“BookNest.In”

Project Report submitted in partial fulfilment of
The requirements for the degree of

BACHELOR OF TECHNOLOGY

In

INFORMATION TECHNOLOGY
Of

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

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Academic year 2021-24

CERTIFICATE

This is to certify that this project report titled **"BookNest.In"** submitted in partial fulfilment of requirements for award of the degree Bachelor of Technology (B. Tech) in INFORMATION TECHNOLOGY of MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY is a faithful record of the original work carried out by,

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DECLARATION

We hereby declare that this project report titled

"BookNest.In"

is our own original work carried out as an undergraduate student in Netaji Subhash Engineering College except to the extent that assistance from other sources are duly acknowledged.

All sources used for this project report have been fully and properly cited. It contains no material which to a substantial extent has been submitted for the award of any degree/diploma in any institute or has been published in any form, except where due acknowledgement is made.

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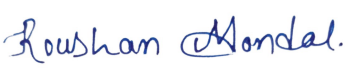
Roushan Mondal		20-May-2024
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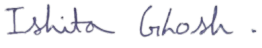
Ishita Ghosh		20-May-2024

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Abstract

"BookNest.In" is an innovative e-commerce platform designed to revolutionise the online book retail market. The project addresses the challenge of bringing traditional offline book sellers into the digital marketplace, offering them tools to manage their inventory effectively. For buyers, we have implemented a Machine Learning (ML) Recommendation System that suggests books based on user-input keywords such as book names. Our solution employs pandas for data handling in the recommendation system and utilises a sleek frontend design crafted with REACT to ensure a seamless user experience. The implementation of our site significantly enhances efficiency, saving both sellers and buyers 90% of their time. Sellers benefit from increased visibility, with a 200% boost in sales, while buyers enjoy the convenience of finding relevant books without visiting multiple stores. This project not only streamlines the cluttered market but also leverages technology to drive significant commercial growth for sellers and improve the overall purchasing experience for buyers.

Keywords: e-commerce, online bookstore, machine learning, recommendation system, inventory management, user experience, sales boost, React, Bootstrap, CSS, JavaScript, Django, Pandas, Python, REST API

CONTENTS

Introduction

"BookNest.In"

Objective: The primary objective of this project is to create an online platform that integrates offline bookstores, enabling them to sell their books online and reach a broader audience.

Motivation and Problem Statement: This project was chosen due to the opportunity it provides to learn and implement various in-demand technologies such as React, Django, Pandas, and Machine Learning. The project addresses the problem of limited reach for offline bookstores, offering them an online platform to expand their customer base and increase sales.

Intended Users and Beneficiaries: The intended users and beneficiaries of this project are:

- **Offline Book Sellers:** They gain a new avenue to sell their books and reach more customers.
- **Buyers:** They benefit from an enhanced user experience and the convenience of purchasing books online, along with personalised book recommendations.

Main Features: The main features of the project include:

- **Book Recommendation System:** Utilising Machine Learning to recommend books to buyers based on their preferences and search keyword.
- **User-Friendly Interface:** A seamless and intuitive website design for both sellers and buyers.
- **Inventory Management:** Tools for book sellers to manage their stock and sales efficiently.

Scope: The scope of this project is to connect as many buyers as possible with our onboarded book sellers, thereby boosting sales and providing a comprehensive online bookstore experience.

Technologies and Frameworks: The project leverages the following technologies and frameworks:

- **Fronted:** REACT, Bootstrap, CSS, JavaScript

System Design and Architecture

Overview of the System Architecture: The system architecture of BookNest.In follows a client-server model. The backend server is built using Django, which handles the core functionalities and data management. The frontend is developed using React, providing a dynamic and responsive user interface. The interaction between the frontend and backend is facilitated through REST API endpoints.

Main Components and Modules:

1. Backend Server (Django):

- **API Endpoints:** Handles requests from the frontend and provides necessary data.
- **Database Management:** Manage the storage, retrieval, and manipulation of book data, user information, and transactions.
- **Machine Learning Model:** Processes data to generate book recommendations for users.

2. Frontend (React):

- **User Interface:** Provides a seamless and intuitive experience for both sellers and buyers.
- **Axios and Fetch:** Utilised for making asynchronous request to the backend API.

3. Data Processing and ML:

- **Pandas and Python:** Used for data processing and implementing the recommendation system.

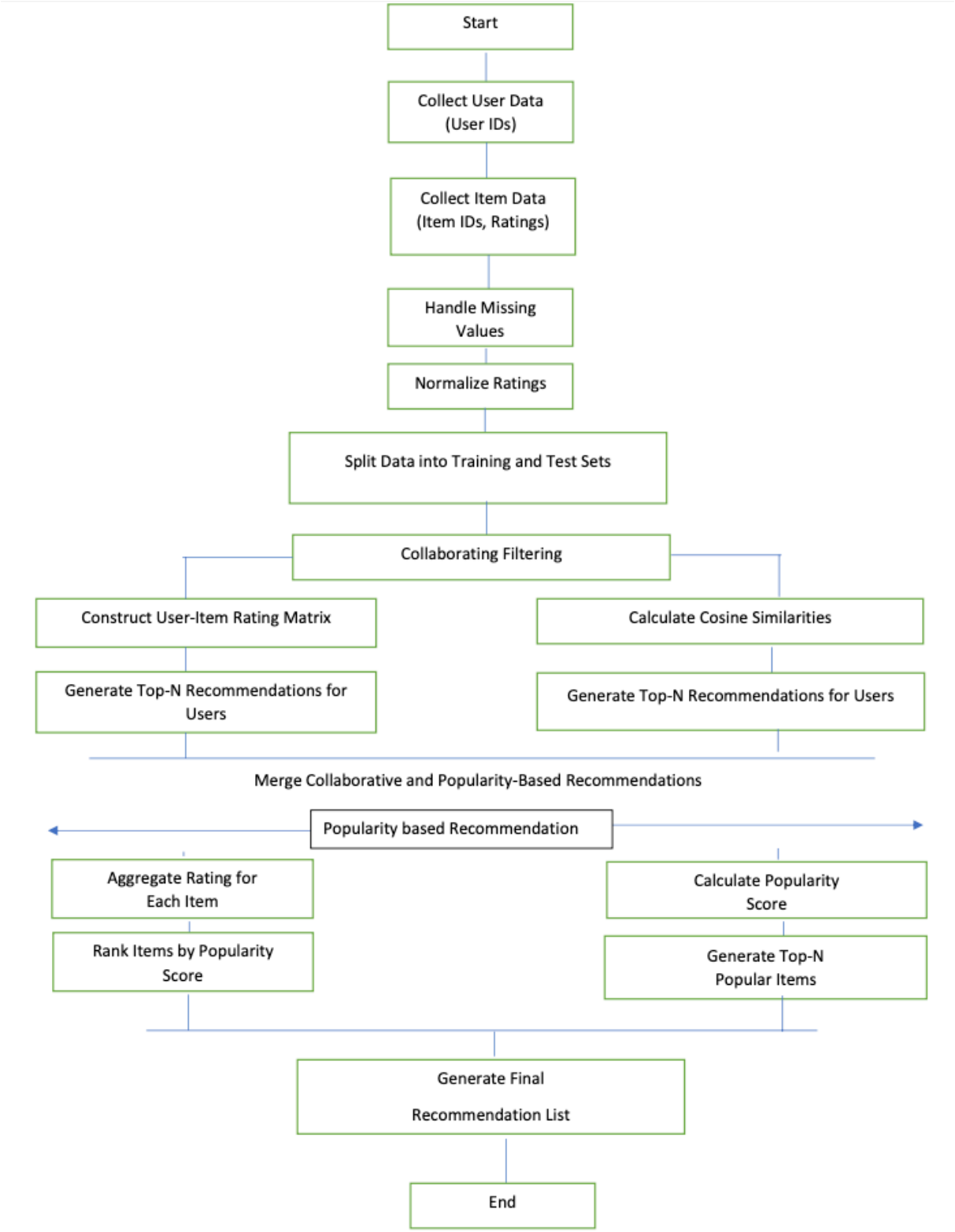
Interaction Between Components: The fronted communicates with backend server through API endpoints. When a user interacts with the website, such as searching for books or making a purchase, REACT components make asynchronous requests using Axios or the Fetch API. The Django Backend processes these requests, interacts with the database if necessary, and return the appropriate responses, The ML model, implemented using Pandas and Python, processes user data to provide personalised book recommendations.

Design Patterns and Principles:

- **RESTful API:** Ensures a stateless communication between the client and server, making the system scalable and easy to maintain.
- **Modular Design:** Each component of system (Eg, User Management, Inventory Management, Recommendation System) is designed as a separate module, promoting reusability and maintainability.
- **Asynchronous Communication:** Utilise async/await patterns in the fronted to handle API calls efficiently, improving the user experience.

Methodologies: The project was developed using the **Agile** methodology, This approach allowed for iterative development, continuous feedback, and adaptation to changing requirements. Regular sprints and stand-up meetings ensured steady progress and timely delivery of features.

Flowchart: Recommendation flowchart.



Implementation

Programming Languages and Frameworks

- **Frontend:** React, HTML, CSS, JavaScript
- **Backend:** Django, Python
- **Data Processing and Machine Learning:** Numpy, Pandas

Core Functionalities: The core functionality of BookNest.In is the Machine Learning-based recommendation system. This system recommends books to users based on their preferences and purchase history. The recommendation system utilises various datasets, such as book ratings and user interactions, to generate personalised recommendations.

Challenges and Solutions: One of the significant challenges faced during implementation was handling large JSON responses from the backend, which led to the browser facing out-of-memory issues on the frontend. To overcome this issue, pagination was implemented. This approach limits the amount of data sent to the frontend at a time, improving performance and user experience.

Code Snippets: Here are some key parts of the implementation:

- **Loading Data for the Recommendation System:**

```
import os
import pandas as pd

# Loading preprocessed data from pickle files
popular_df = pd.read_pickle(open(os.path.join('data',
'popular_df.pkl'), 'rb'))
rating_matrix = pd.read_pickle(open(os.path.join('data',
'rating_matrix.pkl'), 'rb'))
similarity_scores = pd.read_pickle(open(os.path.join('data',
'similarity_scores.pkl'), 'rb'))
books = pd.read_pickle(open(os.path.join('data',
'books.pkl'), 'rb'))

books_df = pd.read_pickle(open(os.path.join('data',
'books.pkl'), `rb'))
```

- **Recommendation Function:**

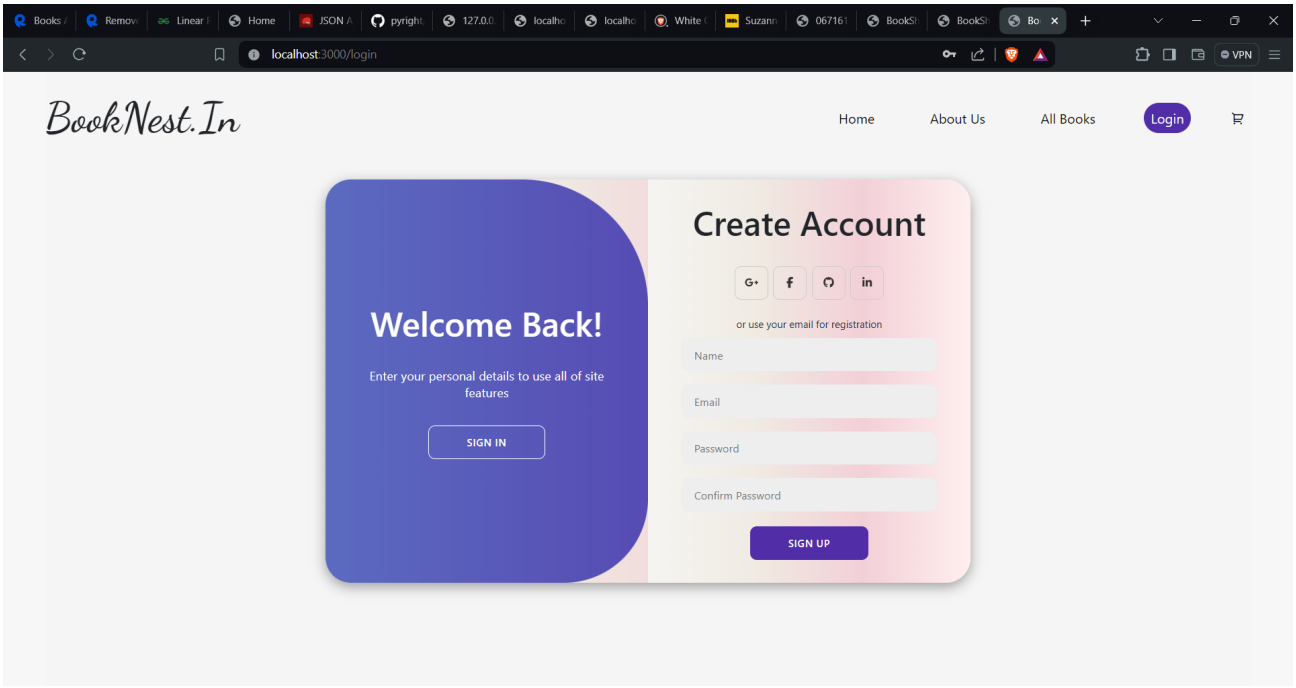
```
def recommend_popular(request, num_recommendations=20):
    try:
        top_books = popular_df.sort_values('avg_rating',
ascending=False).head(num_recommendations)
        recommendations = []
        for nums, row in enumerate(top_books.iterrows()):
            item = {
                'id': nums,
                'title': row['Book-Title'] if 'Book-Title' in
row else 'Not Available',
                'author': row['Book-Author'] if 'Book-Author'
in row else 'Not Available'
            }
            recommendations.append(item)
        return JsonResponse({'recommendations':
recommendations})
    except Exception as e:
        return JsonResponse({'error': str(e)})
```

Ensuring Code Quality and Maintainability

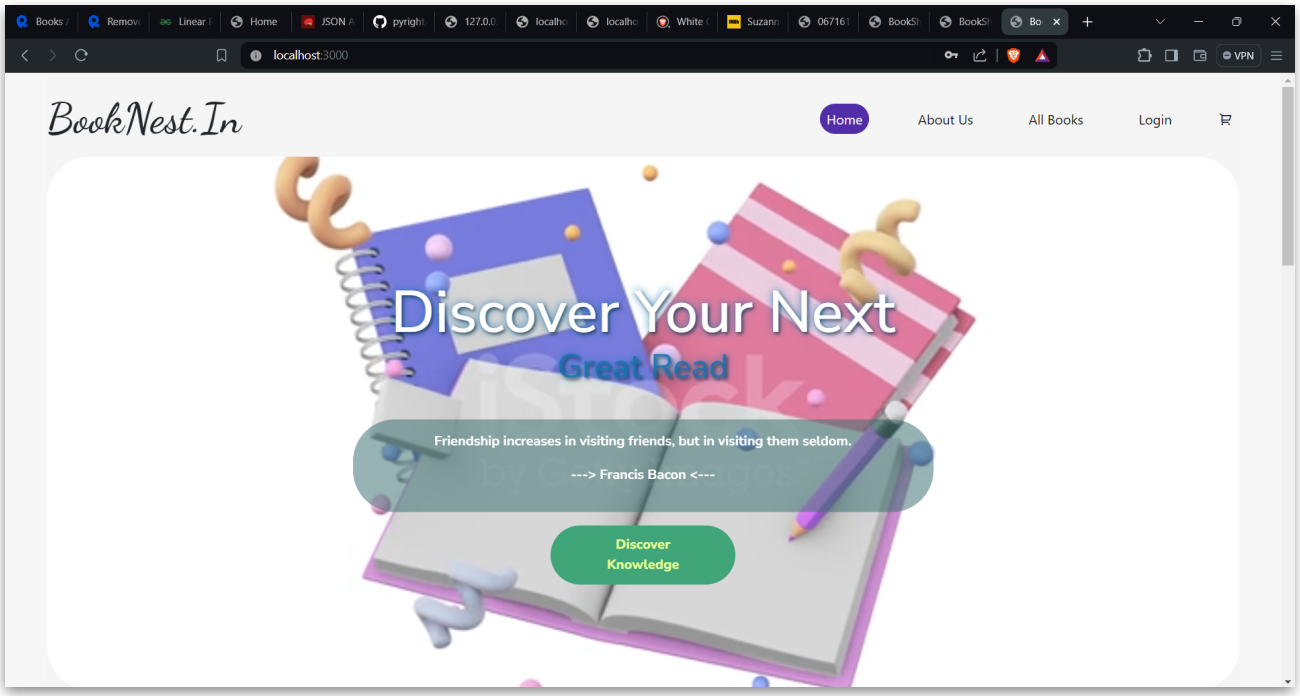
To ensure code quality and maintainability, the following practices were adopted:

- **Version Control:** The project utilised GitHub for version control, enabling collaboration, version tracking, and easy rollback of changes if needed.
- **Code Reviews:** Regular code reviews were conducted to ensure adherence to coding standards and best practices.
- **Modular Code:** The project was structured in a modular way, separating different functionalities into distinct modules, making the codebase easier to manage and extend.
- **Documentation:** Comprehensive documentation was maintained for the code, APIs, and system architecture, aiding in future maintenance and development.

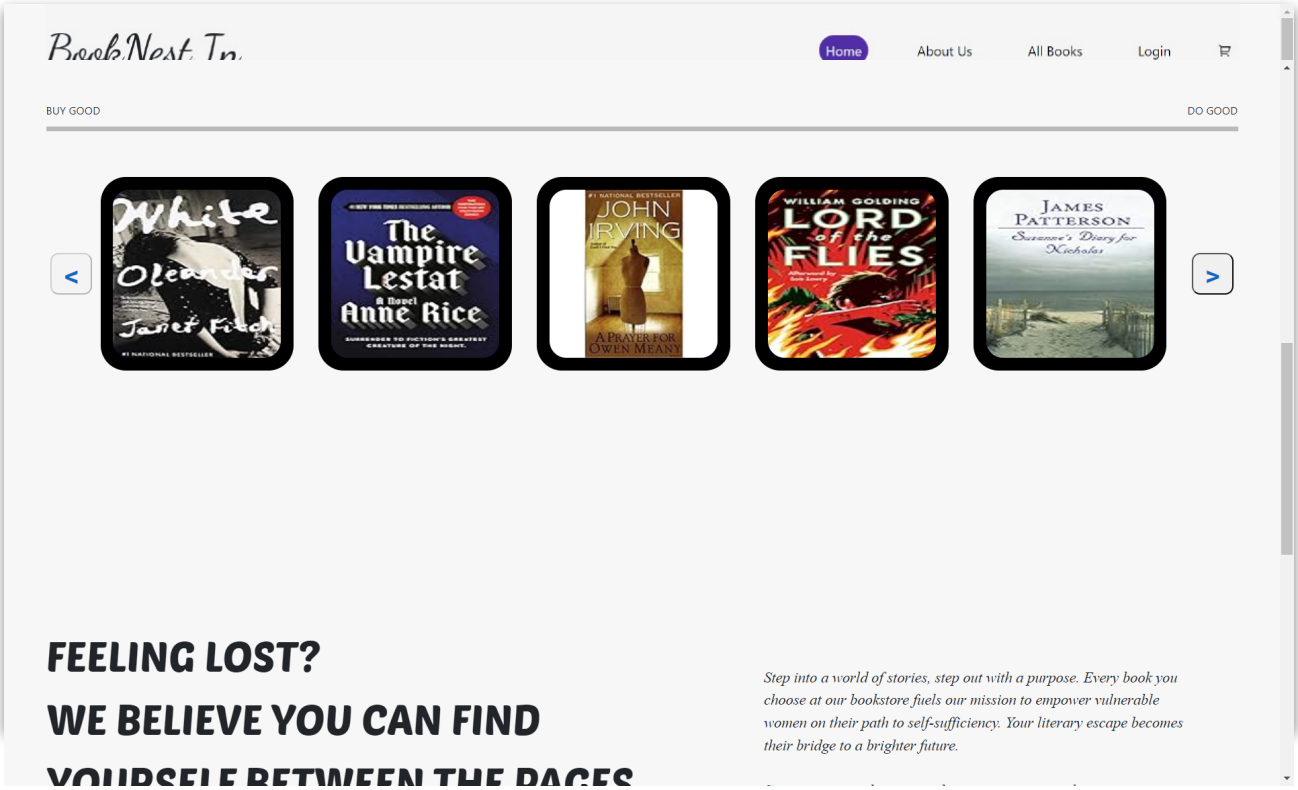
HomePage



- Fig-1: This is our Website HomePage, Where centre of the screen we implemented a fun “Dynamic Quote” generator.

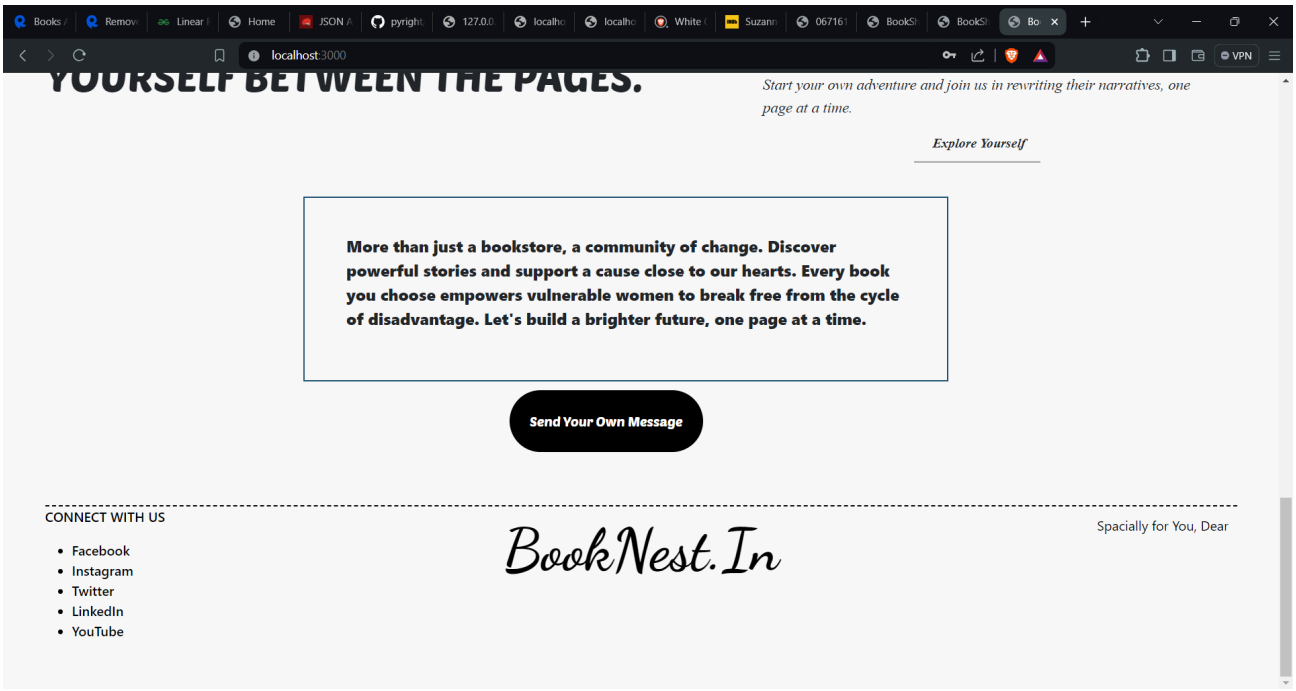


- Fig-2: Clicking “Discover Knowledge” Button will give a outline Text field search feature.

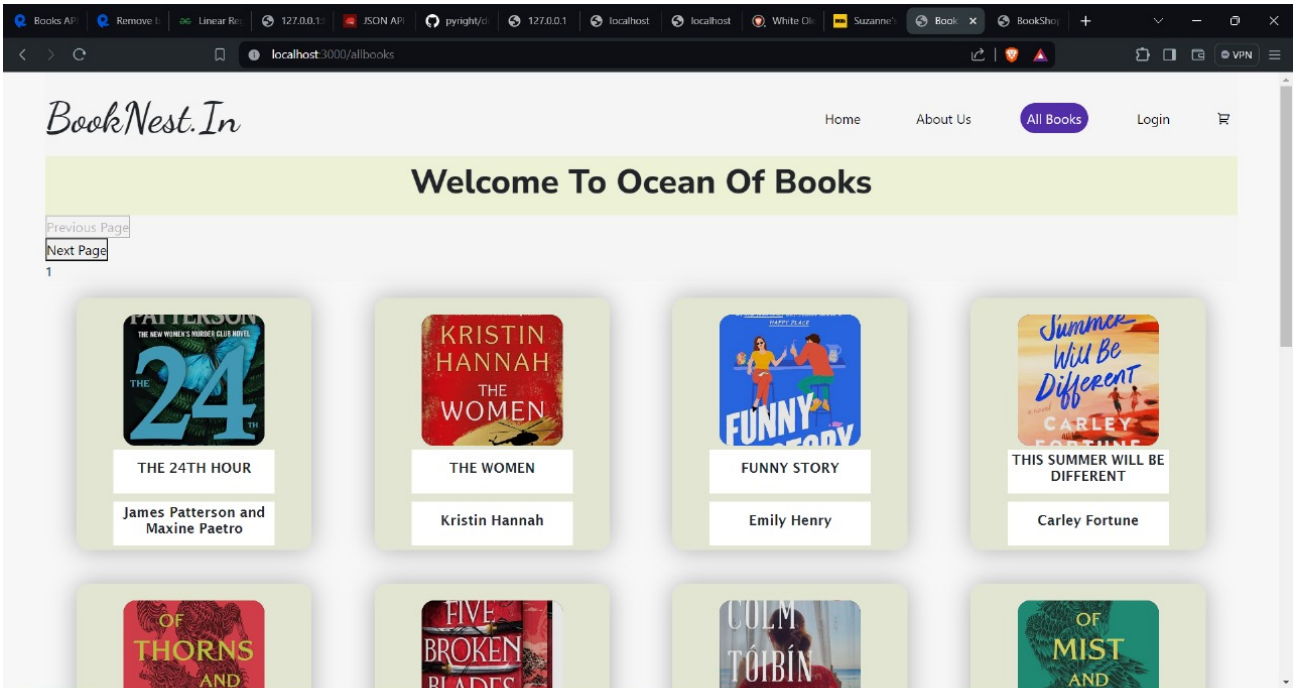


- Fig-3: This siding section for Top 20 Books,

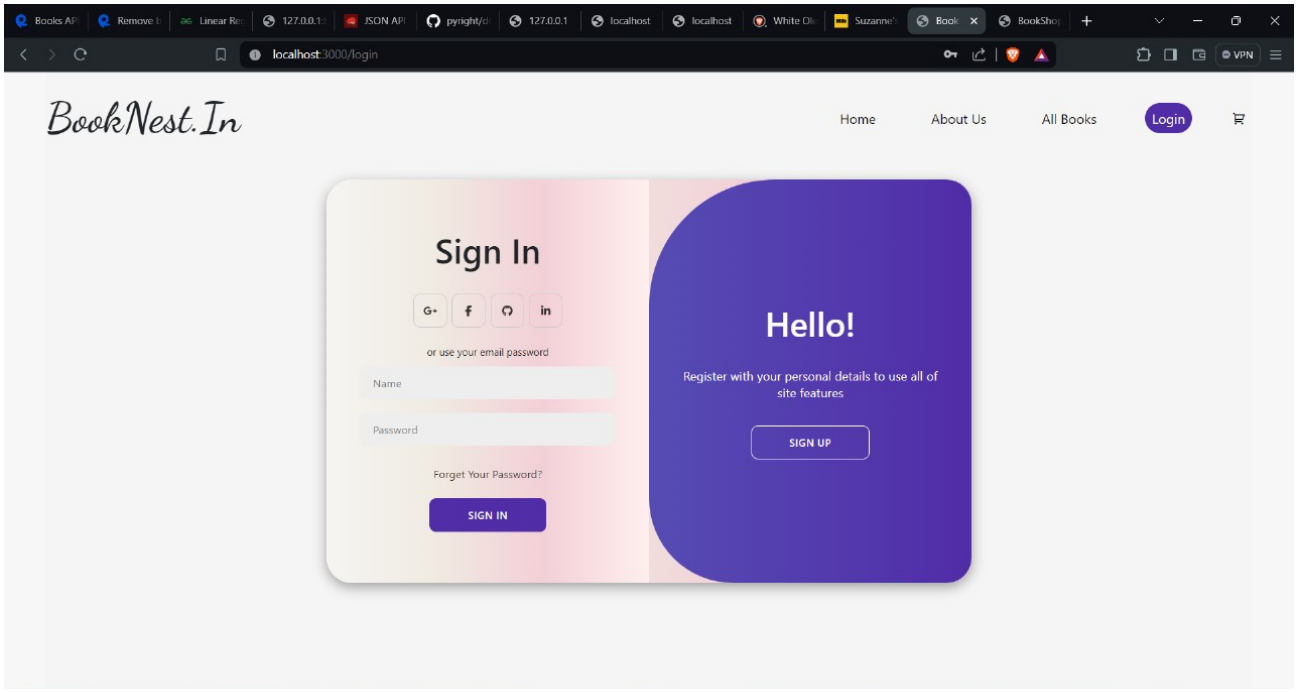
- Fig-4,5: Contain “Send Your Own Message” button which buyer can send there messages like new Books request.



- Fig-7: At HomePage theres a “All Books” section where buyers can find all the listing of the Books.



- Fig-8,9: Login/SignUp Page of the site.



Result and Discussion

Main Results or Outcomes

The primary outcomes of the BookNest.In project include the successful development and deployment of an online platform that integrates offline bookstores. Key achievements are:

- A responsive and user-friendly website built with React, HTML, CSS, and JavaScript.
- A robust backend developed using Django and Python, capable of handling large datasets and complex queries.
- An effective machine learning-based book recommendation system, implemented using Pandas and Numpy, that provides personalised book suggestions to users.

Achievement of Objectives

The project successfully achieved its initial objectives of bringing offline bookstores online and providing a platform for them to reach a wider audience. Success was measured by:

- **User Engagement:** The number of users interacting with the platform, including both book sellers and buyers.
- **Book Recommendations:** Positive feedback on the accuracy and relevance of book recommendations.
- **Performance Metrics:** Improved loading times and reduced out-of-memory issues on the frontend due to the implementation of pagination.

Unexpected Findings or Results

One unexpected result was the initial out-of-memory issue encountered when handling large JSON responses from the backend. This challenge highlighted the importance of efficient data handling and led to the implementation of pagination, which significantly improved the system's performance and user experience.

Interpretation of Results

The successful integration of various technologies and frameworks demonstrates the feasibility of transitioning offline bookstores to an online platform. The machine learning model's ability to provide accurate recommendations indicates the potential for enhancing user satisfaction and engagement. Overall, the project aligns well with its goals of expanding the reach of offline bookstores and offering a convenient online shopping experience for buyers.

Limitations and Future Improvements

Despite its successes, the project has some limitations:

- **Scalability:** As the number of users and data volume grows, further optimisation of the backend and database may be required.

- **User Interface:** While the current interface is user-friendly, continuous improvements based on user feedback can enhance usability.
- **Advanced Features:** Future work could include more advanced recommendation algorithms, better handling of user reviews and ratings, and integration with additional payment gateways.

Future improvements could involve:

- Implementing a more scalable database solution.
- Enhancing the recommendation system with more sophisticated algorithms, such as collaborative filtering or deep learning.
- Continuously iterating on the user interface to incorporate user feedback and improve the overall experience.

Impact and Benefits

Potential Impacts on Intended Users and Community:

The BookNest.In project has several significant impacts on its intended users and the broader community:

- **Offline Book Sellers:** The project provides offline book sellers with an online platform to expand their market reach, increase sales, and stay competitive in the digital age. By having an online presence, these sellers can attract customers beyond their immediate geographic area.
- **Buyers:** Buyers benefit from the convenience of purchasing books online, accessing a broader range of titles, and receiving personalised book recommendations based on their preferences and past purchases.
- **Community Engagement:** By promoting local bookstores and encouraging the purchase of books from small businesses, the project fosters a sense of community and supports local economies.

Contribution to Solving the Problem:

The project addresses the problem of limited market reach for offline bookstores by providing them with an online platform. This solution:

Increases Visibility: Makes it easier for bookstores to be discovered by a larger audience, including those who prefer online shopping.

- **Enhances Sales:** Provides tools for inventory management and personalised recommendations, which can boost sales.
- **Improves Accessibility:** Offers buyers an accessible and user-friendly platform to discover and purchase books, enhancing their overall shopping experience.

Broader Implications and Benefits:

- **Technological Advancement:** The project showcases the integration of modern technologies such as React, Django, and machine learning in creating practical and impactful solutions. This serves as a learning opportunity and inspiration for other developers and students.
- **Support for Education and Literacy:** By making books more accessible and promoting reading, the project contributes to educational and literacy goals. It encourages more people to read and provides easy access to a variety of books.
- **Economic Impact:** Supporting local bookstores can have positive economic impacts, such as job creation and sustaining small businesses.

Feedback from Users and Stakeholders:

Initial feedback from users and stakeholders has been positive:

- **Book Sellers:** Offline book sellers have expressed appreciation for the platform, noting increased visibility and sales. They find the inventory management tools helpful for running their businesses more efficiently.
- **Buyers:** Buyers have responded positively to the user-friendly interface and the accuracy of the book recommendations. They appreciate the convenience of online shopping and the personalised experience.
- **Community Members:** Members of the community have shown support for the project, recognising its role in supporting local businesses and promoting reading.

Conclusion

Key Points and Findings

The BookNest.In project successfully achieved its primary objectives of creating an online platform for offline bookstores, thereby expanding their market reach and enhancing their sales capabilities. Key findings include:

- **Successful Integration of Technologies:** The project effectively utilised React, Django, Pandas, and machine learning to build a robust and user-friendly online bookstore platform.
- **Effective Recommendation System:** The machine learning-based book recommendation system provided accurate and personalised suggestions to users, enhancing their shopping experience.
- **Improved User Experience:** Implementation of pagination and efficient data handling improved the performance and usability of the platform, addressing initial challenges with large JSON responses.

Main Takeaways and Lessons Learned

Several important lessons were learned throughout the development and implementation of the project:

- **Importance of Efficient Data Handling:** Handling large datasets requires careful planning and implementation to avoid performance issues. Pagination proved to be an effective solution to prevent out-of-memory errors in the browser.
- **Value of User Feedback:** Regular feedback from users and stakeholders is crucial for iterative improvement and ensuring that the platform meets the needs of its users.
- **Collaboration and Version Control:** Using GitHub for version control facilitated effective collaboration and code management, ensuring that the project stayed on track and that changes could be easily rolled back if necessary.

Future Work and Extensions

While the project met its initial goals, there are several areas for future improvement and extension:

- **Scalability Enhancements:** As the user base grows, further optimisation of the backend and database architecture may be necessary to ensure scalability and performance.
- **Advanced Recommendation Algorithms:** Incorporating more sophisticated recommendation algorithms, such as collaborative filtering or deep learning models, could enhance the accuracy and relevance of book suggestions.

- **Expanded Features:** Future development could include additional features such as user reviews and ratings, integration with more payment gateways, and enhanced search functionalities.
- **Continuous User Interface Improvement:** Regular updates and enhancements to the user interface, based on user feedback, will ensure the platform remains user-friendly and meets evolving user needs.

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