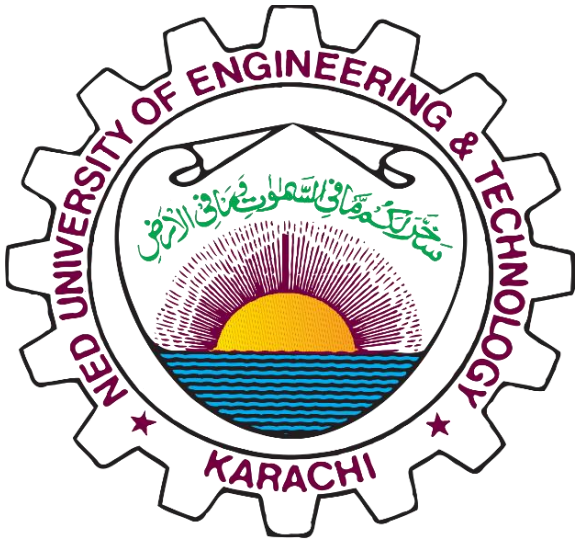


BATCH 2020-21

NAME	**ABDUL RAFFAY**
ROLL #	**CS-094**
CLASS/SEC	**S.E - C**
COURSE NAME	**DATA STRUCTURES AND ALGORITHMS**
COURSE CODE	**CS-218**
SUBMITTED TO	**MS IBSHAR ISHRAT**

DEPARTMENT OF COMPUTER & INFO SYSTEMS ENGINEERING

NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY

PREFACE.

This report describes all the core features of the project, the implementation analysis of the project, code snippets of the key features of the app, snapshots of the test runs of the app.

TABLE OF CONTENTS.

- OVERVIEW OF THE PROJECT:

. PROBLEM STATEMENT:-

Implement a library management system having the following functionalities:

• Add/Remove/Edit book: To add, remove or modify a book or book item.

• Search catalogue: To search books by title, author, subject or publication date.

• Register new account/cancel membership: To add a new member or cancel the membership of an existing member.

• Check-out book: To borrow a book from the library.

• Reserve book: To reserve a book which is not currently available.

• Renew a book: To reborrow an already checked-out book.

• Return a book: To return a book to the library which was issued to a member

. INTRODUCTION OF THE PROJECT:-

This project has been built in order to solve the above problem statement. It has been built purely with Python Programming Language which is a high level language and known widely because of its diversity. In this Library Management System, there are two entities which are The Admin and The User.

The Admin or Librarian has the following options, he/she can:

1. Add a Book.
2. Remove a Book.
3. Update a Book.
4. Delete a Book.
5. See All the Books.
6. Search a Book by its Name, Author, Subject and Publication Date.
7. Sort the Books in an Alphabetical Order.
8. See All the Registered Users.
9. Cancel Membership or Delete Account of a User.

The User or Layman has the following options, he/she can:

1. See All the Books in the Library.
2. Borrow a Book.

3. See Borrowed Books.
4. Reserve a non-available Book.
5. See Reserved Books.
6. Search a Book by its Name, Author, Subject and Publication Date.
7. Return Back a Borrowed Book.
8. Renew an Already Borrowed Book.
9. Delete his/her account.

- IMPLEMENTATION ANALYSIS:

This software is completely built with Python. The whole software has been coded by following the Object Oriented Programming Paradigm in Python.

. Classes Description:

In this software, there are four classes:

1. **Class User** which deals with all of the Stuff Related to User Credentials and Authentication.
2. **Class Book** which deals with all of the stuff related to the Books in the Library.
3. **Class Algorithm** which deals all the Algorithms used in the development.
4. **Class Main** which controls the whole flow of the Application. It will have objects from the classes **Book, User, and Algorithm** in order to utilize their methods.

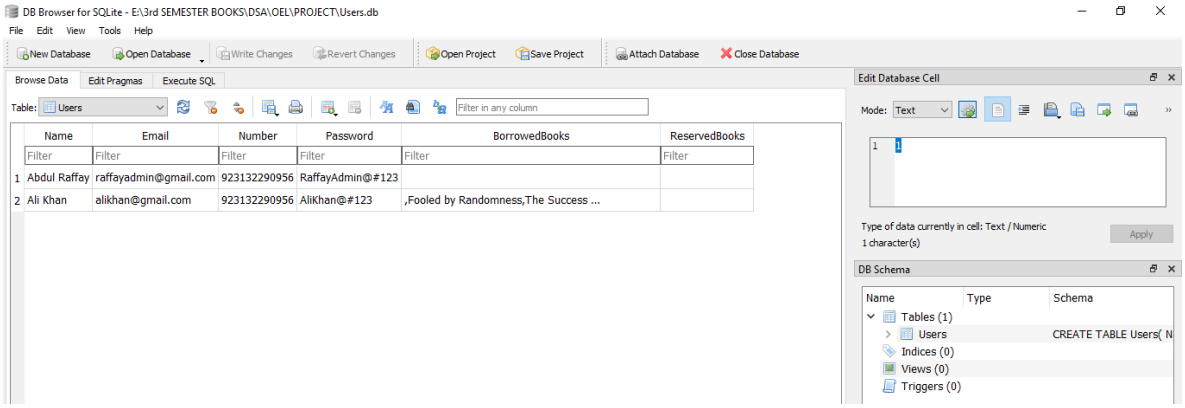
. Database Tables Description:

All the data handling like the CRUD (Create, Read, Update, Delete) Operations has been implemented using **sqlite3** Database in python. Mainly there are two tables as follows:

1. Table 1: **User.db** which saves all the Credentials of the user and lists of books which he or she has borrowed or reserved.
2. Table 2: **Books.db** which saves all the information of a book like the title, author name, quantity, price, subject, publication date

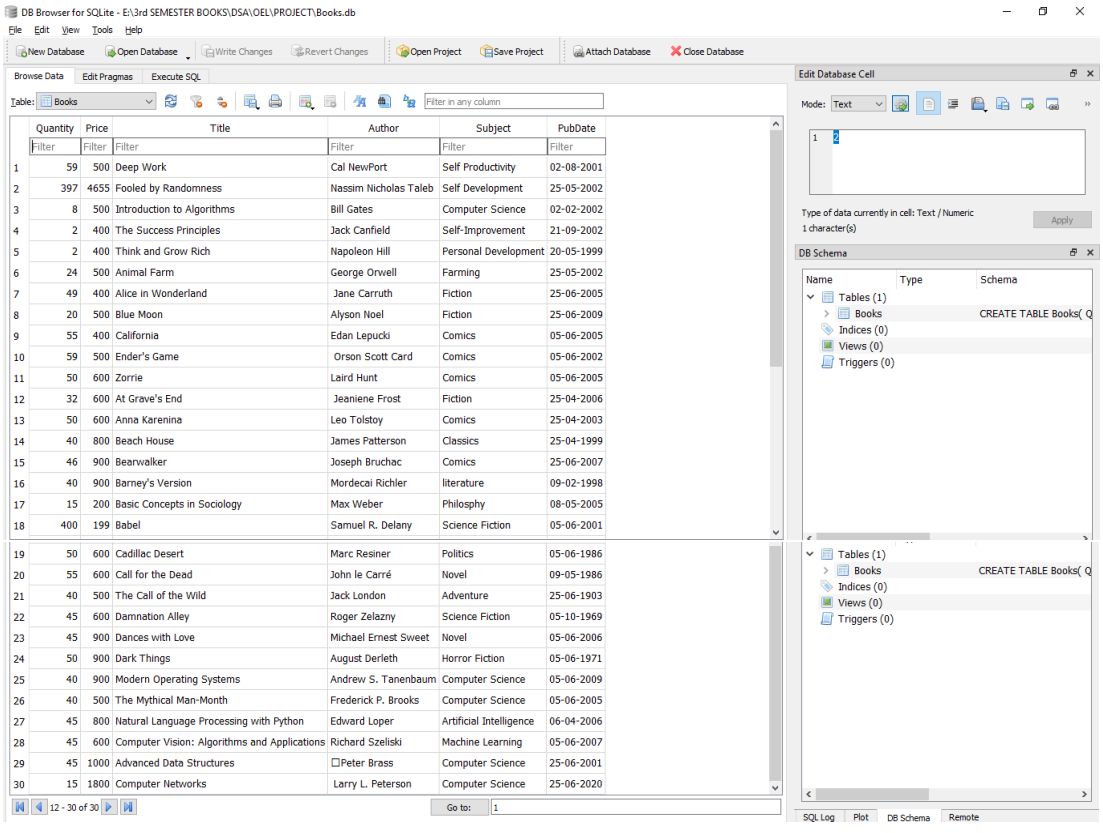
Below are attached the screenshots of the Tables **Users.db** and **Books.db.**

1. Users.db:



Currently there are two users in the Table **Users.db**. The very first record is the admin account and afterwards there are the users accounts.

2. Books.db:



Currently there are 30 books in the Table **Books.db** each book having the following fields:

1. Quantity.
2. Price.
3. Title.
4. Author Name.
5. Subject.
6. Publication Date.

. Application of Sorting Algorithm to Sort the list of Books:-

In this program, list of books has been sorted in an alphabetical order by an algorithm known as **"Merge Sort".** I have used merge sort rather than bubble sort or quick sort because of the following complexity analysis of the three sorting algorithms:

Algorithm	**Big O Complexity in Best Case.**	**Big O Complexity in Average Case.**	**Big O Complexity in Worst Case.**
1. Merge Sort	O(**nlog(n)**)	O(**nlog(n)**)	O(**nlog(n)**)
2. Quick Sort	O(**nlog(n)**)	O(**nlog(n)**)	O($\mathbf{n^2}$)
3. Bubble Sort	O($\mathbf{n^2}$)	O($\mathbf{n^2}$)	O(**n**)

As can seen from the table above merge sort is the most efficient algorithm for sorting than the other two sorting algorithms because it has a big O Complexity of **O(nlog(n))** in all the three cases that are the best, average and worst case. Below are attached the screenshots of the sorting algorithm that has been implemented in the software and the results after the application of the merge sort. In the code merge sort algorithm has been implemented inside the **Class Algorithm.**

. Merge Sort Algorithm:

. Output:


File Edit Selection View Go Run Terminal Help
main.py - PROJECT - Visual Studio Code
EXPLORER
PROJECT
__pycache__
~$L_REPORT... U
Books.db M
main.py M
OEL_REPORT... U
README.md
Users.db M
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
powershell
Python
The Unsorted Books:
1- Deep Work By ('Cal NewPort')
2- Fooled By Randomness By ('Nassim Nicholas Taleb')
3- Introduction To Algorithms By ('Bill Gates')
4- The Success Principles By ('Jack Canfield')
5- Think And Grow Rich By ('Napoleon Hill')
6- Animal Farm By ('George Orwell')
7- Alice In Wonderland By (' Jane Carruth')
8- Blue Moon By ('Alyson Noel')
9- California By ('Edan Lepucki')
10- Ender'S Game By (' Orson Scott Card')
11- Zorrie By ('Laird Hunt')
12- At Grave'S End By (' Jeaniene Frost')
13- Anna Karenina By ('Leo Tolstoy')
14- Beach House By ('James Patterson')
15- Bearwalker By ('Joseph Bruchac')
16- Barney'S Version By ('Mordecai Richler')
17- Basic Concepts In Sociology By ('Max Weber')
18- Babel By ('Samuel R. Delany')
19- Cadillac Desert By ('Marc Resiner')
20- Call For The Dead By ('John le Carré')
21- The Call Of The Wild By ('Jack London')
22- Damnation Alley By ('Roger Zelazny')
23- Dances With Love By ('Michael Ernest Sweet')
24- Dark Things By ('August Derleth')
25- Modern Operating Systems By ('Andrew S. Tanenbaum')
26- The Mythical Man-Month By ('Frederick P. Brooks')
27- Natural Language Processing With Python By ('Edward Loper')
28- Computer Vision: Algorithms And Applications By ('Richard Szeliski')
29- Advanced Data Structures By ('Peter Brass')
30- Computer Networks By (' Larry L. Peterson')


File Edit Selection View Go Run Terminal Help
main.py - PROJECT - Visual Studio Code
EXPLORER
PROJECT
__pycache__
~$L_REPORT... U
Books.db M
main.py M
OEL_REPORT... U
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PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
powershell
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The Sorted Books:
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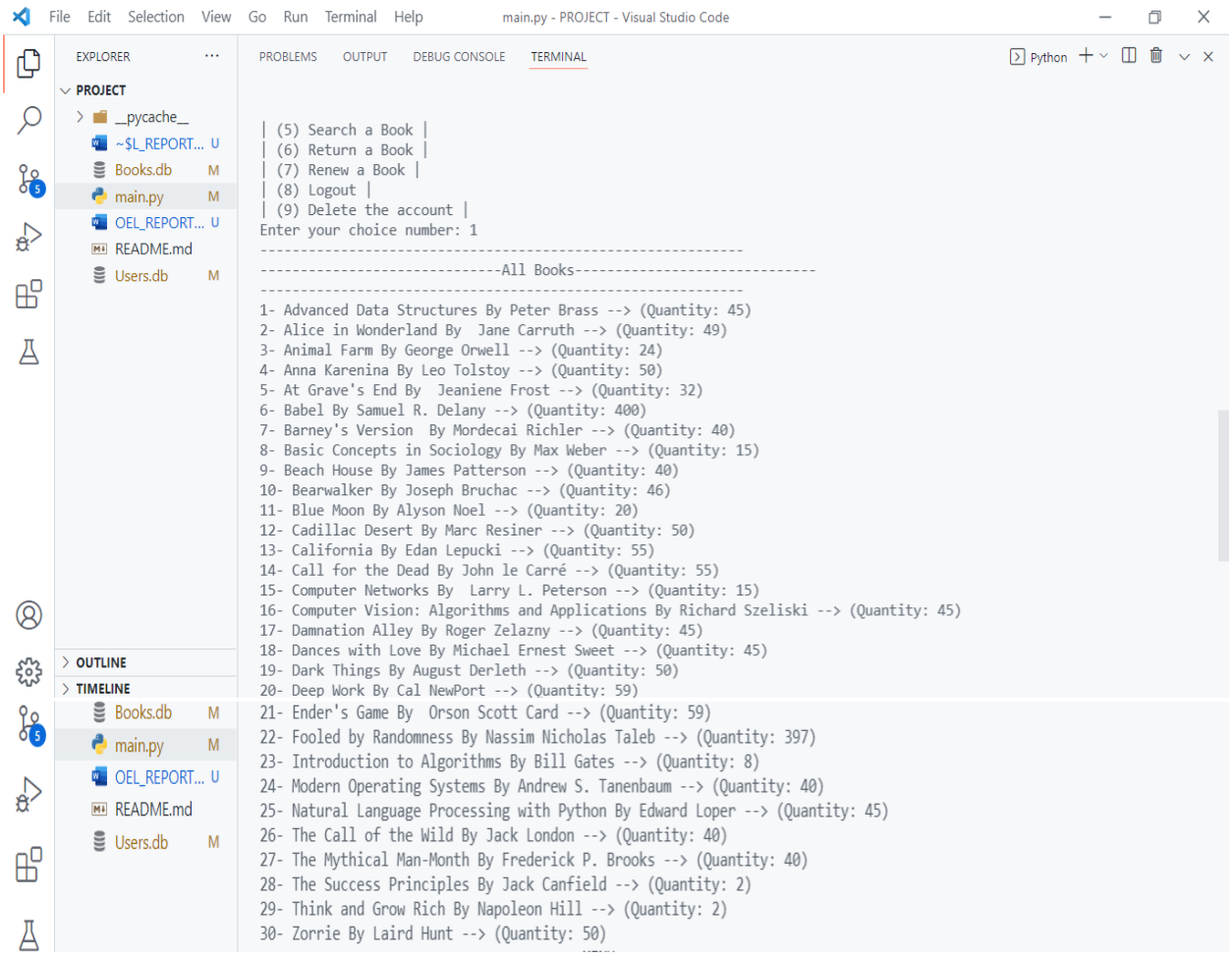
5- At Grave'S End By (' Jeaniene Frost')
6- Babel By ('Samuel R. Delany')
7- Barney'S Version By ('Mordecai Richler')
8- Basic Concepts In Sociology By ('Max Weber')
9- Beach House By ('James Patterson')
10- Bearwalker By ('Joseph Bruchac')
11- Blue Moon By ('Alyson Noel')
12- Cadillac Desert By ('Marc Resiner')
13- California By ('Edan Lepucki')
14- Call For The Dead By ('John le Carré')
15- Computer Networks By (' Larry L. Peterson')
16- Computer Vision: Algorithms And Applications By ('Richard Szeliski')
17- Damnation Alley By ('Roger Zelazny')
18- Dances With Love By ('Michael Ernest Sweet')
19- Dark Things By ('August Derleth')
20- Deep Work By ('Cal NewPort')
21- Ender'S Game By (' Orson Scott Card')
22- Fooled By Randomness By ('Nassim Nicholas Taleb')
23- Introduction To Algorithms By ('Bill Gates')
24- Modern Operating Systems By ('Andrew S. Tanenbaum')
25- Natural Language Processing With Python By ('Edward Loper')
26- The Call Of The Wild By ('Jack London')
27- The Mythical Man-Month By ('Frederick P. Brooks')
28- The Success Principles By ('Jack Canfield')
29- Think And Grow Rich By ('Napoleon Hill')
30- Zorrie By ('Laird Hunt')

. Functionality of Borrow and Reserve Book for the user:-

When the user borrow any book from the library then that book is added to his or her **BorrowedBooks** list and when the user returns that book to the library again then that book is removed from the User's **BorrowedBooks** list and has been added to the records of the library. When any book is currently not available and if the user makes an attempt to borrow that book then the user will be asked to add that non-available book to his or her **ReservedBooks** list so that as soon as the admin or librarian adds that book, the book will automatically been added to the user's **BorrowedBooks** list.

. Functionality of Showing all the Books:-

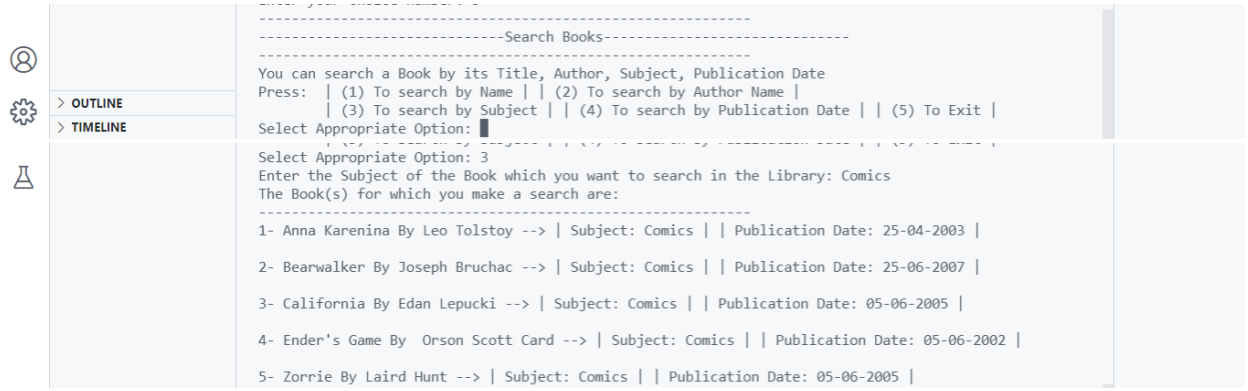
User can see all the books of the libraray, below are attached the screen shots of it:

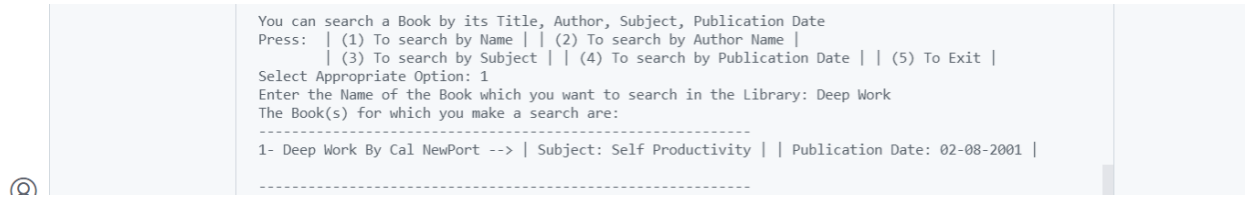


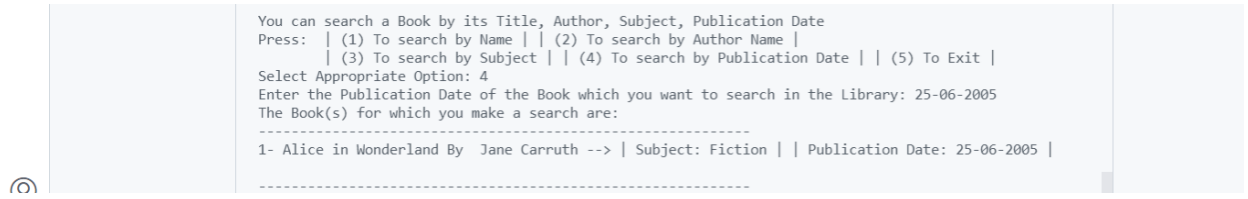
- Searching Mechanism Snapshots:

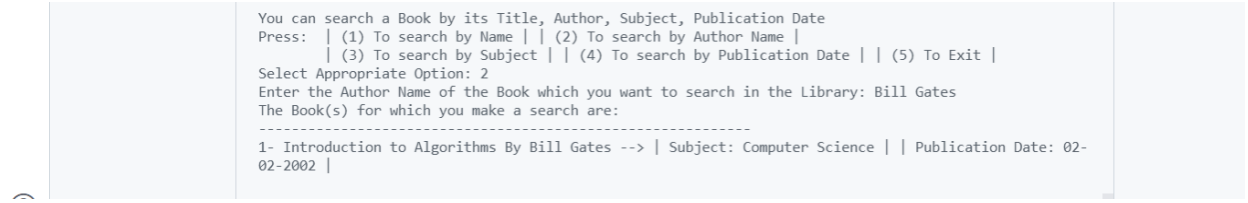
Below are attached the searching mechanisms screenshots for successful and unsuccessful searches:

. Successful Searches:









```
You can search a Book by its Title, Author, Subject, Publication Date
Press:  | (1) To search by Name | | (2) To search by Author Name |
        | (3) To search by Subject | | (4) To search by Publication Date | | (5) To Exit |
Select Appropriate Option: 3
Enter the Subject of the Book which you want to search in the Library: Horror Fiction
The Book(s) for which you make a search are:
------------------------------------------------------------
1- Dark Things By August Derleth --> | Subject: Horror Fiction | | Publication Date: 05-06-1971 |
```

. Unsuccessful Searches:

```
You can search a Book by its Title, Author, Subject, Publication Date
Press:  | (1) To search by Name | | (2) To search by Author Name |
        | (3) To search by Subject | | (4) To search by Publication Date | | (5) To Exit |
Select Appropriate Option: 1
Enter the Name of the Book which you want to search in the Library: Atomic Habbits

------------------------------------------------------------
Sorry This Book with Title "Atomic Habbits" is Not Available
------------------------------------------------------------
```

```
You can search a Book by its Title, Author, Subject, Publication Date
Press:  | (1) To search by Name | | (2) To search by Author Name |
        | (3) To search by Subject | | (4) To search by Publication Date | | (5) To Exit |
Select Appropriate Option: 2
Enter the Author Name of the Book which you want to search in the Library: James Clear

------------------------------------------------------------
Sorry This Book with Author Name "James Clear" is Not Available
------------------------------------------------------------
```

```
You can search a Book by its Title, Author, Subject, Publication Date
Press:  | (1) To search by Name | | (2) To search by Author Name |
        | (3) To search by Subject | | (4) To search by Publication Date | | (5) To Exit |
Select Appropriate Option: 4
Enter the Publication Date of the Book which you want to search in the Library: 05-06-1999

------------------------------------------------------------
Sorry This Book with the Publication Date "05-06-1999" is Not Available
------------------------------------------------------------
```

```
------------------------------------------------------------
You can search a Book by its Title, Author, Subject, Publication Date
Press:  | (1) To search by Name | | (2) To search by Author Name |
        | (3) To search by Subject | | (4) To search by Publication Date | | (5) To Exit |
Select Appropriate Option: 3
Enter the Subject of the Book which you want to search in the Library: Funny Comics

------------------------------------------------------------
Sorry This Book with the Subject "Funny Comics" is Not Available
------------------------------------------------------------
```

```
------------------------------------------------------------
You can search a Book by its Title, Author, Subject, Publication Date
Press:  | (1) To search by Name | | (2) To search by Author Name |
        | (3) To search by Subject | | (4) To search by Publication Date | | (5) To Exit |
Select Appropriate Option: 1
Enter the Name of the Book which you want to search in the Library: Grooky Algorithms

------------------------------------------------------------
Sorry This Book with Title "Grooky Algorithms" is Not Available
------------------------------------------------------------
```

- A Guide to use the Application:-

In order to use the application just download the **main.py, Users.db, and Books.db** all three files in one directory and run the **main.py** file. To login as an admin enter the credentials given below:

1- Email: raffayadmin@gmail.com
2- Password: RaffayAdmin@#123

To login as a user you can just signup by creating a new account or can enter these credentials of an already user made account:

1. Email: alikhan@gmail.com
2. Password: AliKhan@#123