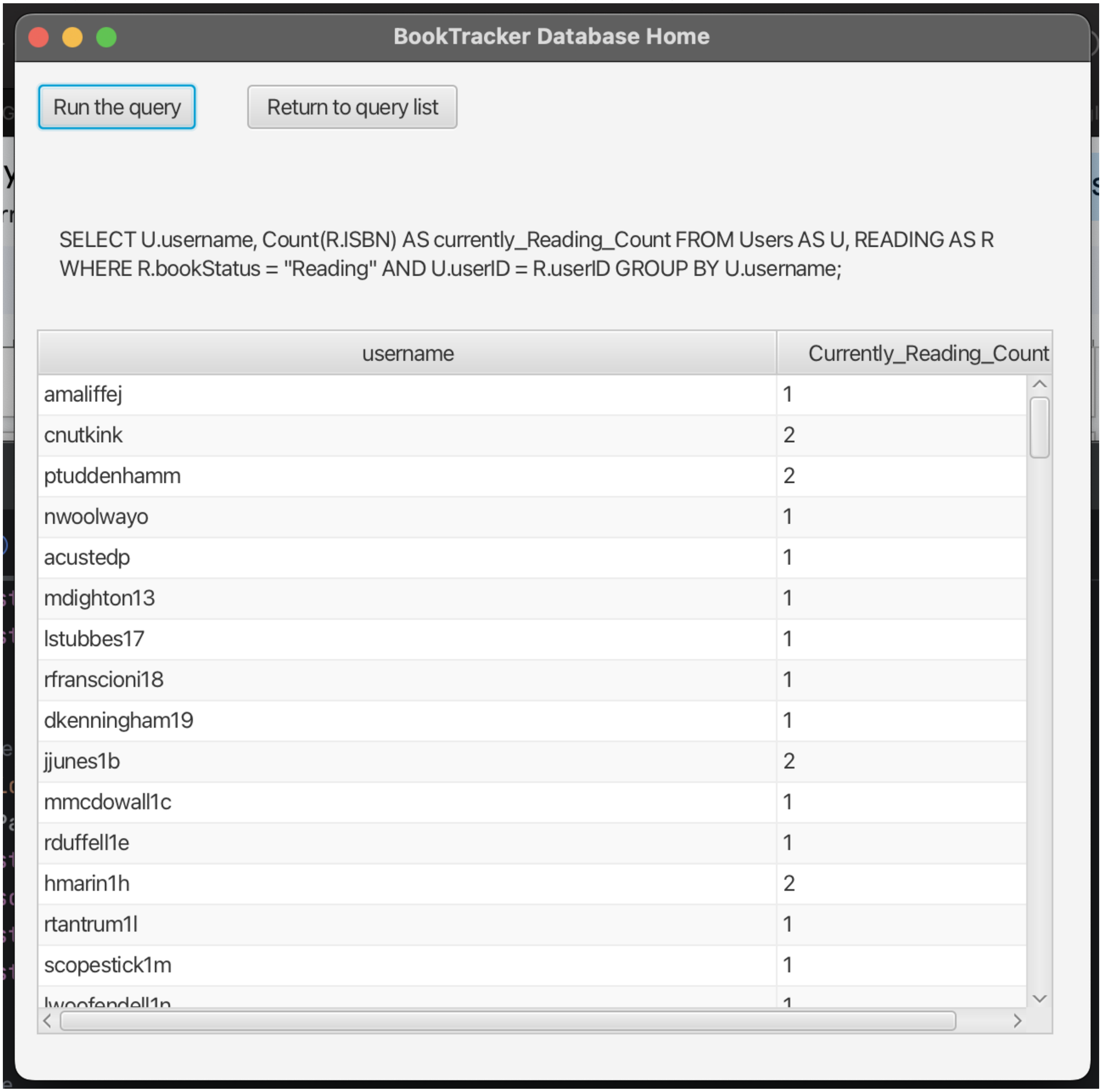


```
SELECT A.authorName, COUNT(B.ISBN) AS BookCount FROM Books AS B, Authors AS A WHERE
A.authorID = B.authorID GROUP BY B.authorID;
```

authorName	BookCount
A.A. Milne	1
Agatha Christie	2
Alan Moore	2
Albert Camus	2
Aldous Huxley	1
Alex Haley	1
Alexandre Dumas	2
Alice Sebold	1
Alice Walker	1
Ally Condie	1
Alyson Noel	1
Amy Tan	1
Andy Weir	1
Anita Diamant	1
Ann Patchett	1
Anna Sewell	1
Anne Frank	1

Query 3

Display the number of books each user is currently reading

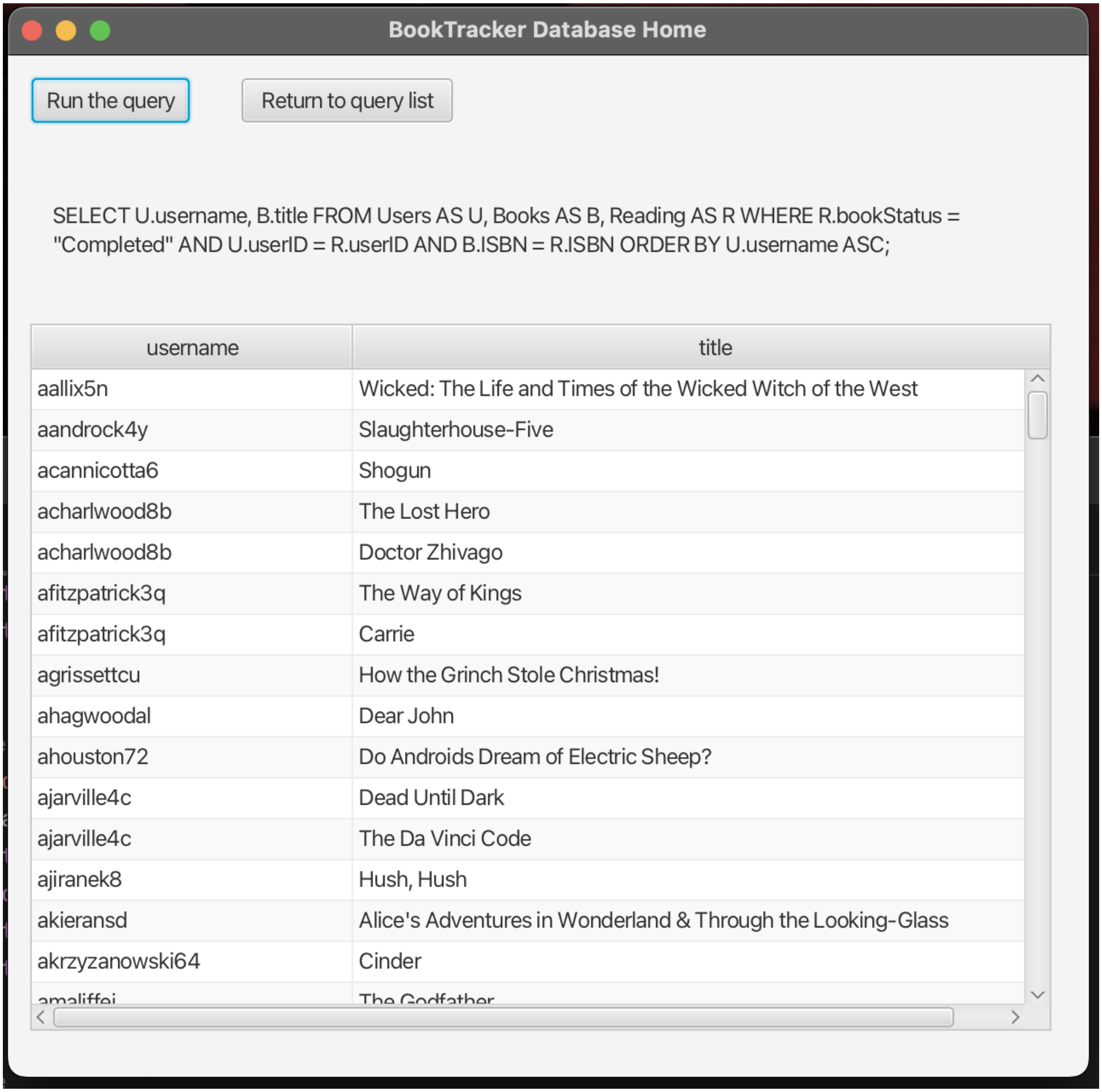


```
SELECT U.username, Count(R.ISBN) AS currently_Reading_Count FROM Users AS U, READING AS R
WHERE R.bookStatus = "Reading" AND U.userID = R.userID GROUP BY U.username;
```

username	Currently_Reading_Count
amaliffej	1
cnutkink	2
ptuddenhamm	2
nwoolwayo	1
acustedp	1
mdighton13	1
lstubbes17	1
rfranscioni18	1
dkenningham19	1
jjunes1b	2
mmcdowall1c	1
rduffell1e	1
hmarin1h	2
rtantrum1l	1
scopestick1m	1
lwoofendell1n	1

<u>Query 4</u>

Display the username and book title for users of completed books

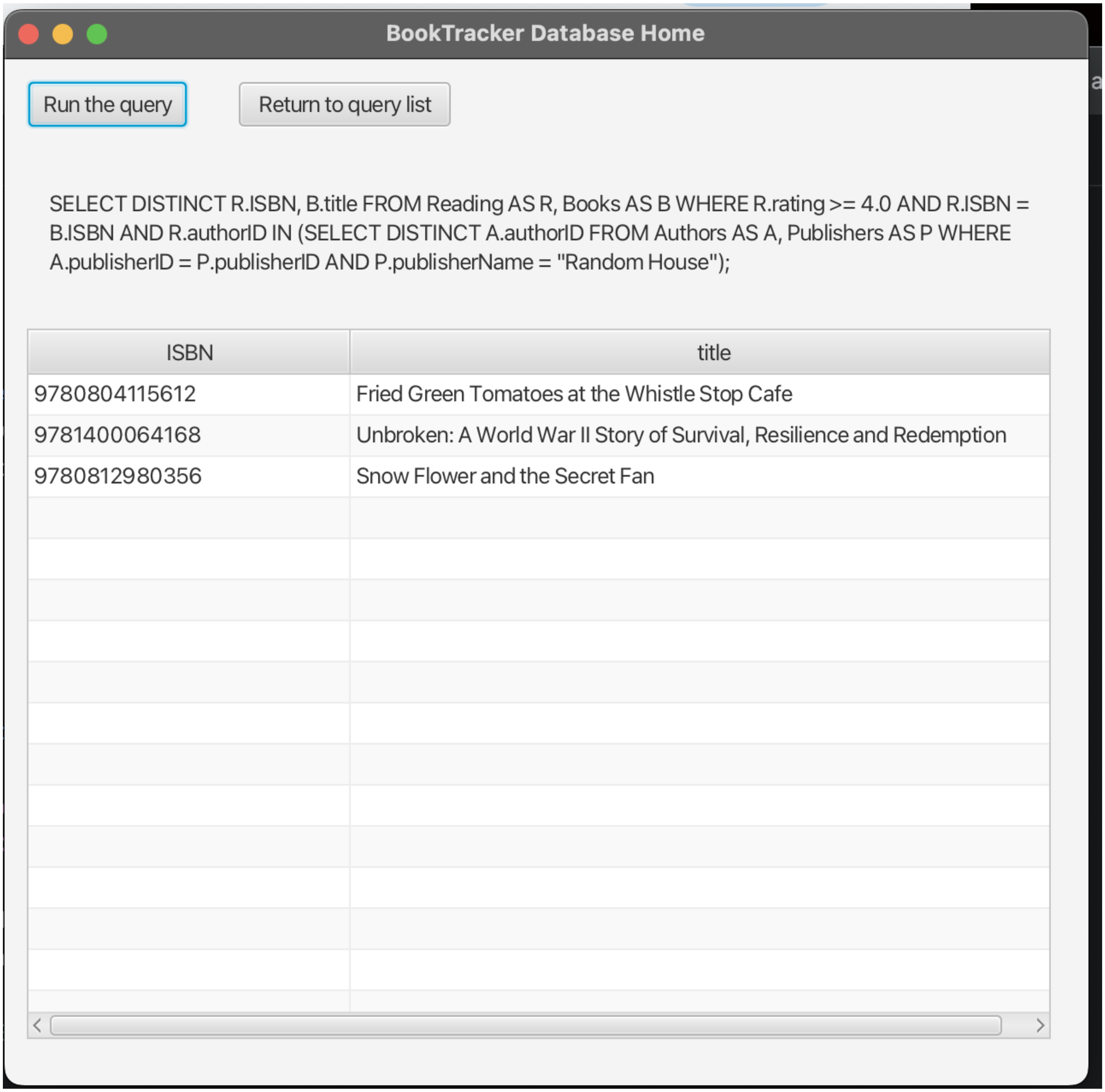


```
SELECT U.username, B.title FROM Users AS U, Books AS B, Reading AS R WHERE R.bookStatus =
"Completed" AND U.userID = R.userID AND B.ISBN = R.ISBN ORDER BY U.username ASC;
```

username	title
aallix5n	Wicked: The Life and Times of the Wicked Witch of the West
aandrock4y	Slaughterhouse-Five
acannicotta6	Shogun
acharlwood8b	The Lost Hero
acharlwood8b	Doctor Zhivago
afitzpatrick3q	The Way of Kings
afitzpatrick3q	Carrie
agrissettcu	How the Grinch Stole Christmas!
ahagwoodal	Dear John
ahouston72	Do Androids Dream of Electric Sheep?
ajarville4c	Dead Until Dark
ajarville4c	The Da Vinci Code
ajiranek8	Hush, Hush
akieransd	Alice's Adventures in Wonderland & Through the Looking-Glass
akrzyzanowski64	Cinder
amaliffei	The Godfather

<u>Query 5</u>

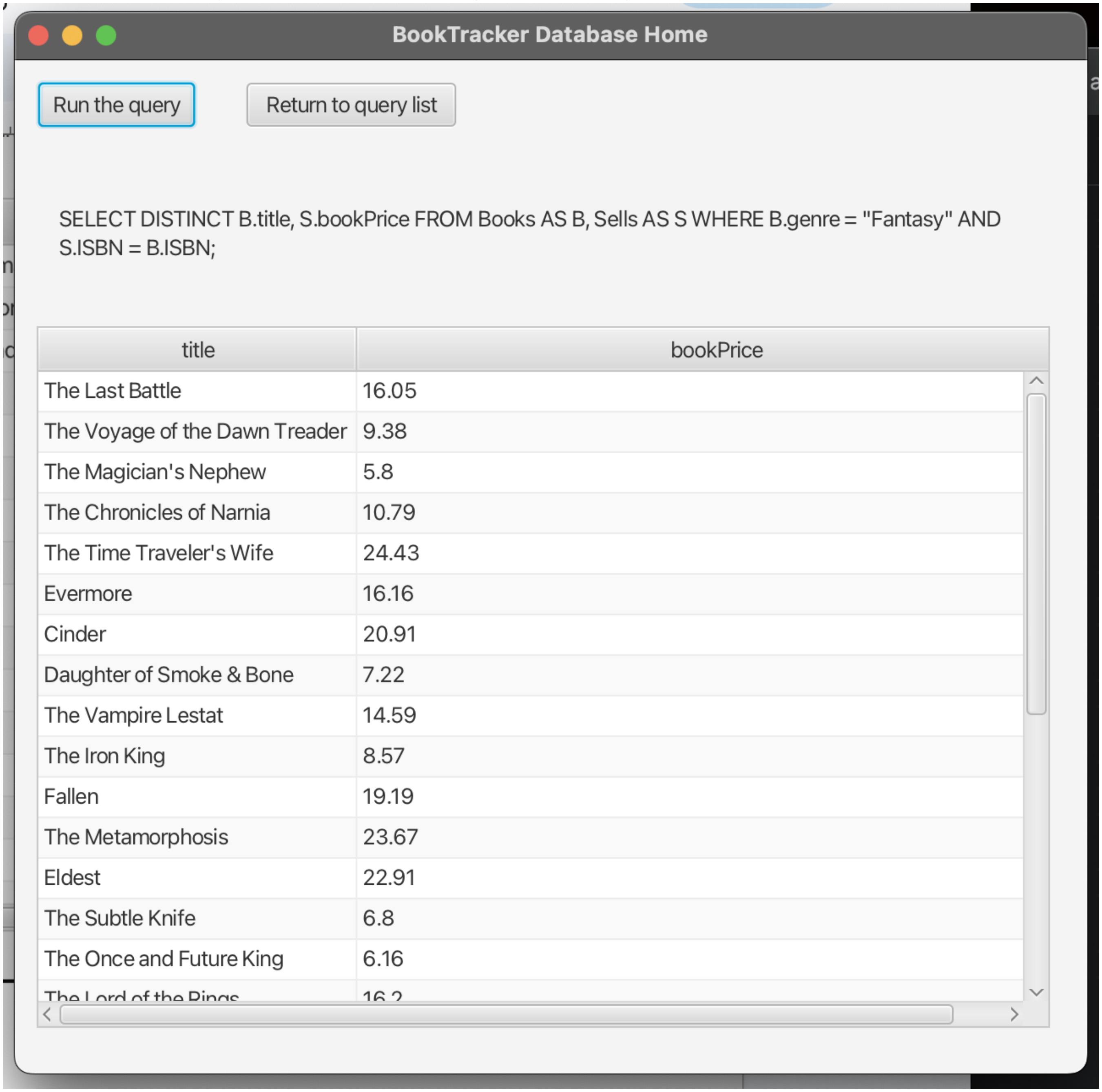
Find all the books by ISBN and Title with ratings greater than or equal to 4.0 written by Authors who published with Random House



```
SELECT DISTINCT R.ISBN, B.title FROM Reading AS R, Books AS B WHERE R.rating >= 4.0 AND R.ISBN =
B.ISBN AND R.authorID IN (SELECT DISTINCT A.authorID FROM Authors AS A, Publishers AS P WHERE
A.publisherID = P.publisherID AND P.publisherName = "Random House");
```

ISBN	title
9780804115612	Fried Green Tomatoes at the Whistle Stop Cafe
9781400064168	Unbroken: A World War II Story of Survival, Resilience and Redemption
9780812980356	Snow Flower and the Secret Fan

<u>Query 6</u>
List all the books by title and price in the genre Fantasy

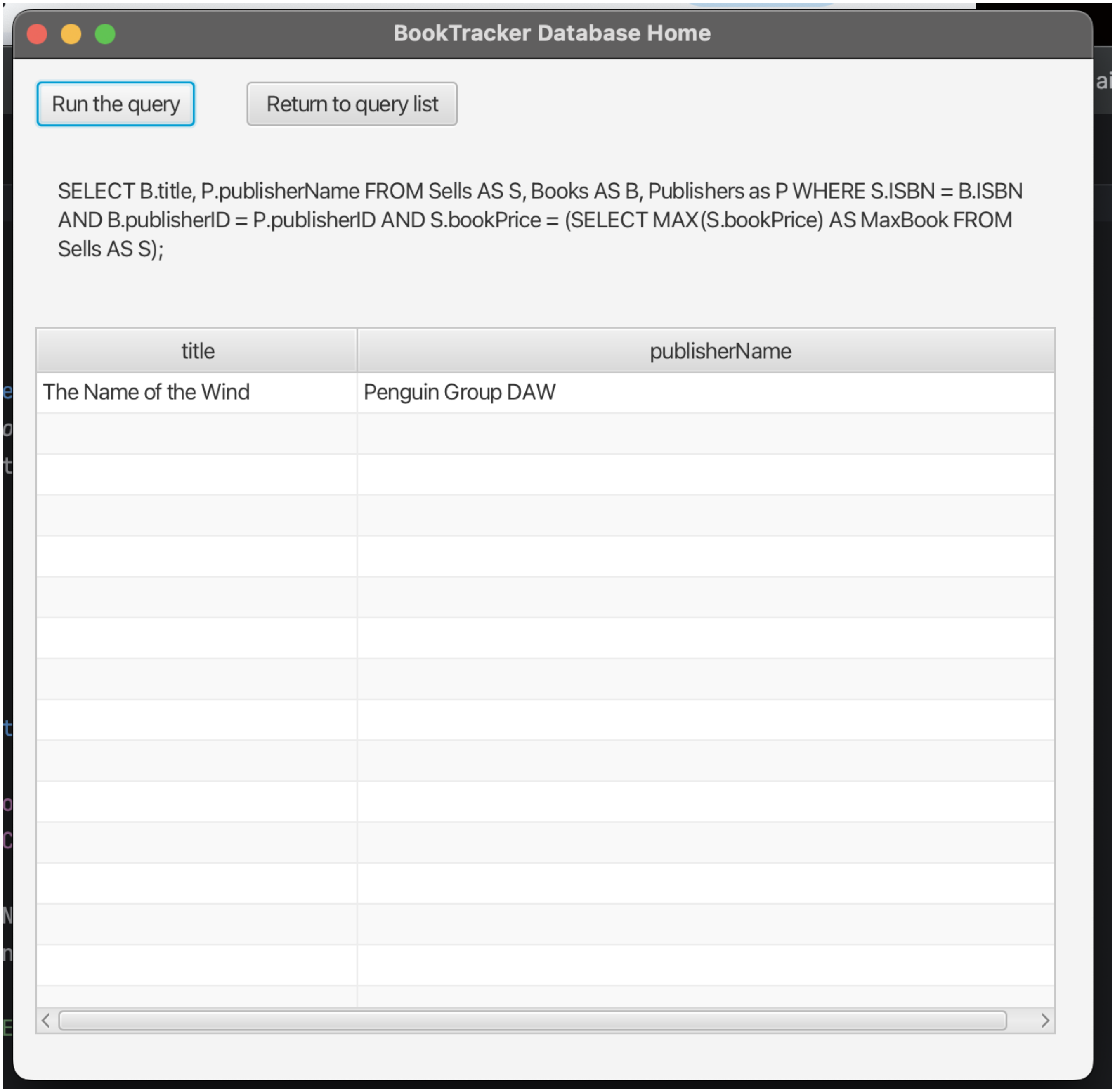


SELECT DISTINCT B.title, S.bookPrice FROM Books AS B, Sells AS S WHERE B.genre = "Fantasy" AND S.ISBN = B.ISBN;

title	bookPrice
The Last Battle	16.05
The Voyage of the Dawn Treader	9.38
The Magician's Nephew	5.8
The Chronicles of Narnia	10.79
The Time Traveler's Wife	24.43
Evermore	16.16
Cinder	20.91
Daughter of Smoke & Bone	7.22
The Vampire Lestat	14.59
The Iron King	8.57
Fallen	19.19
The Metamorphosis	23.67
Eldest	22.91
The Subtle Knife	6.8
The Once and Future King	6.16
The Lord of the Rings	16.2

Query 7

Display the publisher name and book title of the publisher with the highest priced book

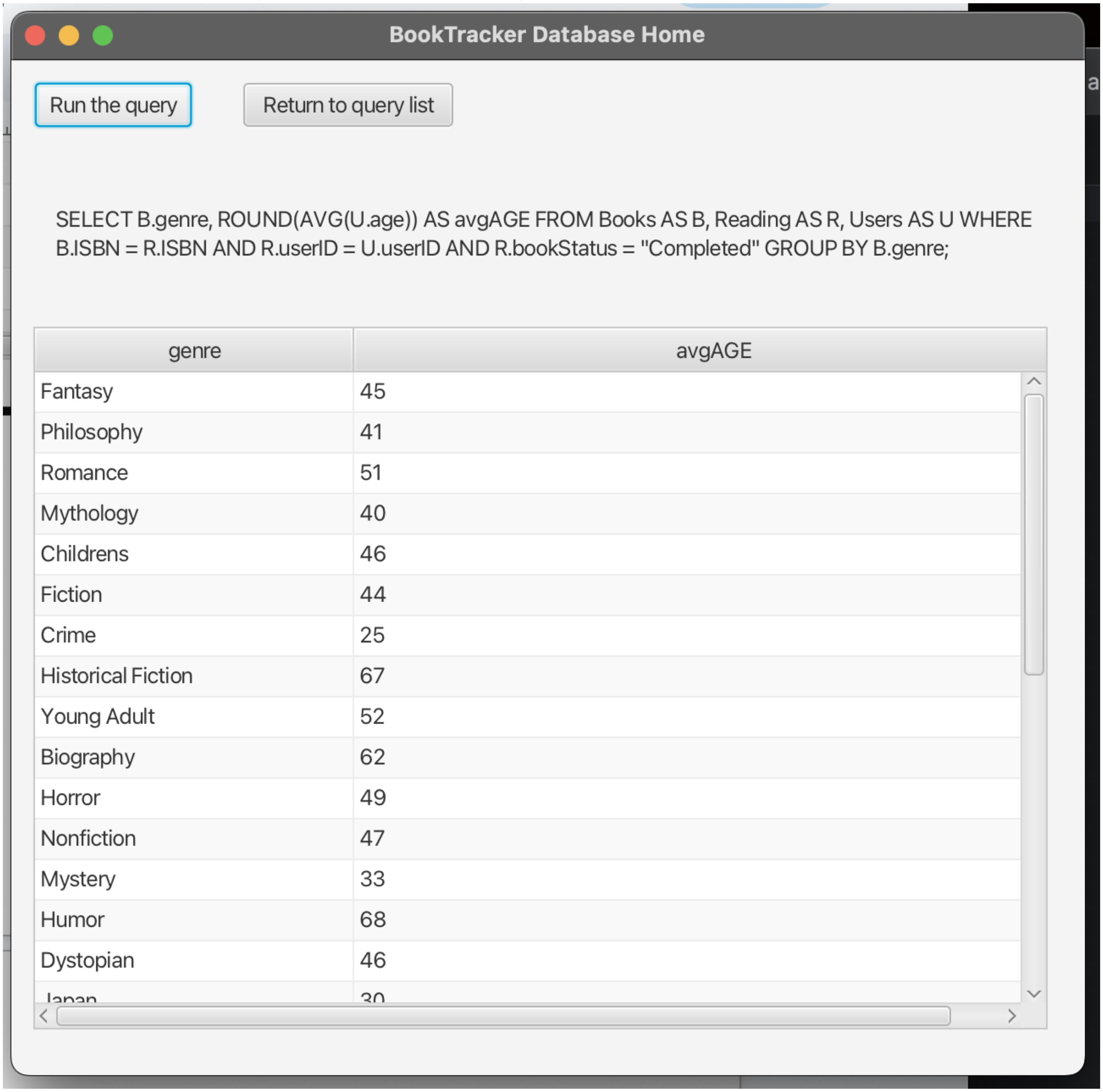


SELECT B.title, P.publisherName FROM Sells AS S, Books AS B, Publishers as P WHERE S.ISBN = B.ISBN AND B.publisherID = P.publisherID AND S.bookPrice = (SELECT MAX(S.bookPrice) AS MaxBook FROM Sells AS S);

title	publisherName
The Name of the Wind	Penguin Group DAW

Query 8

Display the average age of readers for each genre



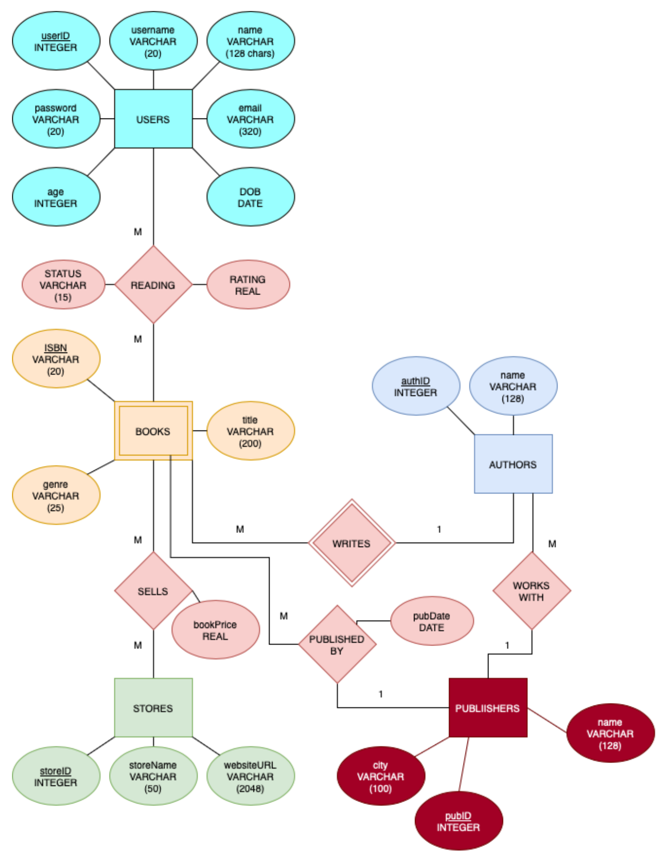
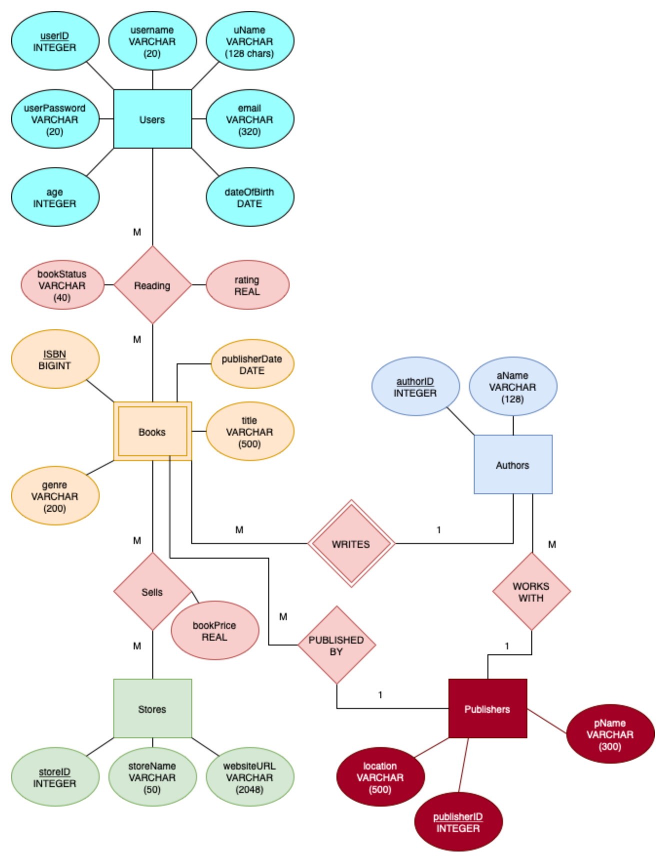
```
SELECT B.genre, ROUND(AVG(U.age)) AS avgAGE FROM Books AS B, Reading AS R, Users AS U WHERE
B.ISBN = R.ISBN AND R.userID = U.userID AND R.bookStatus = "Completed" GROUP BY B.genre;
```

genre	avgAGE
Fantasy	45
Philosophy	41
Romance	51
Mythology	40
Childrens	46
Fiction	44
Crime	25
Historical Fiction	67
Young Adult	52
Biography	62
Horror	49
Nonfiction	47
Mystery	33
Humor	68
Dystopian	46
Japan	30

Edits, Modifications, and Adjustments of the ER Diagram, Relational Schemas, and Queries from Step 2

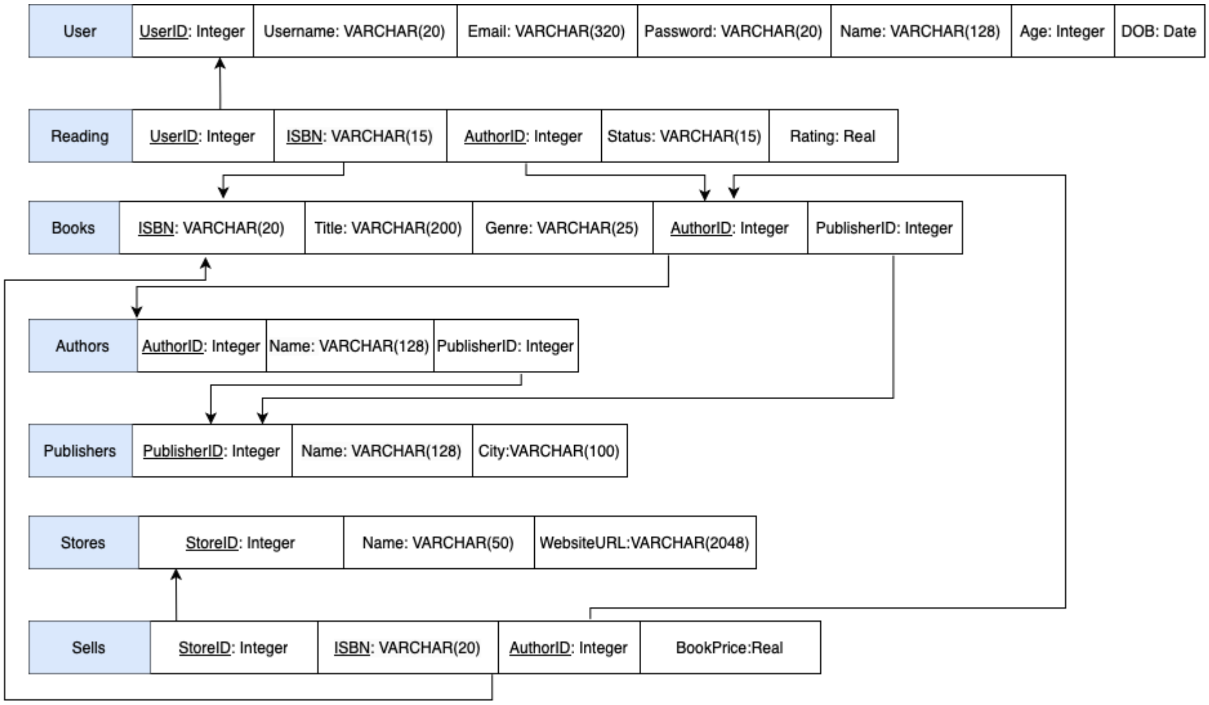
The biggest change to our project from Step 2 to Step 3 was changing the application type from a mobile application using Kotlin and Android Studio to a desktop application using java and javaFX. We made this pivot facilitate the submission of the project within the timeline of the course.

Our final ER Diagram was largely similar to the one that was submitted in Step 2. The changes were primarily updating the names of the attributes, datatypes, and capacity of the VARCHARS that the values will hold. Attribute publisherDate was moved from the relationship Published by to the attribute Books as shown in the final ER Diagram.

Step 2 ER Diagram:	Final ER Diagram:
 userID INTEGER username VARCHAR (20) name VARCHAR (128 chars) password VARCHAR (20) USERS email VARCHAR (320) age INTEGER DOB DATE M STATUS VARCHAR (15) READING RATING REAL M ISBN VARCHAR (20) authID INTEGER name VARCHAR (128) BOOKS title VARCHAR (200) AUTHORS genre VARCHAR (25) M M WRITES 1 M SELLS WORKS WITH bookPrice REAL M PUBLISHED BY pubDate DATE M 1 1 STORES PUBLISHERS name VARCHAR (128) storeID INTEGER storeName VARCHAR (50) websiteURL VARCHAR (2048) city VARCHAR (100) pubID INTEGER	 userID INTEGER username VARCHAR (20) uName VARCHAR (128 chars) userPassword VARCHAR (20) Users email VARCHAR (320) age INTEGER dateOfBirth DATE M bookStatus VARCHAR (40) Reading rating REAL M ISBN BIGINT publisherDate DATE authorID INTEGER aName VARCHAR (128) Books title VARCHAR (500) Authors genre VARCHAR (200) M M WRITES 1 M Sells WORKS WITH bookPrice REAL M PUBLISHED BY M 1 1 Stores Publishers pName VARCHAR (300) location VARCHAR (500) storeID INTEGER storeName VARCHAR (50) websiteURL VARCHAR (2048) publisherID INTEGER

Our final relational schema was largely similar to the one that was submitted in Step 2. The changes were primarily updating the names of the attributes, datatypes, and capacity of the VARCHARS that the values will hold. We also added the publish date of the book into the Books table.

Step 2 Relational Schema:



User | UserID: Integer | Username: VARCHAR(20) | Email: VARCHAR(320) | Password: VARCHAR(20) | Name: VARCHAR(128) | Age: Integer | DOB: Date

Reading | UserID: Integer | ISBN: VARCHAR(15) | AuthorID: Integer | Status: VARCHAR(15) | Rating: Real

Books | ISBN: VARCHAR(20) | Title: VARCHAR(200) | Genre: VARCHAR(25) | AuthorID: Integer | PublisherID: Integer

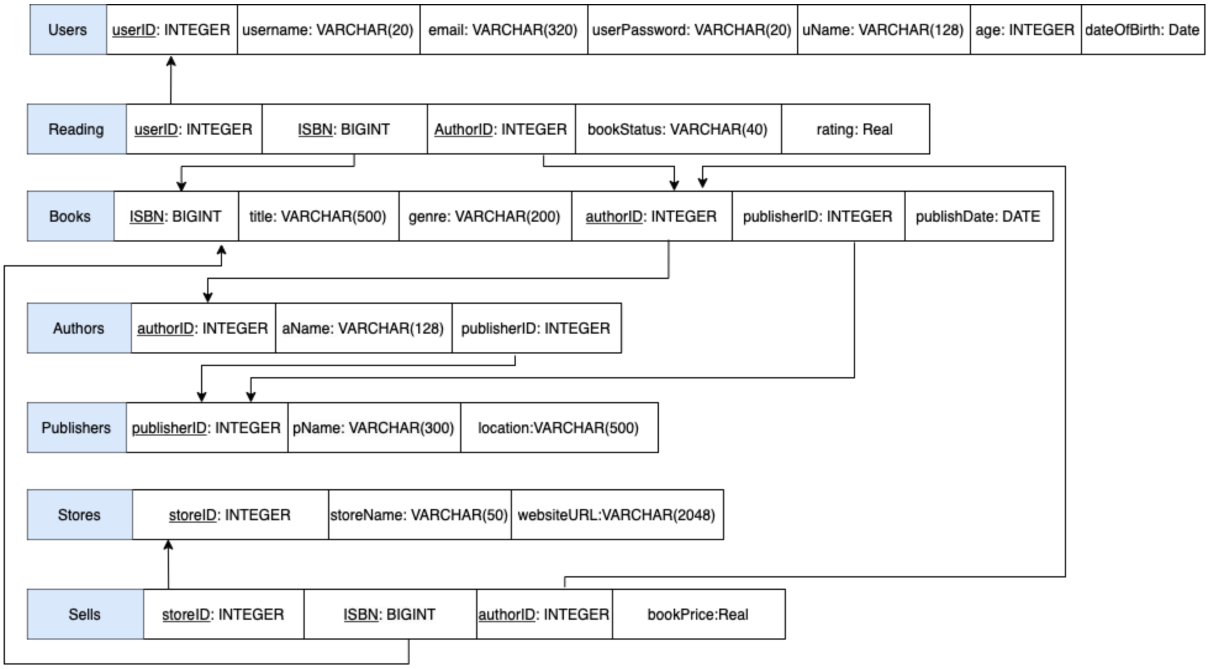
Authors | AuthorID: Integer | Name: VARCHAR(128) | PublisherID: Integer

Publishers | PublisherID: Integer | Name: VARCHAR(128) | City:VARCHAR(100)

Stores | StoreID: Integer | Name: VARCHAR(50) | WebsiteURL:VARCHAR(2048)

Sells | StoreID: Integer | ISBN: VARCHAR(20) | AuthorID: Integer | BookPrice:Real

Final Relational Schema:



Users | userID: INTEGER | username: VARCHAR(20) | email: VARCHAR(320) | userPassword: VARCHAR(20) | uName: VARCHAR(128) | age: INTEGER | dateOfBirth: Date

Reading | userID: INTEGER | ISBN: BIGINT | AuthorID: INTEGER | bookStatus: VARCHAR(40) | rating: Real

Books | ISBN: BIGINT | title: VARCHAR(500) | genre: VARCHAR(200) | authorID: INTEGER | publisherID: INTEGER | publishDate: DATE

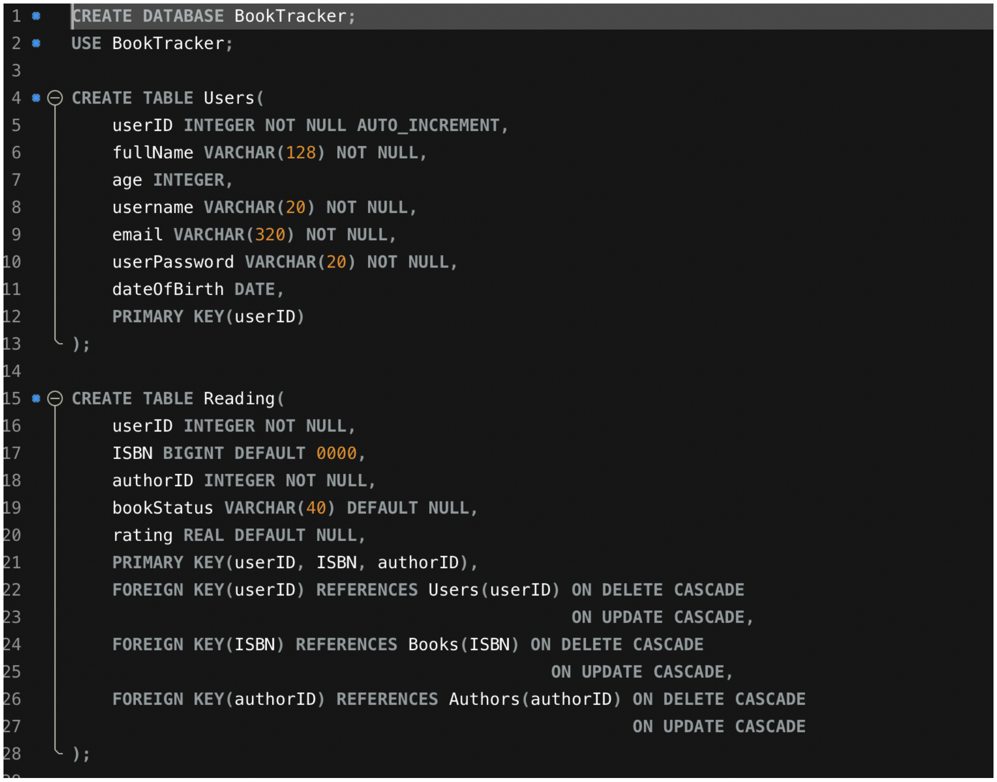
Authors | authorID: INTEGER | aName: VARCHAR(128) | publisherID: INTEGER

Publishers | publisherID: INTEGER | pName: VARCHAR(300) | location:VARCHAR(500)

Stores | storeID: INTEGER | storeName: VARCHAR(50) | websiteURL:VARCHAR(2048)

Sells | storeID: INTEGER | ISBN: BIGINT | authorID: INTEGER | bookPrice:Real

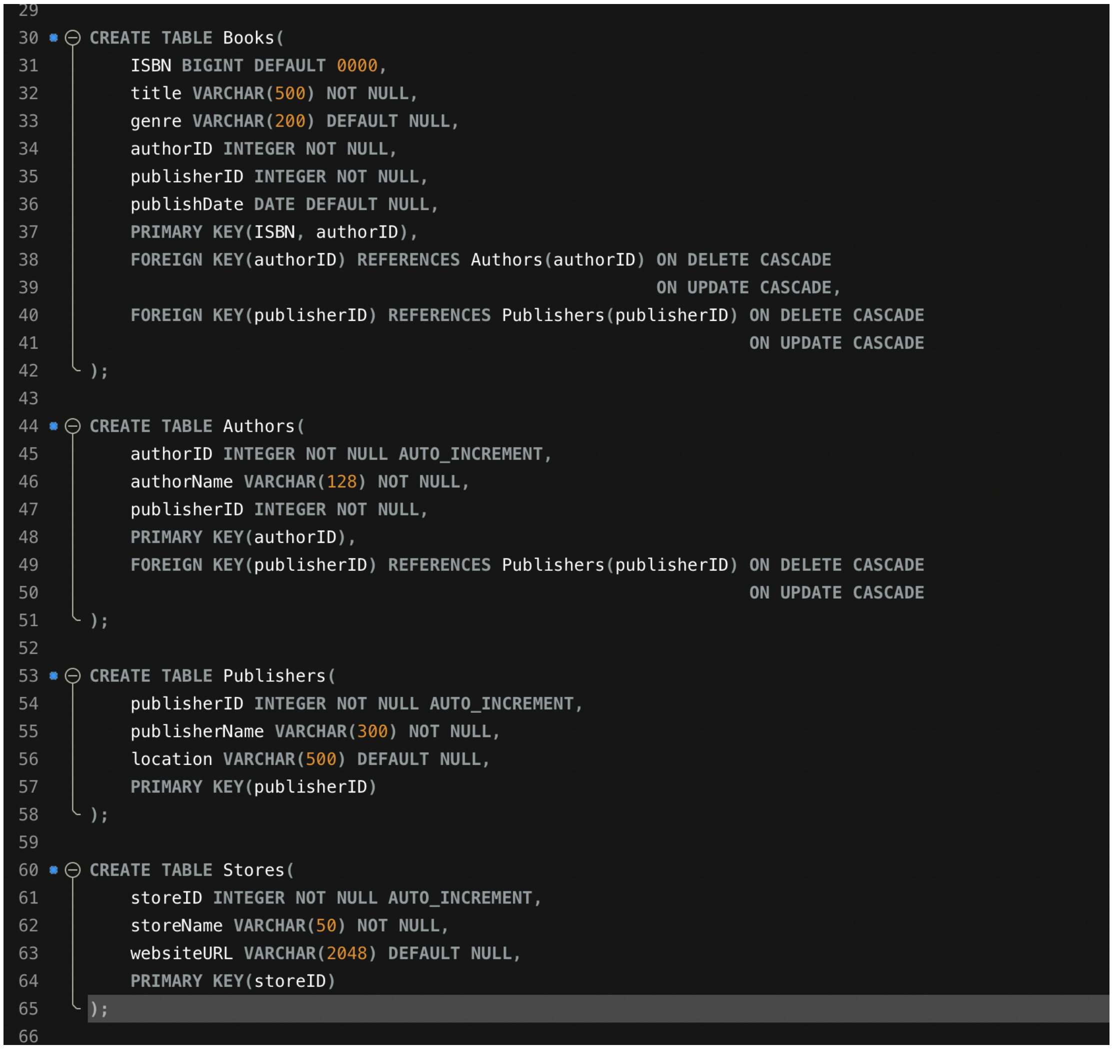
Screenshot of mySQL Database Creation



```sql
CREATE DATABASE BookTracker;
USE BookTracker;

CREATE TABLE Users(
    userID INTEGER NOT NULL AUTO_INCREMENT,
    fullName VARCHAR(128) NOT NULL,
    age INTEGER,
    username VARCHAR(20) NOT NULL,
    email VARCHAR(320) NOT NULL,
    userPassword VARCHAR(20) NOT NULL,
    dateOfBirth DATE,
    PRIMARY KEY(userID)
);

CREATE TABLE Reading(
    userID INTEGER NOT NULL,
    ISBN BIGINT DEFAULT 0000,
    authorID INTEGER NOT NULL,
    bookStatus VARCHAR(40) DEFAULT NULL,
    rating REAL DEFAULT NULL,
    PRIMARY KEY(userID, ISBN, authorID),
    FOREIGN KEY(userID) REFERENCES Users(userID) ON DELETE CASCADE
                                                 ON UPDATE CASCADE,
    FOREIGN KEY(ISBN) REFERENCES Books(ISBN) ON DELETE CASCADE
                                             ON UPDATE CASCADE,
    FOREIGN KEY(authorID) REFERENCES Authors(authorID) ON DELETE CASCADE
                                                       ON UPDATE CASCADE
);
```

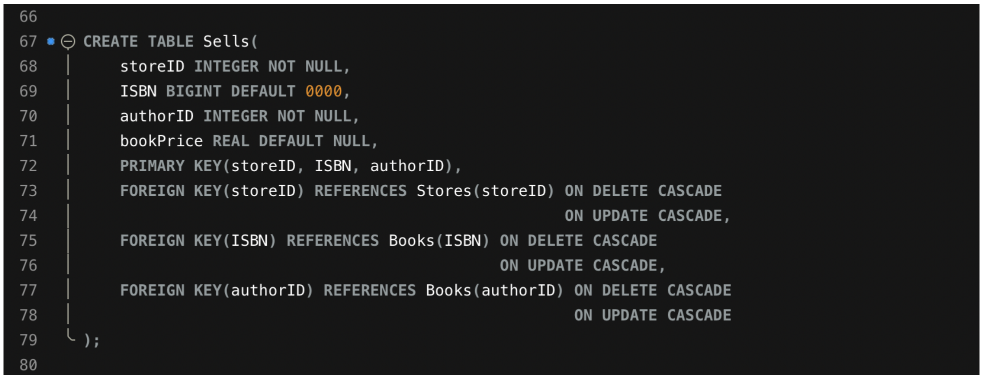


```sql
CREATE TABLE Books(
    ISBN BIGINT DEFAULT 0000,
    title VARCHAR(500) NOT NULL,
    genre VARCHAR(200) DEFAULT NULL,
    authorID INTEGER NOT NULL,
    publisherID INTEGER NOT NULL,
    publishDate DATE DEFAULT NULL,
    PRIMARY KEY(ISBN, authorID),
    FOREIGN KEY(authorID) REFERENCES Authors(authorID) ON DELETE CASCADE
                                                       ON UPDATE CASCADE,
    FOREIGN KEY(publisherID) REFERENCES Publishers(publisherID) ON DELETE CASCADE
                                                                ON UPDATE CASCADE
);

CREATE TABLE Authors(
    authorID INTEGER NOT NULL AUTO_INCREMENT,
    authorName VARCHAR(128) NOT NULL,
    publisherID INTEGER NOT NULL,
    PRIMARY KEY(authorID),
    FOREIGN KEY(publisherID) REFERENCES Publishers(publisherID) ON DELETE CASCADE
                                                                ON UPDATE CASCADE
);

CREATE TABLE Publishers(
    publisherID INTEGER NOT NULL AUTO_INCREMENT,
    publisherName VARCHAR(300) NOT NULL,
    location VARCHAR(500) DEFAULT NULL,
    PRIMARY KEY(publisherID)
);

CREATE TABLE Stores(
    storeID INTEGER NOT NULL AUTO_INCREMENT,
    storeName VARCHAR(50) NOT NULL,
    websiteURL VARCHAR(2048) DEFAULT NULL,
    PRIMARY KEY(storeID)
);
```



```sql
CREATE TABLE Sells(
    storeID INTEGER NOT NULL,
    ISBN BIGINT DEFAULT 0000,
    authorID INTEGER NOT NULL,
    bookPrice REAL DEFAULT NULL,
    PRIMARY KEY(storeID, ISBN, authorID),
    FOREIGN KEY(storeID) REFERENCES Stores(storeID) ON DELETE CASCADE
                                                    ON UPDATE CASCADE,
    FOREIGN KEY(ISBN) REFERENCES Books(ISBN) ON DELETE CASCADE
                                             ON UPDATE CASCADE,
    FOREIGN KEY(authorID) REFERENCES Books(authorID) ON DELETE CASCADE
                                                     ON UPDATE CASCADE
);
```