

# Project Title: Binary Tree Based Search and Recommendation System

In this project you are asked to implement a binary tree data structure in C++ to build a simple search and recommendation system for a library of books. Each node in the binary tree will represent a book, containing attributes such as title, author, and genre. You are asked to create functionalities to search for books based on different criteria and retrieve book recommendations by traversing the binary tree based on user preferences.

## 1 Objectives

- Develop an understanding of binary tree operations including insertion, searching, and traversal.
- Implement functions to search for books based on title, author, and genre.
- Create a recommendation algorithm based on user-defined literary preferences using tree traversal techniques.
- Practice dynamic memory management in C++ with proper implementation of data structures.

## 2 Deliverables

### 1. C++ Source Code:

- A C++ program that implements a binary tree for a book collection.
- Functions for inserting new books, searching for books, and generating recommendations based on user queries.

### 2. Sample Input and Output:

- A demonstration of the system's functionality through a set of user commands.
- Detailed output representing the results of the operations performed.

### 3. Test Cases:

- A collection of test cases illustrating the program's response to various queries and edge cases (e.g., searching for a non-existing book or recommending books when no matches are found).

## 3 Sample Input

The following is an example of the sequence of commands a user might input during a session:

```
Add Book: "The Great Gatsby", "F. Scott Fitzgerald", "Fiction"
Add Book: "1984", "George Orwell", "Dystopian"
Add Book: "To Kill a Mockingbird", "Harper Lee", "Fiction"
Search by Title: "1984"
Search by Author: "Harper Lee"
Recommend Books by Genre: "Fiction"
Display All Books
```

## 4 Output Example

### Console Output After Running the Program:

Welcome to the Library Search and Recommendation System

1. Adding book: "The Great Gatsby", "F. Scott Fitzgerald", "Fiction"  
Book added successfully.
2. Adding book: "1984", "George Orwell", "Dystopian"  
Book added successfully.
3. Adding book: "To Kill a Mockingbird", "Harper Lee", "Fiction"  
Book added successfully.
4. Searching for: Title "1984"  
Found: "1984" by George Orwell
5. Searching for: Author "Harper Lee"  
Found: "To Kill a Mockingbird" by Harper Lee
6. Recommending books in the genre "Fiction":  
Recommendations:
  - "The Great Gatsby" by F. Scott Fitzgerald
  - "To Kill a Mockingbird" by Harper Lee
7. Displaying all books:
  - "The Great Gatsby" by F. Scott Fitzgerald (Genre: Fiction)
  - "1984" by George Orwell (Genre: Dystopian)
  - "To Kill a Mockingbird" by Harper Lee (Genre: Fiction)

## Project Guidelines, Submission Details, and Plagiarism Warning

Please submit your project solution on Gradescope as a single C++ file, titled project3.cpp, by the deadline listed on Gradescope.

We encourage you to solve this project on your own! It's a great opportunity to showcase your unique ideas. Please remember that collaboration or copying isn't allowed. To ensure fairness, we'll be checking all submissions for originality. Let's all strive for our best work individually, and remember that any instances of plagiarism will be addressed according to the course syllabus.

We want to support your creativity, so please complete this project using your own ideas and solutions! While you can research to inspire your work, we ask that you refrain from using internet resources or tools like AI, including ChatGPT, to ensure your submission is truly yours. We'll be checking for similarities in both code content and logic, and simply changing code order or variable names won't make a difference. Additionally, please keep your project details private and avoid sharing them online, as the project content isn't in the public domain.

Feel free to use our course resources, such as lecture notes and our text books, during the solving of this project. If you have questions about this project, please come to my office hours.