

AI - Content Recommendation Integrated with Library Management System

Dr. Bikramjit Sarkar, HOD, Dept. of CSE, JIS College of Engineering Kalyani, WB, India.

Mr. Kaushik Roy Choudhury, Asst. Professor, JIS College of Engineering, Kalyani, Nadia, WB, India.

Ritu Raj, UG Student, Dept. of CSE, JIS College of Engineering, Kalyani, Nadia, WB, India.

Saumya Kumari, UG Student, Dept. of CSE, JIS College of Engineering Kalyani, Nadia, WB, India.

Shiv Shankar Shaw, UG Student, Dept. of CSE, JIS College of Engineering Kalyani, Nadia, WB, India.

ABSTRACT:

The content recommendation system integrated with library management system is a comprehensive solution aimed at modernizing and streamlining various aspects of library operations. Users benefit from features like seamless book browsing, requesting, monitoring of issued books and suggestions for next book based on user activity ensuring a user-friendly experience. Concurrently, administrators can efficiently manage the book inventory, add new titles, and oversee user requests, empowering them with robust control over the library's resources. The system's primary goal is to enhance operational efficiency, provide proper recommendation and optimize user satisfaction within the library setting. The Content Recommendation System enhances user experience by incorporating content-based filtering algorithms for personalized book recommendations based on individual preferences. This innovative feature provides book suggestions to each user, creating a more engaging and joyful reading experience. The system further reinforces responsible borrowing behaviour through the introduction of a 10-day return period, emphasizing the importance of timely book returns. Overall, the Content Recommendation System stands out as a valuable tool in promoting user-centricity and operational efficiency within the library setting keeping the user

Keywords- Content Recommendation System, Content Based Filtering Algorithm

I. INTRODUCTION

Our team has developed a content recommendation library management platform utilizing MERN (MongoDB, ExpressJS, ReactJS, NodeJS) technology to revolutionize the book borrowing and lending system. Traditional e-commerce platforms often face challenges related to static content delivery, high server loads, and unoptimized user experiences due to varying device types, network speeds, and user preferences. Our system addresses these inefficiencies by dynamically adapting content in real time, ensuring seamless performance, personalized recommendations, and optimized resource management.

In an age where users are constantly overwhelmed with choices, recommending relevant content becomes essential. Libraries, whether physical or digital, serve as knowledge hubs but often lack intuitive discovery mechanisms. This project aims to bridge that gap by developing a Content Recommendation System that is personalized, scalable, and easy to integrate into existing library infrastructure.

Many traditional library systems rely solely on manual exploration or keyword searches. While functional, they lack the intelligence needed to guide users toward titles they might enjoy but haven't explicitly searched for. Our system not only automates recommendation using artificial intelligence but also ensures it adapts with time, learning from user interactions and improving recommendations progressively.

The performance of our recommendation system was evaluated based on user engagement, page load speeds, conversion rates, and server efficiency. Results indicate a significant improvement in content accessibility, reduced

bounce rates, and enhanced user satisfaction. The platform operates with two main modules: one for users and one for administrators. Users can seamlessly browse and borrow products, while administrators manage product listings, user interactions, and recommendations. Each user's session is tailored to their browsing habits, ensuring a unique and efficient browsing experience.

The system is especially useful in libraries, bookstores, and online reading platforms, offering a seamless user experience across devices. It enhances operational efficiency, reduces the time users spend searching for books, and boosts overall satisfaction by providing meaningful, timely, and personalized recommendations.

II. RESEARCH METHODOLOGY:

Recommendation systems have become a crucial component in modern digital services. From e-commerce to entertainment, platforms like Amazon and Netflix have successfully integrated intelligent recommender engines to boost engagement. In the library domain, similar approaches are underexplored.

Most existing library systems, like Koha, focus on cataloging and inventory management. While Koha does offer basic personalization, it lacks dynamic learning from real-time user activity. Furthermore, open-source tools often struggle with cold-start problems, where new users receive generic suggestions until sufficient interaction data is collected.

Our approach addresses these shortcomings through an advanced content-based filtering algorithm that is responsive to user preferences from the outset. Inspired by both e-commerce systems and academic literature, we incorporate user profiling, behavioral analysis, and real-time feedback loops.

To directly mitigate the cold-start problem, our system prompts users to select preferred genres, authors, and languages during the initial registration process. This initial input forms the basis for the recommendation engine until

sufficient interaction data becomes available. Additionally, to prevent overwhelming the user, the recommendation output is limited to four books per session (configurable to eight), ensuring clarity and focus without decision fatigue. This curated experience encourages meaningful exploration while maintaining a clean, user-friendly interface.

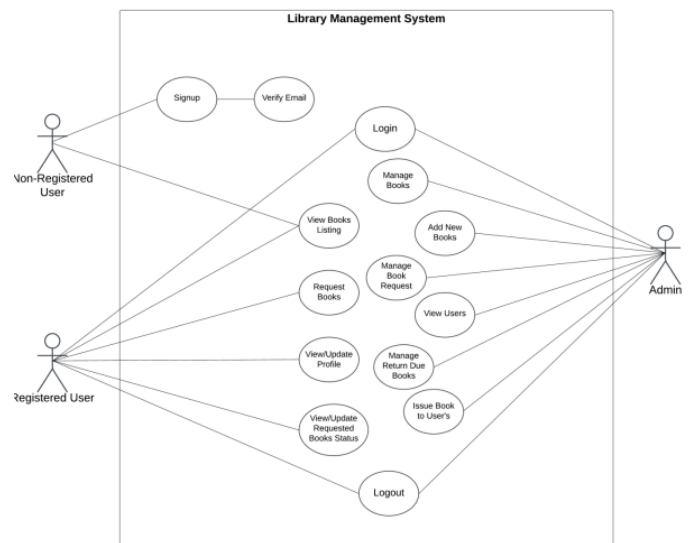


Fig: Workflow Diagram

III. OUTPUT:

Figure 1 depicts the home page of the library management website, featuring, **recommended books from user preference**, books featured by admin, latest books added and popular books. Users can navigate to homepage, books page, about page and profile page from the top navigation bar. The homepage prominently welcomes users to the library management platform and encourages them to borrow books as per their preference.

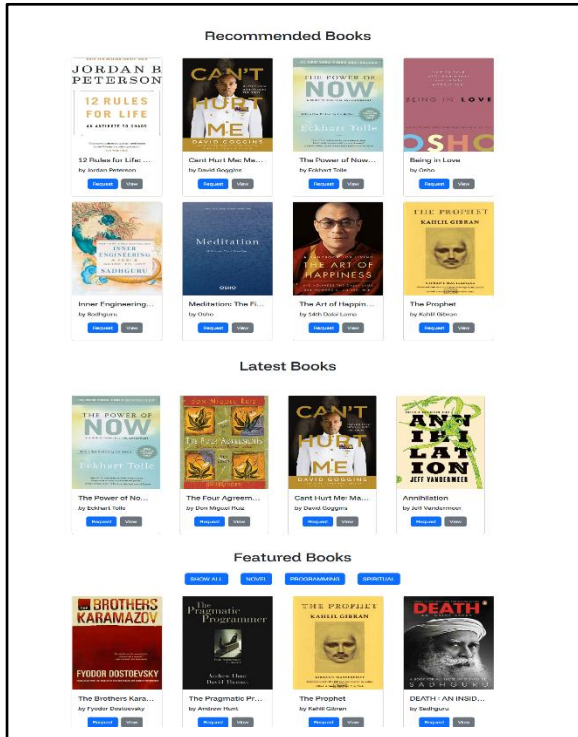


Fig 1. Homepage

Figure 2 showcases the **books** page where the user can find all the collections of books. It has a **popular books** section and **browse** section where users can add **filters** and search their choice of books from the search bar.

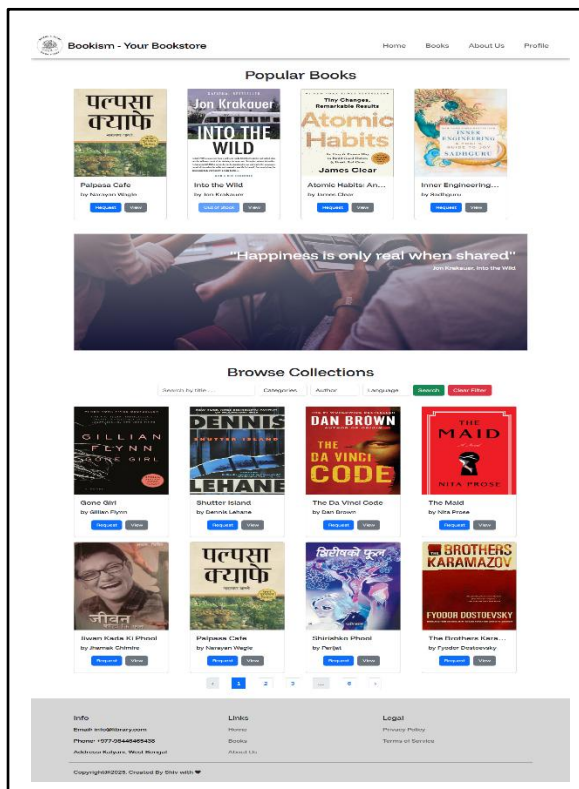


Fig 2. Book page

Figure 3 illustrates the **user profile page**, where registered users can access their borrowed **books** and view other necessary details. The page provides an option to logout of their session and view their details in “my details” page.

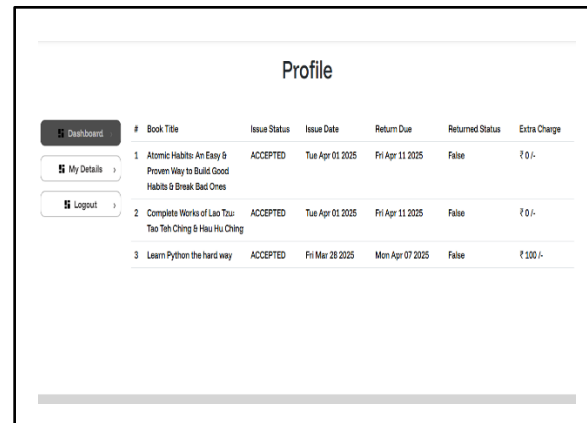


Fig 3. User profile page

Figure 4 displays the recommendation, on the user’s recent searches and interactions. The system analyses past interactions to personalize recommendations, enhancing the experience by presenting items that align with the user’s interests.

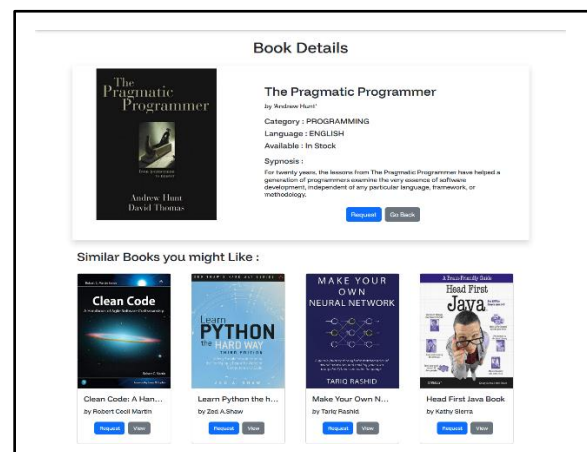


Fig 4. Book details and recommendations

Figure 5 displays the recommendation system, which suggests books based on the user’s recent searches and interactions. The system analyses past interactions to personalize recommendations,

enhancing the experience by presenting items that align with the user's interests.

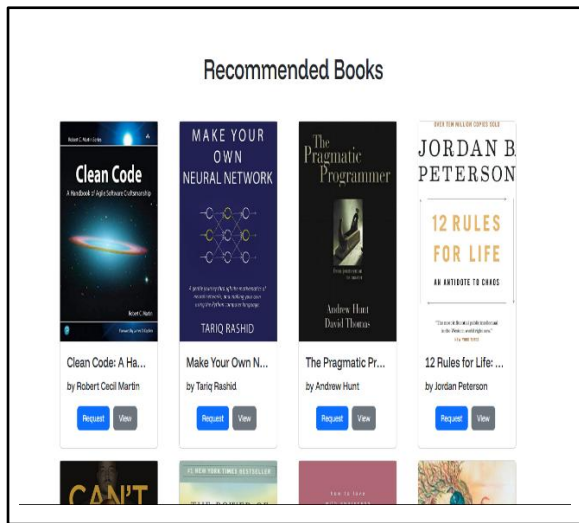


Fig 5. Recommended books

Figure 6 illustrates the admin view of the library management platform, demonstrating the actions allowed by admin. This screen shows some necessary data like no. of registered users, total books, book requests, authors, issued books etc. It has a sidebar for navigation to different pages.

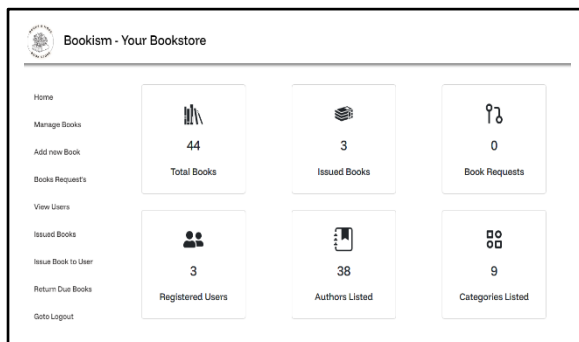


Fig 6. Admin page

Figure 7 displays the page to edit and manage books. With view details admin can view/edit the title, cover image, description, author of any book. Admin can also set any book as featured, latest or popular.

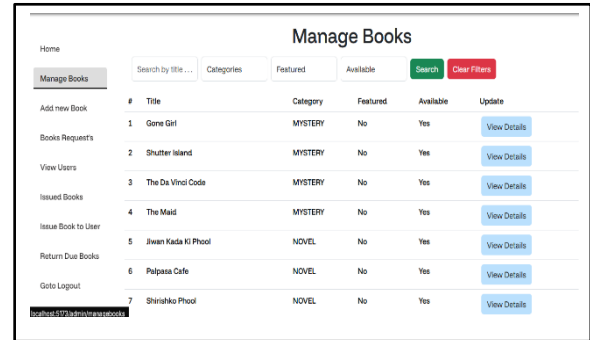


Fig 7. Admin manage books

Figure 8 showcases the admin page to add a new book to the library, here admin can fill all details, add images and set the book as featured.

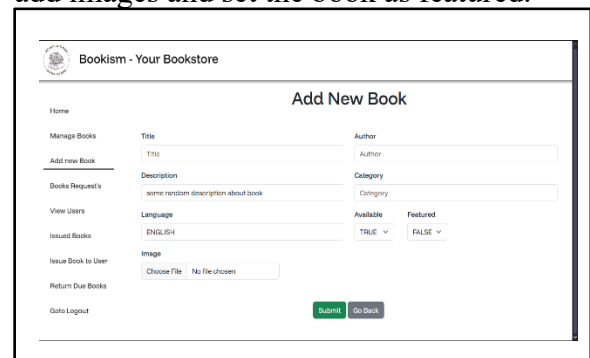


Fig 8. Admin add books

Figure 9 shows the admin page to view all the users who have registered with library management system. Here admin can view the total number of books borrowed by the user and his other details.

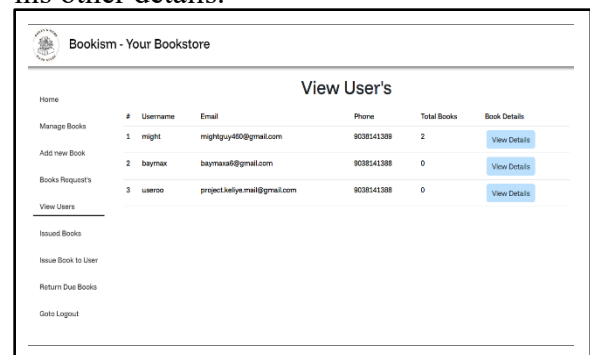


Fig 8. Admin view all users

IV. CONCLUSION AND FUTURE SCOPE:

The development of Library Management and Recommendation System offers a modern, intuitive, and efficient solution to traditional library operations. Built using the MERN stack, the system provides a seamless user interface and leverages artificial intelligence to deliver personalized book recommendations. It automates key functions like inventory management, cataloguing, and user interactions, significantly reducing the manual workload and improving user satisfaction.

One of the system's core strengths lies in its intelligent recommendation engine, which addresses the cold-start problem by collecting user preferences at the time of registration. By understanding a user's preferred genres, authors, and language choices from the outset, the platform delivers meaningful suggestions even in the absence of historical interaction data. As users continue to engage with the system by borrowing books the recommendations dynamically evolve, enhancing relevance and personalization over time.

To ensure users are not overwhelmed, the system deliberately limits the number of recommended books to four (or optionally eight), promoting a focused and enjoyable discovery experience. The recommendations are diversified to prevent repetition and include only books that are currently available.

Several key conclusions can be drawn from this project:

- Automation improves efficiency by streamlining cataloguing, issuing, and inventory management.
- The recommendation system significantly enhances usability compared to traditional static systems.
- Cold-start issues are effectively mitigated through preference-based onboarding.
- Personalized reading experiences encourage greater user engagement and library usage.
- A simplified user interface ensures accessibility for users of all technical backgrounds.

- Scalable architecture and modular components allow for future growth and integration.

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Looking ahead, the system can be expanded with more advanced recommendation strategies such as collaborative filtering, which would allow the algorithm to learn from the behaviour of similar users. Additional features like user reviews, rating systems, and a dedicated mobile application could further elevate the reading experience. Integration with multilingual capabilities and real-time feedback loops will make the system more inclusive and adaptive.

With these enhancements, the Book Recommendation System is poised to become a next-generation solution for modern libraries, promoting not only operational efficiency but also a deeper and more personalized connection between users and books. In library settings. By leveraging MERN stack technologies and an adaptive recommendation engine, the platform personalizes book discovery, addresses the cold-start problem, and simplifies operations for administrators.

Future Enhancements:

- Integration of collaborative filtering alongside content-based logic
- Real-time feedback loop using likes and ratings
- Book rating and review module
- Mobile application integration
- Multilingual support for wider reach

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