

ResearchHub: AI-Powered Research Paper Management System

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Abstract: The quick increase in academic research papers makes it impossible for students, researchers, and academicians to manage their paper database easily and analyze it properly. It takes a lot of time and effort to read lengthy research papers, find useful information, generate summary, generate citations and write research notes. In order to solve these problems, in this paper, we propose a web-based platform called ResearchHub: AI-Powered Research Paper Management System. This platform integrates research paper management with Artificial Intelligence. The proposed system will allow the user to upload the research papers in PDF format and will provide features such as AI-based summarization, keyword extraction, IEEE citation generation, personal note management, and AI-powered chat interface to interact with the uploaded research documents. The system is developed using MERN stack which consists of MongoDB, Express.js, React.js, and Node.js. The frontend design of the website is done using Tailwind CSS while the Groq API is used to provide AI-based functionalities. With the help of intelligent document analysis and central research paper management, ResearchHub saves a lot of effort and enables users to understand and extract useful information from research papers efficiently. It serves as a perfect research workspace for students, researchers, and academicians and further could be enhanced with collaborative research, multilingual analysis, plagiarism detection, mobile compatibility, and personalized research recommendations.

Keywords: Artificial Intelligence, Research Paper Management, Natural Language Processing, MERN Stack, Document Analysis, AI Summarization, Keyword Extraction, Citation Generation, Research Assistant.

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I. INTRODUCTION

➤ Need for Effective Research Paper Management

There has been an increasing number of research publications that makes it tough for students and researchers to read, organize, and manage large volumes of research papers. The researcher needs to read long papers to comprehend concepts, discoveries, and methodologies used in the paper. Apart from reading the research papers, the researcher also needs to create summary, find key terms, keep research notes, and write citations. It takes a lot of time and efforts if these tasks are done manually.

➤ Contribution of Artificial Intelligence

The contributions of Artificial Intelligence (AI) and Natural Language Processing (NLP) are quite effective in order to minimize the labor-intensive process of analyzing research documents.

It is because of these attributes that AI can be used to develop research support systems.

➤ The Need for a Unified Research Platform

Researchers tend to have different tools to store papers, read documents, create notes, cite references, and conduct research. Using various applications for these purposes may complicate the research process and make it very time-consuming. A unified tool with the ability to manage documents and intelligent analysis can offer a more efficient research process. ResearchHub provides a platform where researchers can manage their papers, analyze them, manage notes, generate citations, and interact with documents all on one platform. D. Limitations of Existing Research Paper Management Systems

Current approaches for the management of research papers largely rely on manual techniques or stand-alone software applications. There are quite a few systems which offer basic capabilities including storing, viewing PDF documents, and citations management; however, they offer very little intelligence in terms of document analysis. Users might still have to manually go through lengthy documents to find out important information and write down their summaries and key points.

➤ *How AI Can Help with Research Paper Management*

• *Let's Elaborate on that Paragraph:*

AI can improve research paper management by automating multiple repetitive tasks that people use in order to analyze the document. As opposed to spending a lot of time to read a research paper in its entirety in order to extract its main ideas, users will be able to get an AI-based summary as well as some keywords associated with the paper. The system will be able to automatically generate academic citations for the document as well as allow users to ask questions pertaining to the uploaded documents via an AI-based chatbot. Thus, these features will help users to get necessary information from research papers quicker and without repetitive actions.

Utilizing the tools of natural language processing, the system will be able to perform analysis of a research paper in terms of its structure and contents in order to highlight the main contributions, methodology, and results of the paper. The ability to automatically summarize the paper will be particularly helpful for those who need to determine the relevance of a research paper and spend less time on it. In addition, automatic keyword extraction will help users to understand the topic of the document quicker.

➤ *The Proposed ResearchHub System*

The current research work features “ResearchHub: AI-Powered Research Paper Management System,” a web-based application that has been developed to facilitate the management and analysis of academic research papers. This system facilitates user registration and login, enables uploading of research papers in PDF format, document viewing, generating AI-based summary, extracting keywords from the document, managing notes on the document, generating IEEE citation and interacting with the uploaded paper through the AI-powered chat interface. ResearchHub is built using the MERN stack, which comprises of MongoDB, Express.js, React.js, and Node.js. Tailwind CSS framework is used for the user interface, while the Groq API is used for AI services.

The primary goal of ResearchHub is to create an efficient, accessible platform which can be used to make research papers organized, analyzed, and understood better. The system tries to cut down the time taken for manual analysis of documents by offering summaries and keywords generated by artificial intelligence. In addition to this, the tool can help users keep track of their notes and citations.

By integrating research paper management with AI document analysis, ResearchHub aims at increasing research efficiency and offering a better work environment to students, researchers, and academicians. In the future, it could also be enhanced by introducing collaborative research spaces, multilingual services, plagiarism checkers, mobile apps, cloud implementation, and personalized research recommendations.

The key issues connected with traditional research paper management and the necessity for an AI solution are:

➤ *Manual Reading is a Time-Consuming Process*

Often researchers have to read research papers in order to learn about their concepts, findings, and results. However, such a task takes a lot of time, especially when there is a large number of research papers. Manual analysis also makes the process of finding relevant information more complicated.

➤ *Problem of Organizing Research Papers*

If there is no centralized system for organizing research papers, then it may be problematic to organize documents properly. In such cases, users often have to rely on different programs or places where they store their research papers.

➤ *Lack of Automation in Creating Summaries*

Traditional ways of researching usually require manual summary preparation. It is repetitive and time-consuming when users have to analyze several research papers.

➤ *Manual Keyword Identification*

Finding important keywords or concepts from a lengthy research paper manually requires careful reading and analysis. When researchers work with a large number of papers, identifying relevant keywords for every document can become a repetitive task.

➤ *Separate Tools for Different Tasks*

Researchers often use different applications for storing papers, creating notes, generating citations, and searching for information. Switching between multiple tools increases the complexity of the research workflow and can reduce productivity.

➤ *Difficulties in Citation Management*

Preparing citations manually requires additional time and may result in inconsistent formatting. Researchers need to follow a specific citation style while preparing references for academic work. An integrated citation generation facility can reduce this manual effort.

➤ *Lack of Interactive Document Assistance*

Traditional research paper management systems may not provide an interactive way to ask questions about the content of an uploaded research paper. Users generally have to search through the document manually to locate specific information, which can be difficult when dealing with lengthy papers.

➤ *Repetitive Research Activities*

Activities such as reading, summarizing, extracting keywords, preparing notes, and generating citations are repeated for every research paper. Performing these tasks manually increases the workload of researchers and consumes valuable research time.

➤ *Limited Intelligent Analysis*

Many existing research paper management systems primarily focus on storing and organizing documents and provide limited support for intelligent document analysis. The lack of features such as automatic summarization, keyword extraction, and document-based question answering

makes it difficult for users to quickly obtain useful information from research papers.

➤ *Reduced Research Productivity*

In the current academic landscape, researchers, students, and faculty members are often required to juggle multiple disconnected tools to complete a single research task, one application for storing and organizing PDF files, another for taking notes, a separate citation manager for formatting references, and often manual effort or third-party services for summarizing lengthy papers. This fragmented workflow not only increases the cognitive load on the user but also introduces inefficiencies, as valuable time is spent switching between platforms rather than engaging in meaningful analysis and synthesis of the research material. Moreover, the lack of interoperability between these standalone tools frequently results in duplicated effort, inconsistent organization, and the risk of losing track of important information scattered across different applications.

➤ *Contribution of Blockchain Technology*

An alternative strategy for conducting transparent and secure online voting is blockchain technology. Information is saved in connected blocks on a blockchain, a decentralized digital ledger. Once information is stored on the blockchain, it is close to impossible to edit or delete it without the permission of the entire network.

This feature makes it extremely hard to tamper with the system, therefore blockchain technology provides a high level of security. With its aid, every cast vote on an online voting system will be stored securely as a block, making it inaccessible to hackers and other unauthorized persons.

II. RELATED WORK

In recent years, the increasing volume of academic publications has created a need for efficient tools to manage and understand research papers. Researchers and students often have to work with lengthy documents and use different tools for reading, summarizing, taking notes, extracting keywords, and generating citations. Traditional research paper management systems mainly focus on storing and organizing documents, while intelligent analysis and interactive assistance are provided only to a limited extent. Recent developments in Artificial Intelligence (AI) and Natural Language Processing (NLP) have created opportunities to improve research workflows by automating document analysis and information extraction.

➤ *AI-Based Research Paper Analysis*

AI-based systems have been increasingly used to analyze academic documents and extract useful information from large amounts of text. Techniques such as text summarization and natural language processing can help identify the important content of research papers and present it in a shorter form. AI-based summarization reduces the need to read the complete document initially and helps researchers obtain an overview of the paper more quickly. Such systems are particularly useful when researchers need to review a large number of papers within a limited amount of time.

➤ *Automated Keyword Extraction*

Identifying important keywords from research papers is another useful application of AI and text processing. Keywords provide a quick understanding of the main topics discussed in a document and can also help users organize and search their research papers. Traditional keyword identification requires researchers to read the document and manually identify important terms. AI-based keyword extraction can automate this process by analyzing the content of the document and identifying relevant terms, thereby reducing manual effort.

➤ *Research Paper Management Systems*

Research paper management systems provide facilities for storing, organizing, and accessing academic documents. Such systems help researchers maintain their collection of papers and retrieve documents when required. However, many conventional approaches focus mainly on document storage and organization and may require users to depend on separate applications for summarization, note-taking, citation generation, and document analysis. An integrated research platform can reduce this dependency by providing multiple research-related functions within a single system.

➤ *AI-Powered Document Question Answering*

Recent AI-based document processing systems provide users with the ability to interact with documents using natural language queries. Instead of manually searching through a lengthy research paper, users can ask questions related to its content and obtain relevant responses. This type of document-based interaction can help researchers locate specific information and improve their understanding of academic papers. Integrating such a feature with a research paper management system can provide a more interactive and convenient research experience.

➤ *Citation and Note Management*

Citation generation and note management are important activities in academic research. Researchers need to maintain notes while reading papers and prepare citations according to specific academic formats. Performing these activities manually can consume additional time and may result in formatting inconsistencies. An integrated system that provides personal note management and automatic citation generation can simplify these tasks and allow researchers to maintain their research information in an organized manner.

➤ *Challenges and Future Improvements*

Although AI-based research assistance provides several benefits, challenges remain in developing an effective research paper management system. The accuracy of AI-generated summaries, keywords, and responses depends on the quality and content of the uploaded documents. Handling different document structures and providing relevant responses to user queries are also important considerations. Further improvements can focus on collaborative research features, multilingual document analysis, plagiarism detection, mobile support, cloud deployment, and personalized research recommendations.

III. PROPOSED METHODOLOGY

The proposed "ResearchHub: AI-Powered Research Paper Management System" is a web-based platform designed to provide a centralized environment for managing and analyzing academic research papers. The system combines document management features with AI-based services to reduce repetitive manual work involved in research activities. Users can upload research papers, generate summaries and keywords, maintain personal notes, generate IEEE citations, and interact with their documents through an AI-powered chat interface.

Traditional research workflows often require scholars and students to manually sift through lengthy documents, extract relevant information, organize notes, and format citations, tasks that are time-consuming and prone to human error. ResearchHub addresses these challenges by integrating natural language processing and machine learning techniques directly into the research workflow, enabling users to derive meaningful insights from academic literature with minimal manual effort.

The platform is designed with a strong focus on usability, ensuring that researchers with varying levels of technical expertise can navigate the system efficiently. By automating repetitive tasks such as summarization and keyword extraction, the system allows users to devote more time to critical analysis and knowledge synthesis rather than administrative overhead.

Furthermore, the system's AI-powered chat interface enables users to interact conversationally with uploaded documents, allowing them to ask specific questions and receive contextually relevant answers drawn directly from the paper's content. This significantly reduces the time required to locate specific information within lengthy academic texts.

The integration of automated IEEE citation generation further streamlines the academic writing process, ensuring consistency and accuracy in referencing while eliminating the tedious task of manual citation formatting. Additionally, the note-taking functionality allows researchers to capture and organize their thoughts alongside the source material, creating a cohesive and centralized knowledge base for each project.

The proposed methodology consists of the following steps:

➤ User Registration and Authentication

The first step is user registration and authentication. Users create an account by providing the required information and subsequently log in using their credentials. The authentication process ensures that users can securely access their research papers and related information within the system.

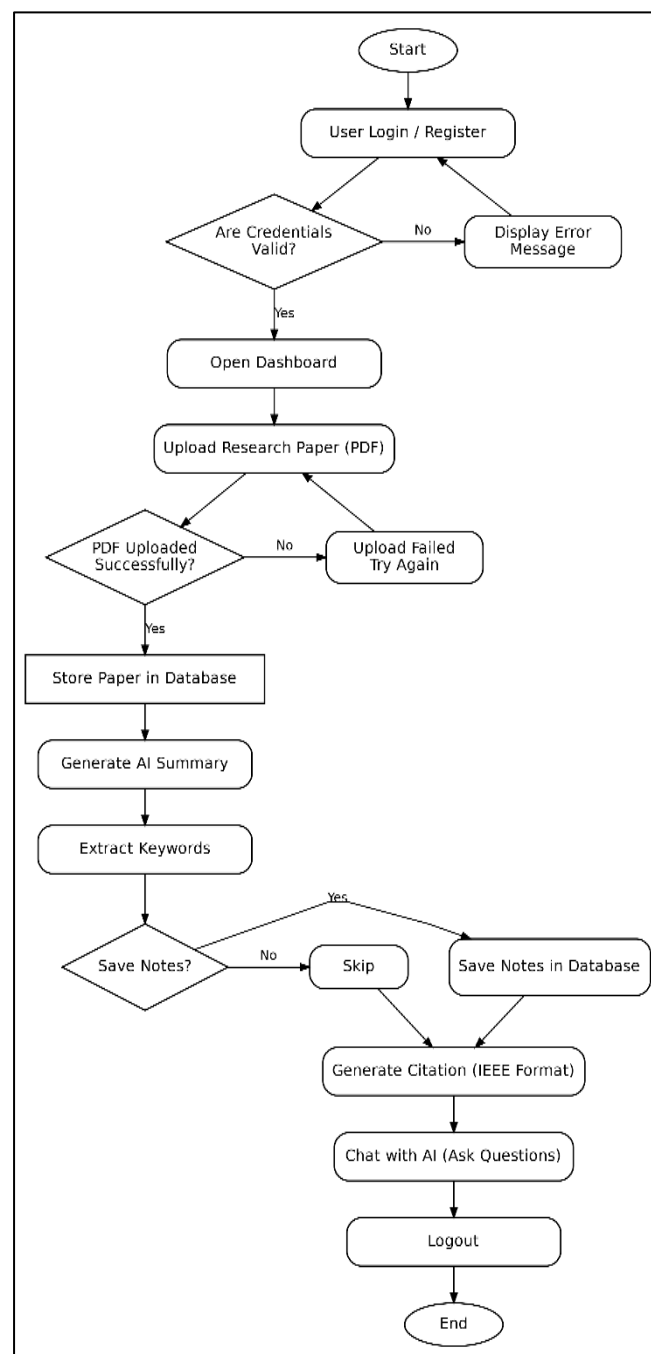


Fig 1 User Registration and Authentication

➤ Research Paper Upload

After successful authentication, users can upload research papers in PDF format to the system. The uploaded documents are processed and stored so that they can be accessed later by the user. This provides a centralized location for managing research papers instead of depending on different storage locations.

➤ AI-Based Document Processing

Once a research paper is uploaded, the system uses AI-based services to analyze its content. The system can generate a summary of the research paper and identify important keywords. These features help users understand the main content of lengthy documents without manually going through the complete paper initially.

➤ *Research Notes Management*

The system provides users with the facility to create and manage personal notes related to their research papers. Users can record important observations, ideas, or information while studying a document. These notes are associated with the user's research activities and can be accessed when required.

➤ *Citation Generation*

ResearchHub provides an IEEE citation generation facility for uploaded research papers. Instead of preparing the citation manually, users can obtain a formatted citation from the system. This reduces the effort involved in preparing references and helps maintain a consistent citation format.

➤ *AI-Powered Document Chat*

The system provides an AI-powered chat interface through which users can ask questions related to their uploaded research papers. The document content is used to provide relevant responses to the user's queries. This allows users to interact with their research papers directly and obtain specific information without manually searching through the entire document.

➤ *Centralized Research Management*

All major research activities, including paper management, AI-based analysis, notes, citations, and document interaction, are provided through a single platform. ResearchHub therefore acts as a centralized research workspace that helps students, researchers, and academicians organize and understand their research papers more efficiently.

By consolidating these previously fragmented functions into one cohesive environment, ResearchHub eliminates the need for users to rely on multiple disjointed applications, thereby reducing context switching and the associated loss of productivity. This unified approach ensures that all research-related data, uploaded papers, AI-generated summaries, extracted keywords, personal notes, and citations, remain interconnected and easily accessible from a single interface, rather than being scattered across separate tools and platforms. Such centralization not only simplifies the day-to-day workflow of the user but also fosters better organization and long-term management of research materials over the course of extended academic or professional projects.

IV. EXPERIMENTAL SETUP

The experimental setup describes the process of developing, testing, and evaluating the “ResearchHub: AI-Powered Research Paper Management System.” To accomplish this objective, the system was developed and tested using a combination of web technologies, database systems, and AI-based services. The software and hardware requirements used for developing and testing the proposed system are described below.

A. *Environment for Development*

The proposed system was developed using modern web technologies and Artificial Intelligence services. The front

end provides a user-friendly interface for user registration, login, research paper upload, document viewing, notes, citation generation, and AI-based interaction. The back end manages user authentication, file uploads, database operations, and communication with the AI service. MongoDB is used to store user and research-related information, while the Groq API provides AI-based functionalities.

➤ *Software Requirements:*

- *Operating System: Windows 10/11*
- ✓ Programming Language: JavaScript
- ✓ Front-end: React.js, HTML, CSS, and Tailwind CSS
- ✓ Back-end: Node.js and Express.js
- ✓ Database: MongoDB
- ✓ AI Service: Groq API
- ✓ Development Tool: Visual Studio Code
- ✓ Web Browser: Google Chrome or Microsoft Edge
- ✓ Document Format: PDF

• *Equipment Requirements:*

The following configuration of a personal computer was used for developing and testing the system:

- ✓ Processor: Intel Core i5 or equivalent
- ✓ RAM: 8 GB or more
- ✓ Storage: 256 GB or more
- ✓ Internet connection for accessing the web application and AI services

The system follows a three-tier architecture consisting of the presentation layer, application layer, and data layer. This separates the user interface, application logic, and database operations and supports better organization of the system.

B. *Test Methodology*

➤ *Here's an Expanded Version of this Paragraph:*

Several test cases were performed to verify the functionality of the proposed ResearchHub system. Users were registered and authenticated before accessing the research paper management features. Research papers in PDF format were uploaded and processed by the system. The generated summaries and keywords were checked to verify the AI-based document analysis functionality. Users also created personal notes, generated IEEE citations, and interacted with uploaded research papers through the AI-powered chat feature.

The testing process began with validating the user registration and login module, ensuring that credential verification worked correctly and that unauthorized access attempts were appropriately handled with error messages. Following successful authentication, the document upload module was tested using research papers of varying lengths and formatting styles to confirm that the system could reliably parse and store PDF files in the database without data loss or corruption. Multiple file sizes and paper structures, including

papers with tables, figures, and multi-column layouts, were used to evaluate the robustness of the upload and parsing mechanism under diverse real-world conditions.

The AI-based summarization and keyword extraction modules were evaluated by comparing the generated outputs against the actual content of the source papers, ensuring that the summaries captured the core contributions and that extracted keywords were relevant and representative of the paper's subject matter. The note-taking feature was tested by allowing users to add, edit, and save annotations associated with specific papers, confirming that the notes were correctly linked and retrievable from the database. The IEEE citation generation module was verified by cross-checking the automatically generated citations against standard IEEE formatting guidelines to ensure accuracy in author names, publication details, and formatting conventions.

Finally, the AI-powered chat interface was tested by posing a range of questions related to the uploaded papers, from factual queries to more interpretive questions, to assess the system's ability to generate contextually accurate and relevant responses. Throughout testing, particular attention was given to response time, system stability, and the overall user experience, confirming that ResearchHub performs reliably across its core functionalities and provides a seamless, efficient workflow for managing and analyzing academic research papers.

➤ *The Testing Process was Conducted to Ensure that:*

- Only registered users could access protected features.
- Users could successfully upload and manage PDF research papers.
- Uploaded documents could be viewed correctly.
- AI-based summaries were generated successfully.
- Relevant keywords were extracted from research papers.
- Personal notes could be created and managed.
- IEEE citations could be generated for uploaded papers.
- Users could interact with uploaded documents through the AI chat feature.
- Research paper information was stored and retrieved correctly from the database.
- The major system functions worked correctly without errors.

C. *Evaluation of Performance*

The following parameters were considered to evaluate the performance of the proposed ResearchHub system:

- **Functionality:** The system should perform its major functions correctly, including user authentication, paper upload, document viewing, summarization, keyword extraction, note management, citation generation, and AI-based document interaction.
- **Accuracy:** The generated summaries, extracted keywords, citations, and responses from the AI-powered document chat should provide useful information based on the uploaded research papers.
- **Usability:** The system should provide a simple and user-

friendly interface that allows users to manage research papers and access AI-based features without unnecessary complexity.

- **Efficiency:** The system should reduce the time and manual effort required for activities such as reading, summarizing, extracting keywords, preparing citations, and searching for information within research papers.
- **Reliability:** The system should consistently perform its major functions, including document uploading, storage, retrieval, and AI-based processing, without frequent failures.
- **Security:** User authentication and protected access should prevent unauthorized users from accessing personal research papers and related information.
- **Scalability:** The system should provide a foundation that can be extended with additional research features and support a larger collection of research documents in the future.

V. **SYSTEM ANALYSIS AND DESIGN**

➤ *Analysis of the System*

The objective of the system analysis phase is to identify the difficulties faced by students, researchers, and academicians while managing and understanding research papers and to propose a more efficient research paper management system. Traditional methods require users to manually store research papers, read lengthy documents, prepare summaries, identify keywords, maintain notes, and generate citations. Using different applications for these activities can make the research process time-consuming and difficult to manage. These limitations create a need for a centralized system that can simplify research paper management and reduce repetitive manual work.

- The proposed ResearchHub: AI-Powered Research Paper Management System is intended to address these difficulties by combining research paper management with Artificial Intelligence. The system provides facilities for uploading and viewing PDF research papers, generating summaries and keywords, maintaining personal notes, generating IEEE citations, and interacting with uploaded documents through an AI-powered chat interface. The integration of these features provides users with a single platform for managing and analyzing their research documents.

The primary goal of ResearchHub is to make the research process more convenient and efficient while reducing the time required for repetitive document analysis activities. AI-based services help users obtain important information from research papers without having to manually analyze every part of a lengthy document. The proposed system therefore aims to provide students, researchers, and academicians with an organized and user-friendly environment for managing their research work.

➤ *Planned Operation*

The system under consideration provides a simple interface through which users can perform different research-related activities. ResearchHub consists of several major

components, including user authentication, research paper management, AI-based document processing, notes management, citation generation, and AI-powered document interaction.

The operation of the system begins when a user registers and logs into the platform. After successful authentication, the user can upload a research paper in PDF format and access the available document management features. The uploaded paper can be viewed and processed using the AI services provided by the system. The user can generate a summary, extract keywords, create personal notes, generate an IEEE citation, and ask questions related to the uploaded research paper through the AI-powered chat interface.

First, the user needs to register with the system to gain access to the ResearchHub platform. After registration, the user can log in using the required credentials. Once authenticated, the user is redirected to the main dashboard, where the available research paper management functions can be accessed. The user can upload a PDF research paper, view its contents, and use the available AI-based features for analyzing the document.

The AI-based processing allows the system to generate a summary and identify important keywords from the uploaded paper. Users can also maintain personal notes related to their research work and generate IEEE-formatted citations. The AI-powered chat facility allows users to ask questions about the uploaded document and obtain relevant information without manually searching through the complete paper.

The system stores user information and research-related data in MongoDB, while the backend handles authentication, file uploads, database operations, and communication with the AI service. React.js is used for the front-end interface, while Node.js and Express.js manage the backend operations. The Groq API is used to provide the AI-based functionalities.

The proposed system provides a centralized research workspace where users can manage their documents and perform different research activities. By combining document storage with AI-based analysis, ResearchHub reduces the need to use multiple applications for different tasks and provides a more organized research workflow.

VI. HIGH-LEVEL DESIGN

➤ *The proposed ResearchHub:*

AI-Powered Research Paper Management System provides an integrated framework for managing, analyzing, and interacting with academic research papers. The system consists of several interconnected modules that perform different tasks related to research paper management. Unlike traditional approaches that depend on separate applications for different research activities, ResearchHub combines document management and AI-based services within a single platform.

The proposed system follows a three-tier architecture consisting of the presentation layer, application layer, and data layer. The presentation layer provides the user interface through which users interact with the system. The application layer manages authentication, document processing, research-related operations, and communication with AI services. The data layer manages the storage and retrieval of user and research-related information using MongoDB.

The major modules of the proposed system include user registration and authentication, research paper upload, document viewing, AI-based summarization, keyword extraction, research notes management, citation generation, AI-powered document chat, and research paper storage.

• *User Registration*

User registration is the first step in accessing the ResearchHub platform. A new user provides the required information to create an account. After successful registration, the user can access the system using the registered login credentials. The registration process provides individual users with access to their research papers, notes, and other research-related information.

• *User Authentication*

The authentication module allows registered users to securely access the system using their login credentials. Authentication ensures that users can access the research papers and information associated with their accounts. Protected routes and authentication mechanisms are used to restrict access to authorized users.

• *Research Paper Upload*

The research paper upload module allows users to upload academic papers in PDF format. After uploading a document, the system processes and stores the required information so that the paper can be accessed later. This provides users with a centralized location for maintaining their research papers instead of storing them across different applications or folders.

• *Document Viewing*

The document viewing module allows users to access and read their uploaded research papers through the system. Users can select a paper from their collection and view its contents when required. This feature provides direct access to research documents within the ResearchHub environment.

• *AI-Based Summarization*

The AI-based summarization module generates a concise summary of the uploaded research paper. Instead of manually reading the complete document to understand its main ideas, users can use the generated summary to obtain an overview of the paper. This feature helps reduce the time required for the initial analysis of lengthy research documents.

• *Keyword Extraction*

The keyword extraction module identifies important keywords from the uploaded research paper. Keywords provide users with a quick understanding of the main topics

and concepts discussed in the document. This feature also helps users identify relevant information when managing and reviewing multiple research papers.

- *Research Notes Management*

The notes management module allows users to create and maintain personal notes related to their research papers. Users can record important observations, ideas, and information while studying a document. These notes can be stored and accessed later as part of their research activities.

- *Citation Generation*

The citation generation module helps users prepare citations for their research papers in IEEE format. Instead of manually preparing the citation details, users can use the system to generate a formatted citation. This reduces the effort required for citation preparation and helps maintain consistency in academic documentation.

- *AI-Powered Document Chat*

The AI-powered document chat module allows users to ask questions related to their uploaded research papers. The system processes the document content and provides responses to user queries through the AI service. This allows users to interact with their research papers and find specific information without manually searching through the complete document.

- *Research Data Management*

The research data management module is responsible for storing and retrieving user and research-related information. MongoDB is used as the database for storing the required data, while the backend manages communication between the application and the database. This provides organized access to the user's research papers and related information.

- *Performance Evaluation*

The performance of the proposed ResearchHub system can be evaluated based on functionality, accuracy, usability, efficiency, reliability, and security. Functional testing can verify whether the major system modules operate correctly. Accuracy can be evaluated by examining the usefulness of generated summaries, keywords, citations, and AI responses. Usability can be evaluated based on how easily users can upload, manage, and analyze research papers.

Efficiency can be evaluated by considering the reduction in time and manual effort required for research-related activities. Reliability can be assessed by checking whether the system consistently performs document upload, storage, retrieval, and AI-based operations. Security can be evaluated by ensuring that only authenticated users can access protected research data.

This high-level design provides ResearchHub with a structured framework for combining research paper management and AI-based document analysis in a single platform. The different modules work together to provide a convenient research environment for students, researchers, and academicians.

VII. CONCLUSION

The proposed "ResearchHub: AI-Powered Research Paper Management System" presents a unified and user-friendly system for managing and analyzing academic research papers. It solves the problems that people usually face when working with research papers, such as the need to read extensive documents, write summaries, find keywords, keep notes and generate citations. The integration of research paper management and Artificial Intelligence helps to automate routine tasks and access relevant information.

With the help of ResearchHub, users are able to store their research papers in PDF format in a safe manner and use the following functions: AI Summarization, AI Keyword Extraction, IEEE Citation Generator, Personal Notes, and AI Document Chat. This project is built on the MERN Stack framework with the use of MongoDB as the database and Groq API for AI-based services. Thus, users will have a unified space where they can organize and analyze their research papers.

This project is expected to be useful for students, researchers, and academicians by providing a simple and organized platform for storing, managing, and accessing academic research papers. Instead of depending on different applications for reading documents, preparing notes, generating citations, and understanding lengthy research papers, users can perform these activities through a single platform. The integration of AI-based document analysis can further reduce the time and effort required for repetitive research tasks by helping users generate summaries, identify important keywords, and obtain relevant information from their uploaded documents.

The AI-powered interaction with research papers also provides a more convenient way for users to understand academic content. Rather than manually searching through lengthy documents whenever specific information is required, users can interact with the uploaded paper through the document-based chat feature. This can make the process of reviewing and understanding research papers more efficient, particularly when users need to study multiple documents within a limited amount of time.

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