AI-Driven Library Management System

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ABSTRACT

Artificial intelligence plays a crucial role in the transformation of library science by optimizing decision-making, automation, and data management. The current study explores the different aspects of an AI-driven framework for the improvement of academic libraries' efficiency, resource allocation, and service optimization. Other AI applications like learning analytics, virtual reality, recommendation systems, reduction of the workload of administrators, and optimization of different library operations. The current study highlights the technical challenges associated with metadata usages, semantic technologies, and the adoption of fair technologies. Research findings suggests that integration of Artificial intelligence can modernise library services, making them more adaptive and user friendly.

Keywords:- Artificial Intelligence, Automation, Library, Data Management**.**

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I. INTRODUCTION

The Artificial intelligence is making revolutions in various sectors, the library science is one of the prominent sectored that must adopt artificial intelligence features and services, in order to optimize the process of automaton of management services ,like management of records , user authentication , reliable services. Traditional library management requires a lot of time-consuming tasks for the administrator, inefficient resource allocation, and limited personalization n user services. AI-driven solutions offer a transformative approach to library operations, enhancing catalogue book retrieval.

This study examines the role of AI in library science, focusing its impact on academic libraries, decision making frameworks, and automation strategies. By analysing the previous work done in the field of library science with artificial intelligence, the study highlights the potential of AI to enhance the efficiency, reduction of administrative burdens and support digital transformation

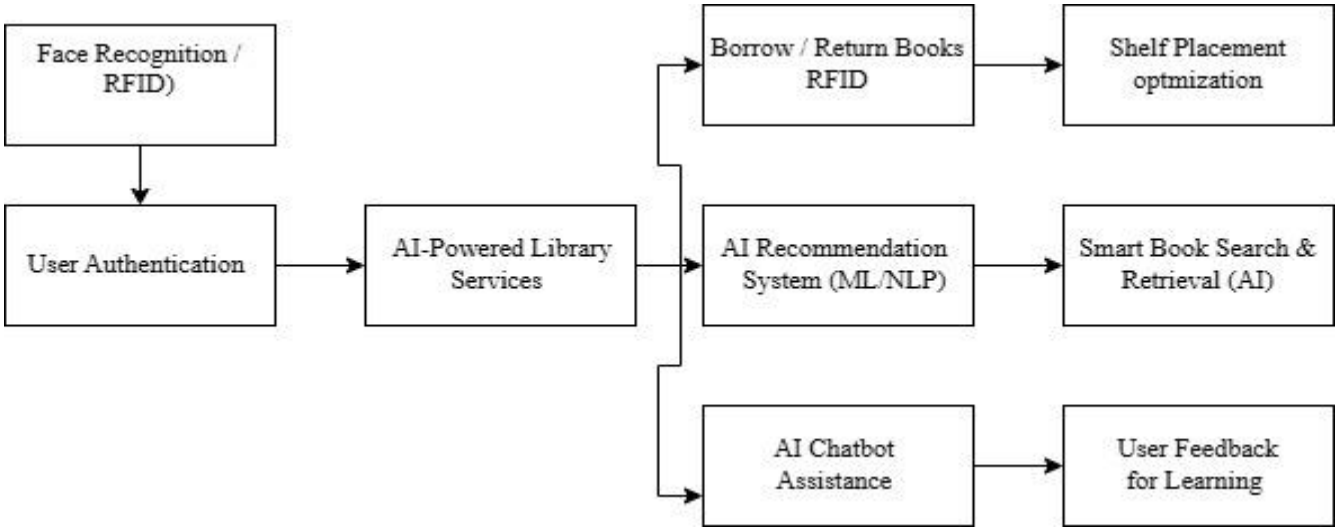

Figure 1: AI-Driven Library Management System: Methodology Flowchart

Figure 1 shows the flow of events for integrating artificial intelligence into library science. It represents one of the many solutions that can be adopted to optimize the overall process involved in any library management system. In the next part, we will discuss various research papers in the field of AI and library science.

II. RELATED STUDY

The survey underscore the importance of a knowledge management oriented approach, ensuring the academic libraries remain adaptive, efficient, and aligned with the organisational goals. AI driven analytics and user feedback mechanism to enhance service reliability and operational efficiency. The study emphasis that, by implementing AI driven framework the academic institution can better rationalize management decisions, optimize resource allocation, and deliver reliable, high quality services to academic institution[1].Artificial intelligence is playing a key role in every aspect of human life, from the earth to the sky. The ecosystem of NEP (2020) of the India encourages the involvement of the new technologies like Artificial intelligence for the various departments of academic institution [2]. Automation, decisionmaking, accurate data analysis and data management are the key responsibilities, performed by the AI in the field of library. Graphical user interface (GUI), database and mechanized shelves play a crucial role for the process of automation in the library management system. Author proposes radio frequency communication to identify the book location accurately. Even after the automation there is dire need of data management with accuracy, the suggestion generated by the Artificial intelligence algorithm for the user guidance in order to get the correct literature and the related literature with accuracy. The cross sectional study has been made to find out the role and responsibilities of

Library and information science professionals in digital data management, challenges was recorded during the study that absence of formal data management policies hinder effective implementation [3] The study has discussed many technical challenges related to the metadata use, semantic technologies, and far principles adoption challenges [4]. Exploration of the research related to the data management for the branch of library science, gives motivation to generate new idea and related to the management process in efficient manner, the research proposes an innovative conceptual framework to explore the application of AI for the value added, innovative library services. The proposed frame work supports the digital transformation, improves the time required for service delivery. The research encourages the professional to integrate AI into their operations [5].

Here we have a tabular representation of studies made over the artificial intelligence in the field of library science

Table 1: The research done so far in the field of library science along with AI

Author	Findings	References
Asemi, A., Ko, A., & Nowkarizi, M. (2021)	AI can play a key role in decision making and management. The Author emphasizes localization and human–robot interaction.	[6]
Harisanty, D., Anna(2024)	The study done over the Indonesia library system, the favourable outlook suggest a readiness for AI integration	[7]
Cox, A. (2023).	The study suggest that the librarians will evolve into hybrid professionals, integrating AI driven competencies with traditional	[8]

	expertise.	
Ahmad SF(2022)	Findings suggested that an AI application can significantly reduces the administrative workload and enhances the students learning through tools like learning analytics, virtual reality.	[9]
Ahmad(2022)	It minimizes the administrative tasks of a teacher to invest more in teaching and guiding students	[10]

III. PROPOSED METHODOLOGY

The current section discusses the work done for the library management system, including Artificial Intelligence. We have developed a graphical user interface that includes AI. The face recognition module uses the Haar Cascade classifier [11] for the face detection algorithm. The model uses the tkinter module to develop a GUI. The module contains different buttons for the manager's ease, like face authentication, borrow book, return book, AI recommendation [12], and chat assistance using Artificial Intelligence [13]. Figures 2 to 6 are the snapshots taken during the whole process. A user can click the button to recognise the face and thus enter the portal. After entering the portal, he can borrow or return a book. The AI recommendation button provides the user with the option to choose. If a user enters his or her choice, the AI module can recommend the book, as this module has large language model functionality. In the same way, chat assistance provides assistance related to the user's query. We have a built-in set of predefined questions and answers.

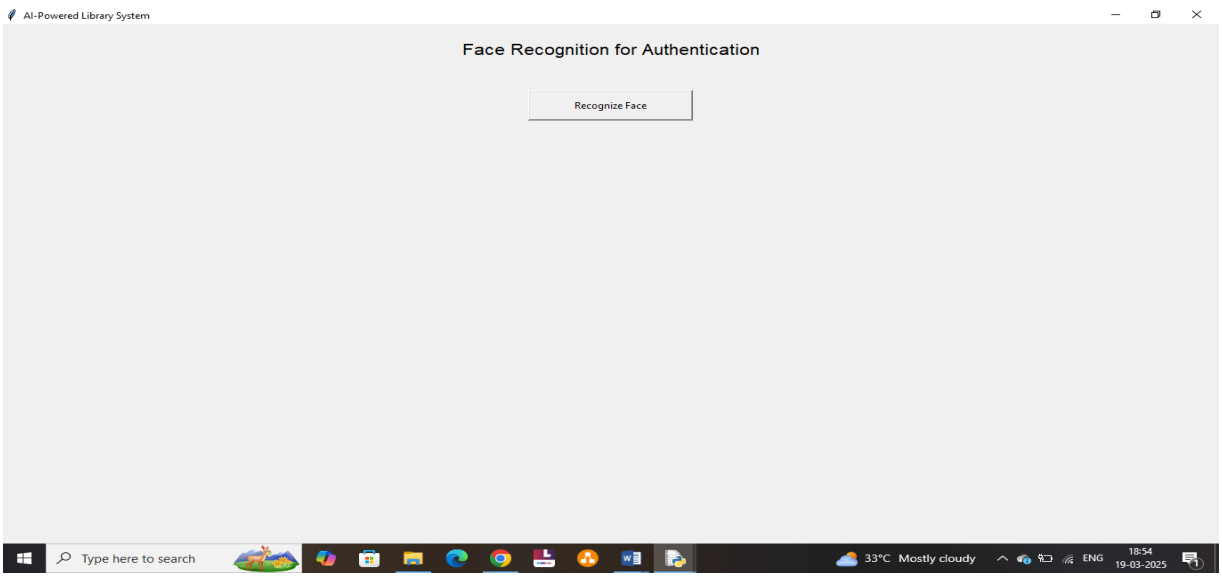

Figure 2: Face recognition module

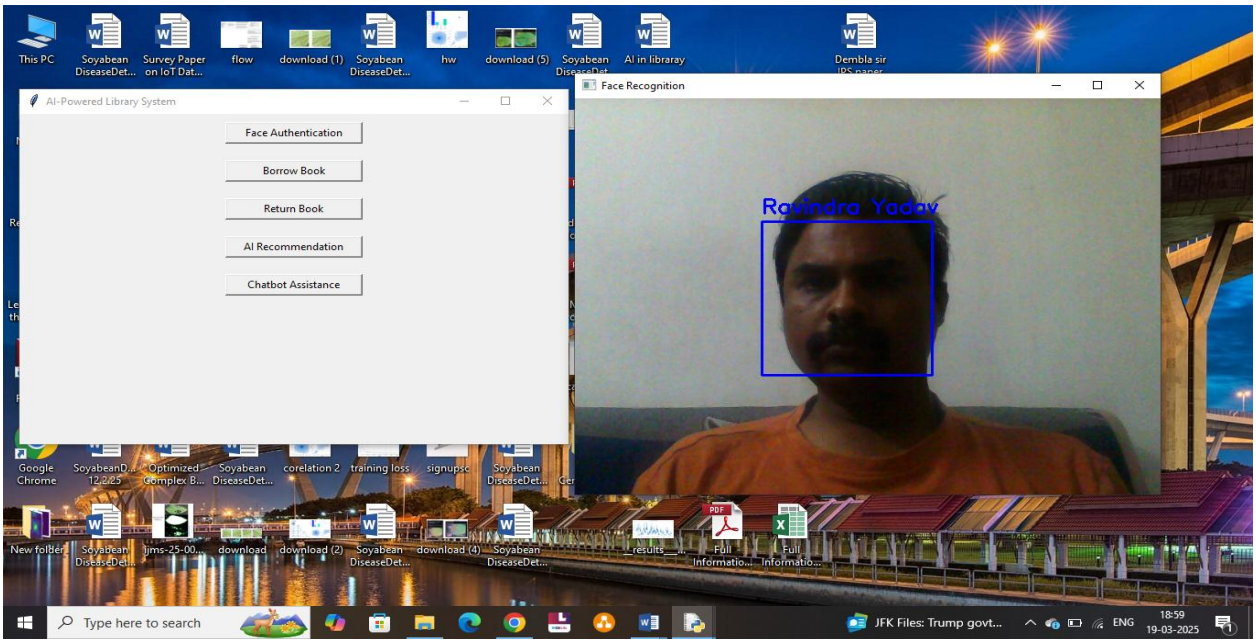

Figure 3: Face Authentication module

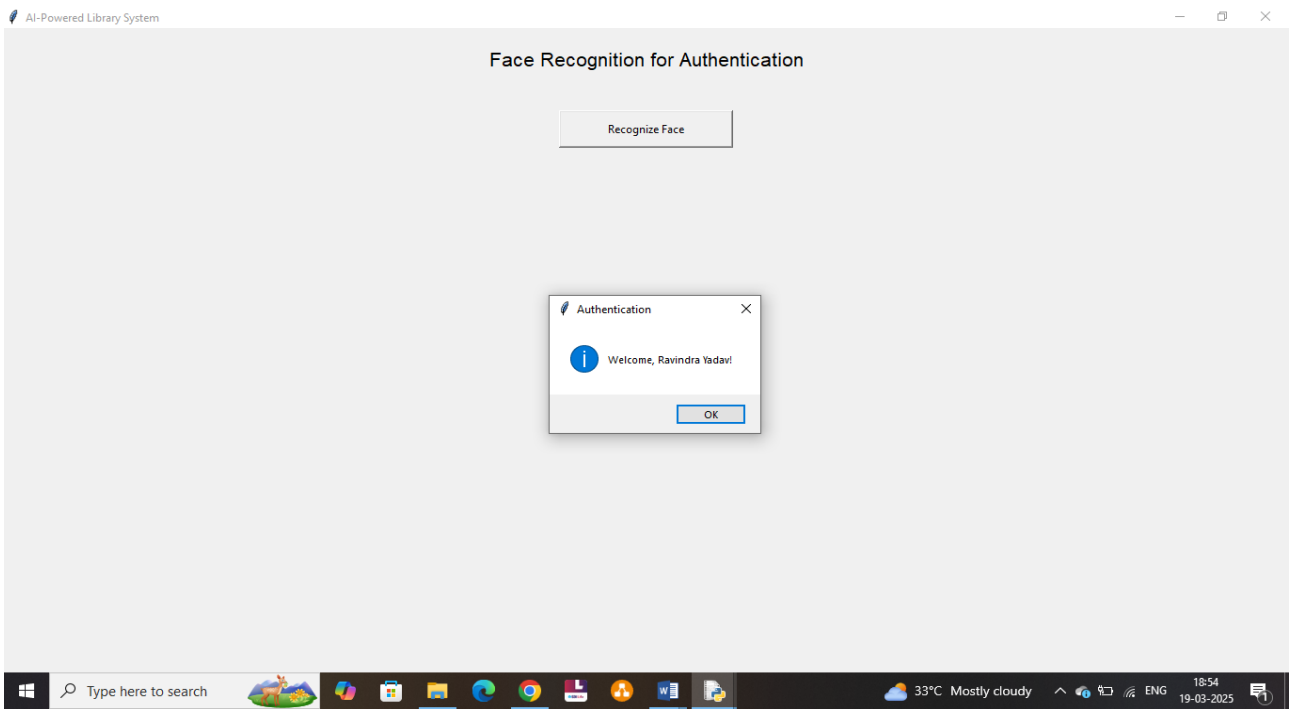

Figure 4: Post Process

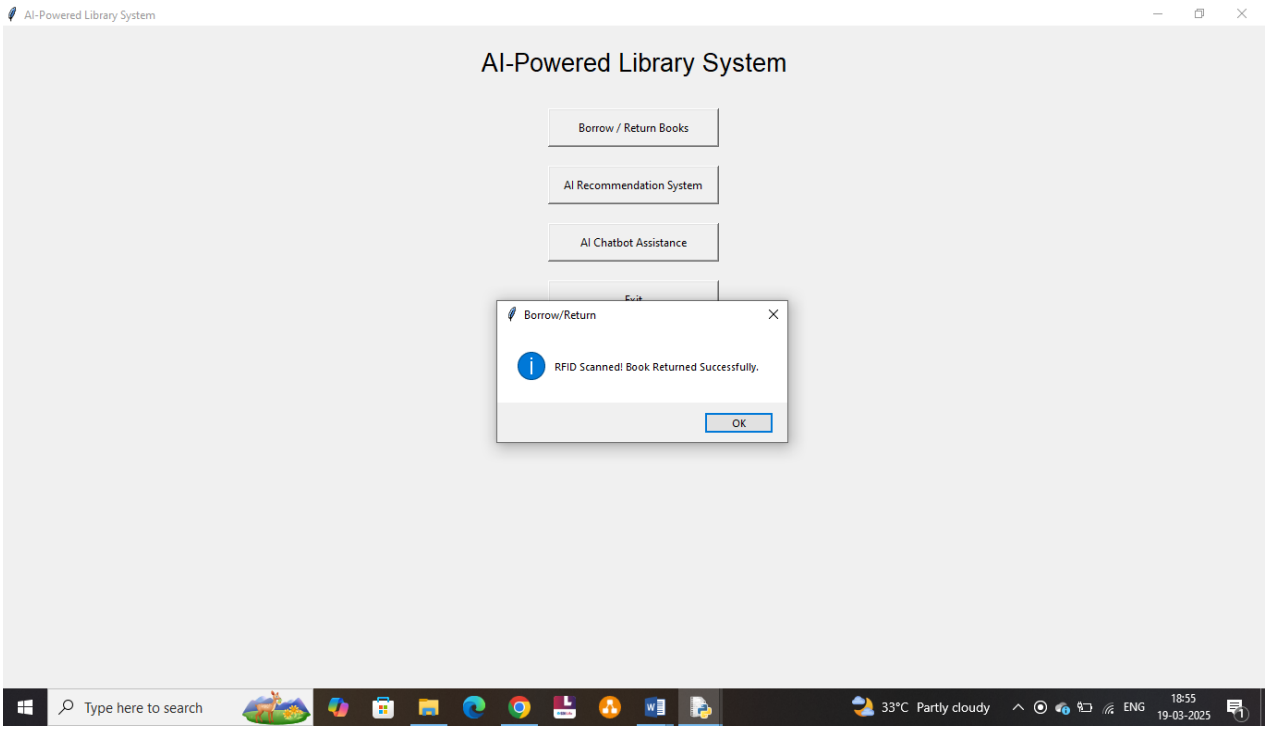

Figure 5: Scanner module

IV. RESULTS AND DISCUSSION

The face recognition system successfully identifies users and grants access to library services. The system was tested under different lighting conditions and facial positions. The system

efficiently allows users to borrow and return books with simple interactions, and the AI recommendation system suggests books based on predefined logic. The chatbot assists with basic library assistance. It was tested under various user queries.Face recognition needs a deep learning based model for better accuracy. The book database currently lacks integration with a live book inventory system.

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