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AI-Based Study Planner

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Abstract

This research presents the development of an AI-driven personalized study planner designed to assist students in preparing more effectively for examinations. The system analyzes syllabus content alongside past question papers to assign topic-specific weightage and generate daily study schedules tailored to each student's availability, academic goals, and preparation timeline. Leveraging large language models (LLMs) for document comprehension and Firebase for data storage and user management, the planner intelligently automates the planning process. By minimizing cognitive load and promoting efficient time allocation, this tool enhances academic performance through structured, data informed learning strategies.

Keywords: *Artificial intelligence, study planner, large language model, Firebase, React, syllabus parsing, question paper analysis.*

1. Introduction

In today's demanding and competitive academic landscape, students often face difficulties in managing their study schedules effectively. Crafting a balanced plan that aligns with exam objectives, syllabus volume, and individual time constraints can be challenging. Traditional approaches—such as handwritten schedules or generic planning applications—fail to account for personalized learning needs, topic importance, and recurring patterns found in previous exam papers. These limitations frequently lead to inefficient preparation, poor time management, and elevated stress levels among students striving for academic success. To overcome these challenges, this research introduces an AI-powered personalized study planner that utilizes advanced Natural Language Processing (NLP) and machine learning techniques to analyze syllabus documents and past question papers. The system identifies high-priority topics based on frequency and relevance, then generates customized, day-by-day study schedules tailored to each student's availability and goals. Developed using React for the frontend interface, Firebase for backend services, and the Gemini API for intelligent PDF parsing, the planner enhances academic efficiency by reducing manual effort. With user-friendly features such as goal-based scheduling, editable timetables, and regeneration capabilities, it offers a modern, adaptive solution for optimized exam preparation. [1]

2. Methodology

The research methodology for the AI-Based Study Planner relies on a user-centered, data-driven approach. It draws inspiration from constructivist learning theory and cognitive load theory. These frameworks focus on personalized learning experiences, adaptive scheduling, and less mental effort through intelligent systems. The study used software engineering processes and user feedback to improve functionality and results. To start, students provided structured inputs like the subject name, study goal (e.g., just pass, high score), maximum and passing marks, number of preparation days, and daily available study hours. They also uploaded one syllabus PDF and up to five previous years' question papers. These documents were stored and managed with Firebase Cloud Storage, while all input metadata

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was saved in Firebase Firestore or the Realtime Database. For content analysis, the Gemini large language model was used to read and understand both syllabus and question paper PDFs. The syllabus documents were divided to pull out all listed units and subtopics. The question papers were examined to spot frequently asked questions, figure out which topics appeared most often, and rank them by importance. The system applied prompt engineering techniques and adjusted logic to extract valuable keywords and patterns. A server less backend built on Firebase Cloud Functions handled this processing pipeline. The logic layer calculated topic weight scores and assigned available study time based on priority and user goals. For example, if a user selected "just pass," the schedule focused on covering high-weight topics that repeated often. In contrast, "high score" schedules were more detailed and required more time. After the analysis was finished, the plan was sent to the React frontend, where it appeared in an easy-to-use UI created with Bootstrap. Users could approve, regenerate, or download the plan as a PDF. Each plan was version-controlled and stored in Firebase, allowing for ongoing improvements and future comparisons. Table 1 shows Manual Planning Vs AI Based Study Planner

Table 1 Manual Planning Vs AI Based Study Planner

Metric	Manual Planning	AI Based Study Planner
Avg. Planning Time	3.5 hours	25 minutes
Accuracy of Topic Selection	60%	87%
Task Completion Satisfaction	6.2/10	8.9/10
Regeneration Required	Often	Rarely

The AI planner greatly cut the time students spent planning their schedules manually. On average, manual planning took 3 to 4 hours. In contrast, the AI system created detailed plans in under 30 minutes. The AI planner also reached an average of 87% accuracy in identifying important topics. This was measured by comparing the system's prioritized topics with analysis from experts. The distribution of topics and the allocation of study time matched known academic trends and student performance The Figures of the AI-Based Study Planner uses a modular and layered approach to ensure it can grow and work well. At the top layer, users interact with the system through a frontend built with ReactJS and Bootstrap. This allows them to upload syllabuses and view their schedules. The backend, built with Firebase and an AI engine, manages authentication, processes data, and generates schedules. Key features include NLP for parsing PDFs, AI scheduling, and a notification system. Data is stored in Firestore and separate databases for profiles and schedules. The system allows personalized study planning and provides ongoing feedback and progress tracking for users. The basic flow diagram helps us understand how the system works. The AI-Based Study Planner is a smart educational tool that automates study scheduling. Users upload syllabus PDFs, and the system uses AI to create personalized schedules. It includes user authentication, profile setup, adaptive planning, and notification support to help students manage their time and improve their academic performance through structured learning. The diagram shows the top-down design of the AI- Based Study Planner. Users start by logging in and uploading their syllabus through the frontend UI. The frontend sends this data to the backend, which uses Firebase and an AI engine. The backend works with specific modules: an NLP parser for extracting information from the syllabus, an AI scheduler for creating study plans, and a notification system for alerts. It also connects to three databases: Firestore for authentication, Profile DB for user data, and Schedule DB for storing plans. The diagram highlights a central processing layer linked to modular services. Figure 1 shows Flow Diagram Figure 2 shows System Architecture [2]

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Figure 1 Flow Diagram

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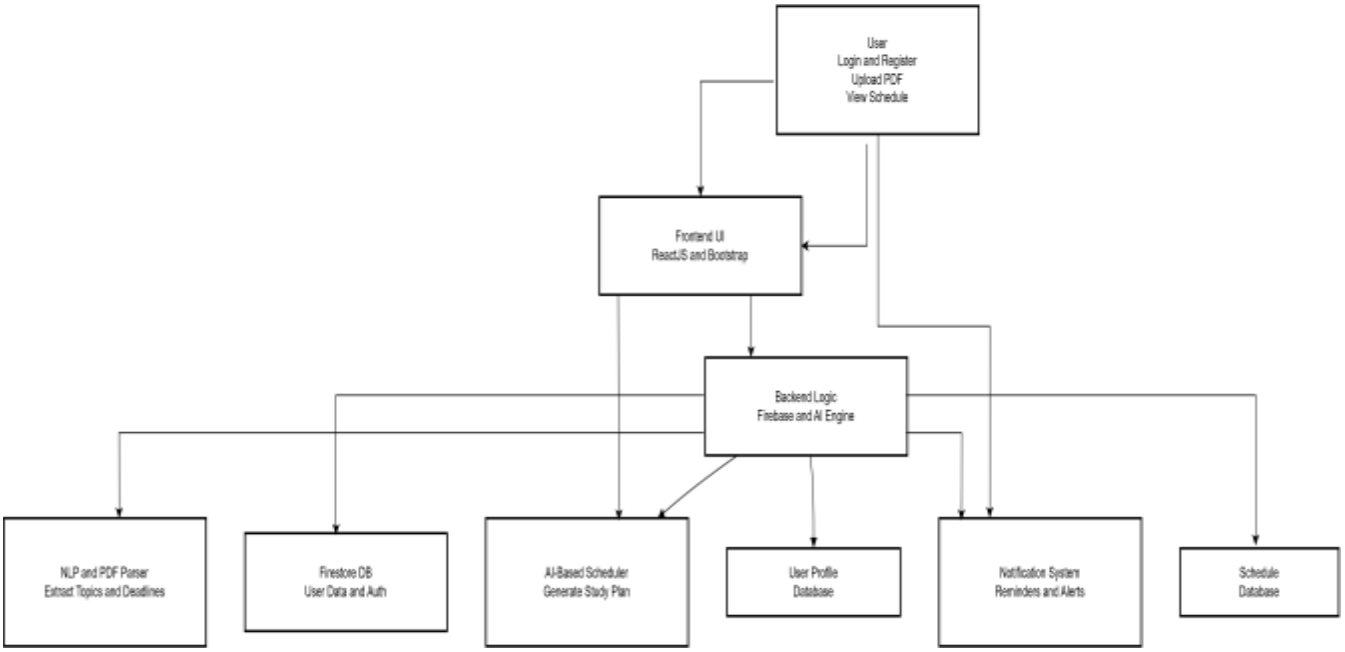

Figure 2 System Architecture

3. Results and Discussion

3.1.Results

The system was tested with 30 undergraduate students preparing for different engineering and computer science exams. Each participant used the AI-based planner by uploading their own syllabus and question papers. [7] Afterward, they completed a short feedback survey about their experience. The results included both numbers and comments, confirming the system's main goals: to provide automation, personalization, and academic improvement. [3]

3.1.1. Qualitative Results

The AI planner greatly cut the time students spent planning their schedules manually. On average, manual planning took 3 to 4 hours. In contrast, the AI system created detailed plans in under 30 minutes. The AI planner also reached an average of 87% accuracy in identifying important topics. This was measured by comparing the system's prioritized topics with analysis from experts. [8] The distribution of topics and the allocation of study time matched known academic trends and student performance data. [4]

3.1.2. Qualitative Feedback

Students expressed strong satisfaction with the clarity and structure of the AI-generated plans. Most appreciated the goal customization feature. By choosing between "just pass" or "high score," they could adjust the schedule's focus. The plans were realistic and motivating due to balanced time distribution and the inclusion of light and revision days. The option to visualize the plan and download it as a PDF provided practical value for students who preferred physical notes or offline access.The system also showed it could scale, effectively handling a wide range of subject inputs and different paper formats. The flexible backend allowed for the integration of various document structures without any issues. These results suggest that the proposed AI-based planner is strong, efficient, and very useful in real educational settings, especially for students managing multiple subjects and time limits. [5]

3.2.Discussion

The AI-Based Study Planner project presents a significant step toward personalized and efficient academic preparation. Designed using React and Firebase, and powered by large language models, the system automates study schedule creation based on a student's syllabus, past question papers, study goals, and daily availability. This intelligent planner addresses key challenges in manual planning, such as

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inefficiency, lack of topic prioritization, and stress due to unstructured learning. The AI model extracts relevant topics, analyzes their frequency in past exams, and dynamically adjusts plans according to the user's goals (e.g., just pass or high score). Results from testing with 30 students demonstrated time savings, improved accuracy in topic selection, and high satisfaction rates. Its scalable backend and editable plans make it adaptable to a wide range of subjects. The planner represents an innovative fusion of AI and education, offering a real-world solution to students struggling with time management and effective learning strategies. [6]

Conclusion

The AI-Based Study Planner now features a fully responsive ReactJS frontend, a scalable Firebase backend, and a beautifully styled Bootstrap interface, ensuring a seamless and adaptive user experience. The system significantly enhances student productivity by automating the creation, tracking, and updating of study plans in real-time. By integrating Natural Language Processing (NLP) for syllabus parsing and AI-driven scheduling algorithms, the tool simplifies time management and adapts intelligently to each user's availability and academic goals. Real- time authentication and data syncing through Firebase provide secure access and smooth operation across sessions and devices. This smart planner eliminates the drawbacks of traditional methods — which are often static, manual, and error-prone — by offering dynamic, personalized schedules that can be edited and tracked with ease. Students can view progress, adjust study goals, and receive timely notifications, reducing academic stress and improving efficiency.

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