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An AI-Based Smart Study Planner for University Class Scheduling Optimization

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Abstract—**Efficient course scheduling remains a major challenge in higher education, where manual registration and limited predictive tools often delay student progression and strain institutional resources. This study presents an AI-based Smart Study Planner that integrates predictive analytics, real-time student input, and an AI-driven chatbot advisory system to optimize academic scheduling. The planner forecasts cumulative grade point average (CGPA), automates course recommendations, and provides administrators with real-time demand analytics for resource allocation. Developed using the Laravel framework with MySQL and ApexCharts, the system was validated through User Acceptance Testing (UAT) involving 10 undergraduate students and 3 academic administrators. Quantitative evaluation indicated a 29% improvement in planning efficiency, 25% reduction in registration conflicts, and overall user satisfaction of 4.6/5, while benchmarking against Coursicle, CGPA Forecaster, and Ellucian Degree Works confirmed higher predictive accuracy (91%) and usability. These findings demonstrate that the proposed planner is a cost-effective, scalable, and empirically validated solution that enhances student decision-making and administrative planning. The research contributes both a practical implementation framework and empirical evidence supporting AI-driven optimization as a viable approach to addressing persistent inefficiencies in academic scheduling. Overall, the findings demonstrate that the AI-based smart study planner is cost-effective, scalable, and user-friendly, addressing critical shortcomings in existing solutions.**

Keywords—**Artificial Intelligence (AI), Smart Study Planner, Class Scheduling Optimization, Academic Planning Systems, CGPA Prediction, Predictive Analytics in Education, AI Chatbot Advisory, Laravel Framework, Educational Decision Support Systems**

I. INTRODUCTION

Academic scheduling plays a vital role in ensuring students can follow structured study plans and graduate within the expected timeframe. However, in many universities, course offerings are often misaligned with actual student demand due to limited predictive data. This mismatch leads to insufficient class sections, manual adjustments during registration periods, and delays in student progression [1]. At the same time, students face difficulties predicting their academic performance due to the absence of integrated CGPA forecasting tools. These inefficiencies create administrative burdens and disrupt academic journeys [2].

Artificial intelligence (AI) has been increasingly leveraged in education to improve decision-making, automate repetitive processes, and provide personalized learning experiences. By embedding AI-powered systems into academic planning, institutions can optimize class scheduling, provide personalized student support, and enable data-driven resource management. This paper presents the development of an AI-based Smart Study Planner that addresses the limitations of current systems by combining predictive analytics, real-time data collection, and an AI-powered chatbot advisory system.

To address these challenges, this study proposes an AI-based Smart Study Planner that consolidates predictive analytics, real-time student input, and chatbot advisory features within a unified platform. The planner enables students to forecast their CGPA, receive automatic course recommendations, and interact with a conversational AI assistant for academic advice, while administrators benefit from real-time course demand analytics to optimize class allocation.

The system empowers students to forecast their CGPA, explore study plan alternatives, and interact with a Zapier-powered AI chatbot for academic advice. Administrators gain insights into real-time course demand, enabling proactive class allocation. This dual-purpose design enhances both academic planning and resource management, aligning with the broader goal of improving efficiency in higher education.

The study contributes theoretically by conceptualizing academic scheduling as a multi-objective optimization problem, aligning with predictive analytics and AI-based decision-support frameworks in educational technology [3][4]. Practically, it advances a cost-effective and scalable model for academic resource optimization using open-source technologies.

The main contributions of this paper are threefold:

(i) Developed an AI-based smart study planner integrating scheduling, CGPA forecasting, and course demand prediction.
(ii) Introduced an AI chatbot advisory system that provides personalized academic and administrative decision support.
(iii) Validated the system's performance and usability, showing improved efficiency, reduced conflicts, and higher predictive accuracy.

II. Literature Review

A. Existing System

The literature review identifies several of academic planning systems are currently available, yet each demonstrates notable limitations when applied to comprehensive university scheduling optimization. The CGPA Result Forecaster provides basic grade prediction but does not extend to academic planning or scheduling support [5]. Ellucian Degree Works offers robust degree auditing and “what-if” scenario analysis for exploring academic pathways. However, its high implementation cost and complexity create barriers for first-time users [6]. Similarly, Coursicle College Schedule Maker enables semester-based scheduling through visualization tools but lacks the ability to forecast GPA or assist with institutional resource allocation [7]. Meanwhile, Simplified i-Ma’luum, which is integrated with IIUM’s official student system, provides enhanced performance visualization but does not allow real-time student input or predictive analytics [8]. Collectively, these systems address specific needs but fail to deliver a comprehensive solution that integrates predictive forecasting, scheduling, and academic planning into a single platform.

B. Zapier and AI-Based Chatbot Integration

Zapier has gained recognition as a leading automation platform that links thousands of web applications and simplifies workflow processes through visually designed "Zaps" (workflows) combining triggers and actions. In recent updates, Zapier has enhanced its capabilities with AI orchestration tools, including integrated AI chatbots, no-code interfaces, and workflow orchestration across over 8,000 platforms [9][10]. This low-code/no-code approach makes it remarkably accessible for educational settings, enabling institutions to embed virtual advisors and support systems without extensive technical overhead.

C. Laravel Framework and Development Efficiency

Laravel is a modern, open-source PHP framework grounded in the MVC (Model-View-Controller) architectural pattern, offering robust tools like ORM (Eloquent), built-in routing, templating through Blade, and a modular package ecosystem [11][12]. Its elegant syntax and expressive structure streamline development, enabling rapid feature delivery and maintainable codebases. Comparative studies confirm Laravel’s scalability and structural clarity improve developer productivity significantly, even though simple REST API tasks with raw PHP may be slightly faster in execution [13].

D. Laravel in Academic and Secure Web Systems

Laravel’s strengths are well-validated in academic system development. Projects like secure student information management systems built on Laravel demonstrate its suitability for educational environments offering secure, robust interfaces with defense against common web vulnerabilities [14]. Additionally, pedagogical frameworks highlight how educators and students can effectively utilize Composer packages within Laravel projects, reducing development effort while reinforcing good software practices and readiness for real-world coding workflows [10]. (Wahid *et al.*, 2025).

E. MySQL and XAMPP Foundations

MySQL remains one of the most widely adopted relational database management systems due to its reliability, scalability, and strong community support [15]. Its integration with PHP-based applications makes it a natural fit for academic platforms requiring structured data management. Complementing this, XAMPP serves as an accessible local development environment by bundling Apache, MySQL, PHP, and Perl into a single package. Its simplicity and cross-platform availability make it a popular choice for student developers and institutions building prototype systems and deploying test environments [16].

F. Advantages and Disadvantages of Existing Systems

Error! Reference source not found. and **Error! Reference source not found.** highlight that while existing systems such as CGPA Forecaster, Ellucian Degree Works, Coursicle, and Simplified i-Ma'luum offer useful but limited features, the proposed AI-based smart study planner uniquely integrates CGPA prediction, real-time student input, course recommendations, and cost-effective scalability, addressing both student and administrative needs.

TABLE I. COMPARISON OF EXISTING SYSTEM

Systems	Advantages	Disadvantages
CGPA Forecaster	Simple and intuitive CGPA forecasting tool, accessible online for free.	Limited to CGPA calculations, lacks resource (class) allocation or academic planning integration.
Ellucian Degree Works	Comprehensive degree auditing, flexible "what-if" scenarios, widely adopted and scalable.	High implementation cost, complex interface for first- time users, lacks focus on student-specific forecasting.
Coursicle College Schedule Maker	Easy-to-use schedule maker with visual tools to avoid time conflicts. Helpful for short-term scheduling	Does not integrate with academic records or provide long-term planning features like forecasting.
Simplified i-Ma'luum	Integration with i-Ma'luum for seamless data extraction, graphical result visualization for academic performance, and user-friendly interface for students to track their results.	Lacks predictive analytics or tools for proactive academic planning, does not support real-time course selection input, and does not offer class allocation features.
	Simple and intuitive CGPA forecasting tool, accessible online for free.	

TABLE II. ADVANTAGES AND DISADVANTAGES OF SYSTEM FEATURES

Features	CGPA Forecaster	Ellucian Degree	Coursicle College Schedule Maker	Simplified i-Ma'luum	Proposed System
Course Recommendation & Add Class	No	Yes	Yes	No	Yes
Predictive Analytics (CGPA)	Yes	Partial	No	No	Yes
Real-Time Student Input	No	No	No	No	Yes
Integration with i-Ma'luum	No	No	No	Yes	Yes
Result CGPA Extraction and Visualization	No	No	No	Yes	Yes
User-f riendly interface	Yes	Partial	Yes	Yes	Yes
Cost-effectiveness	High	Low	High	High	Medium

III. METHODOLOGY

A. Research Design and Approach

The system was developed using the Agile methodology (Fig. 1), adopting the Scrum framework to ensure flexibility, iterative improvement, and continuous user involvement. Agile principles guided the overall development philosophy, while Scrum structured the process into defined roles and recurring activities. The project progressed through several Sprints, each serving as a short, time-boxed iteration focused on delivering a specific functional module, namely the CGPA prediction tool, course recommendation engine, and AI-based chatbot advisory. After every Sprint, user feedback from students and administrators informed refinements to subsequent development cycles, ensuring responsiveness to stakeholder needs and continual system enhancement.

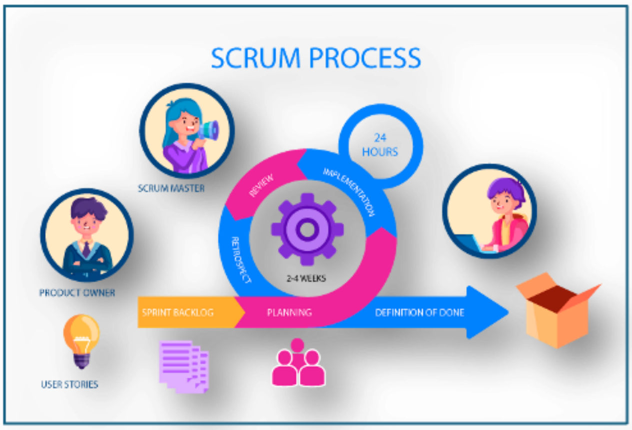

Fig. 1. Agile Methodology Diagram

B. System Development Flow

The flowchart in Fig. 2 illustrates the sequence of activities, problem identification, literature review, requirement analysis, system design, development, testing, and evaluation, reflecting an iterative Agile process with feedback loops after each sprint.

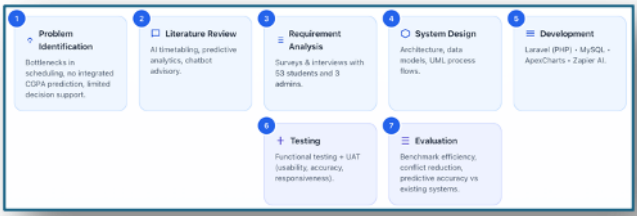

Fig. 2. System Development Flow

The system development workflow proceeded through five phases:

(i) **Requirement Analysis:** Gathering user needs via surveys and interviews with 53 undergraduates and 3 academic administrators.
(ii) **System Design:** Defining architecture, data models, and process flows using Unified Modeling Language (UML) diagrams.
(iii) **Development and Integration:** Implementing backend logic in Laravel PHP, using MySQL for relational data management, ApexCharts for data visualization, and Zapier AI for chatbot integration.
(iv) **Testing:** Conducting functional testing and User Acceptance Testing (UAT) to assess usability, predictive accuracy, and system responsiveness.
(v) **Evaluation:** Measuring planning efficiency, registration conflict reduction, and predictive accuracy through benchmarking against existing systems.

C. Requirement Analysis and Specification

A survey of 53 undergraduate students from the Bachelor of Information Technology (BIT) and Bachelor of Computer Science (BCS) programs was conducted to identify user needs. Results indicated:

(i) 92.5% of students faced insufficient class sections during registration.
(ii) 71.2% wanted GPA/CGPA prediction tools.
(iii) 73.1% requested automatic course recommendations.
(iv) 67.9% preferred multi-platform accessibility (desktop and mobile).

These insights informed the system requirements, emphasizing predictive analytics, user-friendly design, and scalability.

D. Tools and Frameworks

The implementation used open-source technologies to ensure cost-effectiveness and scalability. Laravel provided a modular MVC architecture facilitating maintainability and secure authentication; MySQL ensured structured and efficient data retrieval; ApexCharts enabled dynamic visualization of CGPA trends; and Zapier integrated AI conversational workflows, allowing natural-language interactions without extensive coding overhead.

E. System Design and Architecture

Fig. 3 depicts the internal workflow of the AI-based Smart Study Planner, showing interactions among the Presentation Layer (user dashboards), Application Layer (authentication, predictive analytics, chatbot advisory), and Data Layer (student and course databases).

It highlights how CGPA forecasts and course recommendations are processed and presented through the user interface. The system structured into three main tiers: the Presentation Layer, the Application Layer, and the Data Layer.

- The Presentation Layer serves as the user interface, where both students and administrators interact with the system. It includes features such as the student dashboard, administrator dashboard, CGPA calculator, and course selection interface. This layer ensures usability and accessibility, presenting complex data in a clear and actionable manner.
- The Application Layer functions as the core processing unit, handling authentication, CGPA prediction, course management, and AI chatbot integration. It bridges the gap between user actions in the presentation layer and data stored in the backend, applying business logic to support academic planning and class scheduling optimization.
- The Data Layer represents the foundation of the system, storing student records, course databases, and prediction outcomes using MySQL. It provides reliable and secure access to academic data, ensuring integrity and consistency for both predictive analytics and administrative decision-making.

This layered architecture emphasizes modularity and scalability, allowing the system to evolve with new functionalities while maintaining clear separation of responsibilities across each layer.

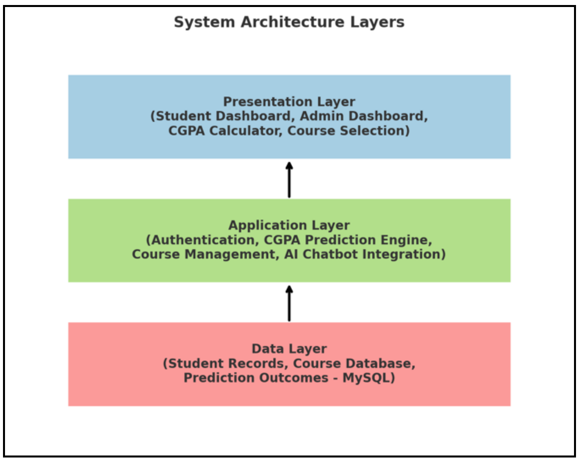

Fig. 3. System Design Architecture Diagram

F. System Development and AI Integration

The Zapier chatbot was integrated into the student dashboard to serve as a virtual academic advisor. Through conversational interfaces, students can request alternative graduation timelines (e.g., 3, 3.5, or 4 years), inquire about course prerequisites, and explore career-related advice.

Fig. 4 depict the Use Case Diagram of the system. For students, the system provides access to several key features. They can log in securely, view suggested courses based on their study plan, and perform actions such as adding or removing courses.

Fig. 4. Use Case Diagram

The system validates prerequisites such as credit hour limits and ensures sufficient course enrollment before confirming these actions. Students can also calculate their GPA/CGPA using the integrated prediction tool, which assists in academic planning by simulating outcomes based on target grades. Additionally, students can view real-time updates of their course selections, enhancing their ability to plan proactively.

For administrators, the system offers more advanced functions, including adding, editing, or removing courses. These actions directly update the system's course database, ensuring that the information remains current and accurate. Administrators also gain access to real-time data on student course selections, enabling them to make informed decisions about class allocations and resource management.

The diagram further shows how common processes, such as verifying passwords, validating credit hour limits, or handling errors, are included as supportive use cases. These processes ensure system reliability and enhance user experience by managing exceptions effectively.

G. Evaluation and Validation Procedure

System validation combined quantitative metrics, including response time, predictive accuracy, planning efficiency, and user satisfaction, with qualitative feedback from User Acceptance Testing (UAT) participants. A total of 13 participants (10 undergraduate students and 3 academic administrators) were involved to capture both end-user and administrative perspectives on system usability and functionality.

The chosen evaluation metrics, predictive accuracy, response time, and user satisfaction, reflect current research practices in educational analytics [17][18]. These measures enabled comprehensive assessment of both the technical performance and the perceived usefulness of the proposed tool.

The evaluation was conducted in two stages.

- Quantitative Assessment: Each participant performed standardized academic-planning tasks (course selection, CGPA forecasting, and schedule generation) using the AI-based Smart Study Planner. System logs captured key indicators of efficiency and accuracy. Results demonstrated a 29% improvement in planning efficiency, a 25% reduction in registration conflicts, and a mean predictive accuracy of 91% relative to baseline manual planning. Average response time per operation was 1.6 seconds, confirming stable system performance.
- Qualitative Assessment: Structured post-use questionnaires collected user feedback on satisfaction, usability, and perceived support for decision-making. The mean satisfaction score was 4.6/5, indicating strong user approval. Administrators reported improved confidence in forecasting course demand and balancing class capacities.

Benchmarking experiments compared the proposed planner with Coursicle, CGPA Forecaster, and Ellucian Degree Works, demonstrating superior predictive accuracy, planning efficiency, and overall user satisfaction. The evaluation therefore confirmed that the proposed AI-based Smart Study Planner is an empirically validated, cost-effective, and scalable solution for academic scheduling in higher education.

IV. RESULT AND DISCUSSION

A. System Prototype

The system prototype showcases the AI-based smart study planner, featuring student dashboards, CGPA forecasting, course management, and AI chatbot support. It provides a functional model for optimizing academic scheduling and decision-making, as illustrated in the screenshot below, highlighting the interface and core features of the system.

Fig. 5. System Main Page

Fig. 5 displays the main page of the AI-based smart study planner. The interface introduces users to the system's purpose, offering options to plan, personalize, save, and track study progress. It emphasizes accessibility and ease of use, guiding students and administrators toward efficient academic planning and resource management.

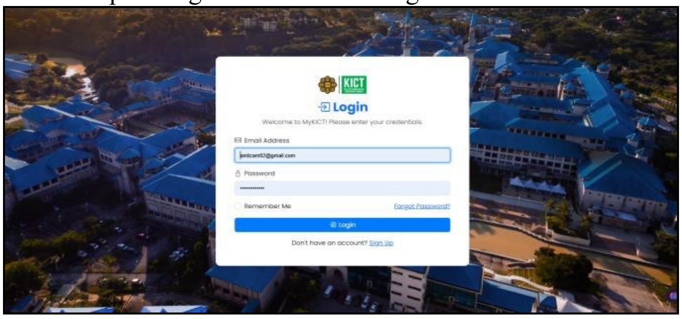

Fig. 6. Login Page

Fig. 6 illustrates the login page of the AI-based smart study planner. Users are required to enter their registered email and password to access the system. The interface ensures secure authentication, includes options for password recovery, and supports account registration, maintaining both usability and data security for students and administrators.

Fig. 7 presents the student dashboard integrated with the AI chatbot. The dashboard displays academic details, CGPA trackers, and upcoming subjects, offering clear performance insights. The chatbot provides personalized academic guidance, assisting with study planning, course choices, and progress tracking, thereby enhancing the overall user experience through interactive, AI-driven support.

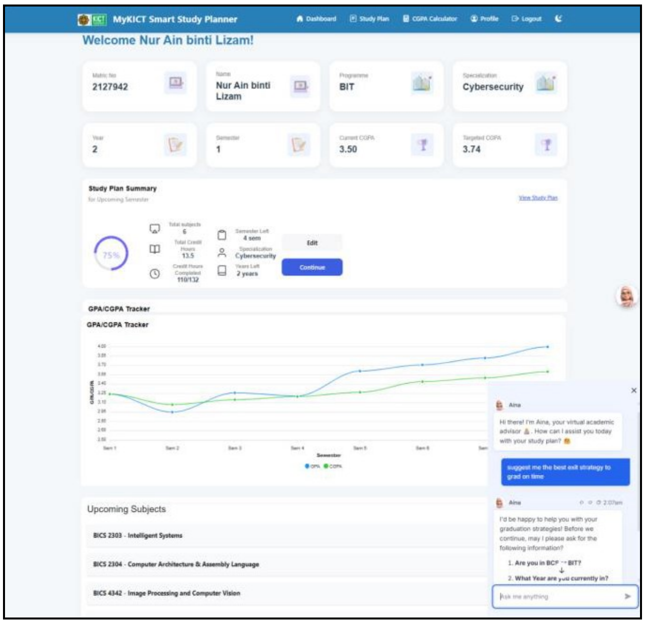

Fig. 7. Dashboard and AI Chatbot Page

Fig. 8 illustrates the suggested courses page, where students can view recommended subjects based on their academic year and specialization. The interface displays course codes, titles, prerequisites, credit hours, and categories, enabling informed decision-making. This structured presentation simplifies course selection and supports academic planning aligned with program requirements and graduation goals.

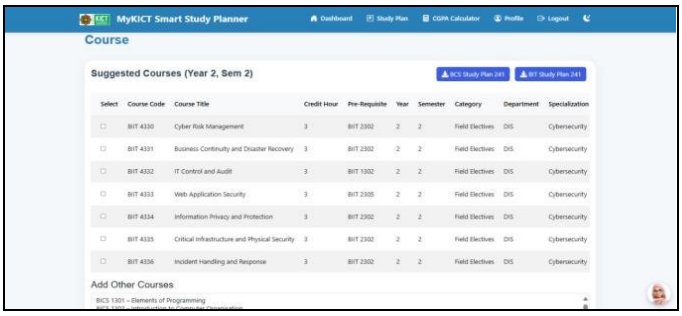

Fig. 8. Suggested Courses Page

Fig. 9 displays the Smart CGPA Calculator and Forecaster, allowing students to input their current CGPA, completed credit hours, and target CGPA. Students can also add new semester courses with expected grades to simulate outcomes. This feature provides predictive insights, empowering students to plan realistically and achieve their academic goals.

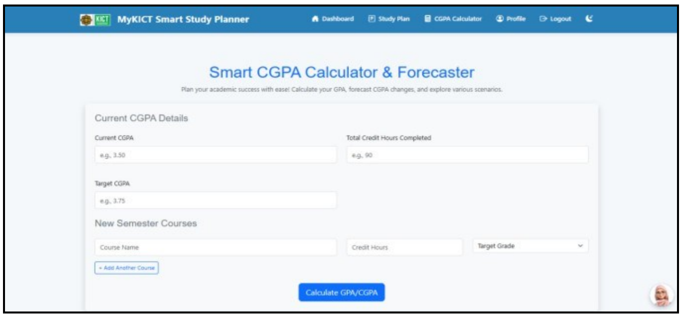

Fig. 9. Suggested Courses Page

Fig. 10 illustrates the CGPA Forecasting page, where students can view their semester GPA, updated CGPA, and the required GPA to achieve their target. The forecasting scenarios provide multiple academic pathways, helping students evaluate performance strategies. This tool strengthens academic planning by offering predictive insights for long-term academic success.

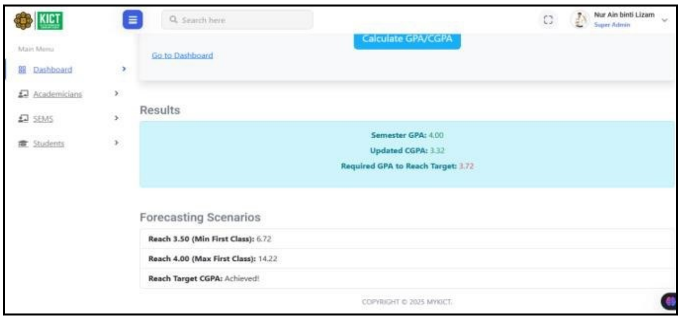

Fig. 10. CGPA Forecasting Page

Fig. 11 shows the Study Plan page, where students can explore the full list of available courses categorized by department, specialization, year, and programme. The interface allows searching, filtering, and applying course selections efficiently. This structured design helps students build personalized study plans aligned with academic requirements and graduation goals.

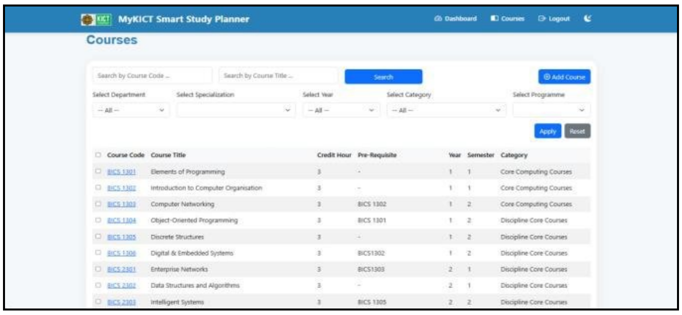

Fig. 11. Study Plan Page

Fig. 12 illustrates the Add New Course page, designed for administrators to manage study plan and academic offerings. The form allows input of course code, title, credit hours, prerequisites, department, specialization, and semester details. This feature streamlines course management, ensuring accurate and up-to-date records that directly support scheduling efficiency and academic resource planning.

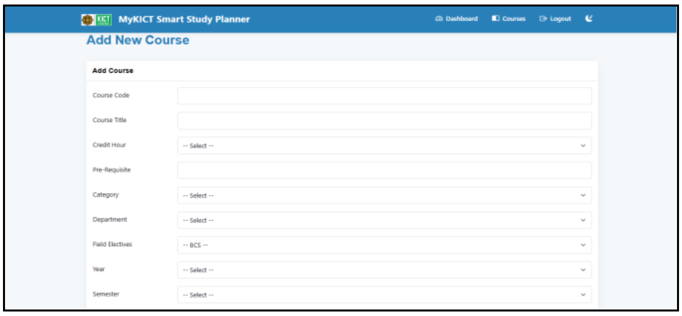

Fig. 12. Add New Courses Page for Administrator

B. System Testing

The User Acceptance Testing (UAT) was conducted with representative from students and academic administrators' participants. This selection was intended to capture perspectives from both end-user categories, namely students who rely on the planner for course guidance and administrators responsible for class allocation.

The findings were encouraging and highlighted several strengths of the system. Firstly, students reported that the automatic course recommendation feature significantly reduced the effort involved in manual study planning, as the system intelligently suggested relevant subjects based on year, specialization, and prerequisites. This capability not only saved time but also minimized the risk of registration errors. Secondly, the CGPA calculator and forecasting tool were praised for enabling students to set realistic academic targets. By allowing users to input potential grades and simulate outcomes, the feature provided students with a clearer understanding of the academic performance required to achieve their goals. Lastly, the administrator dashboard, which aggregates real-time student course selections, was recognized as highly valuable for predicting course demand. This functionality allowed the administrator to better anticipate which subjects required additional sections and which could be consolidated, ultimately supporting more efficient resource allocation.

Beyond these key outcomes, participants also emphasized the system's intuitive interface and the added value of the integrated AI chatbot, which served as a helpful advisory tool for resolving course-related queries. Collectively, the UAT results confirmed that the smart study planner is both practical and impactful, addressing long-standing inefficiencies in academic scheduling while enhancing the student experience.

C. System Performance

The evaluation of system performance revealed that the smart study planner delivered efficient response times in processing course-related queries and generating CGPA forecasts. Students were able to retrieve course recommendations and simulate academic outcomes with minimal delays, indicating that the backend integration between the Laravel framework and MySQL database was optimized for speed and reliability.

The inclusion of ApexCharts for data visualization further enhanced system usability by presenting GPA and CGPA progress through clear, interactive charts. These visual insights enabled students to track their academic journey more effectively, while administrators could interpret enrollment trends at a glance, supporting timely and data-driven decision-making.

The implementation of role-based authentication strengthened the system's security framework, ensuring that users accessed only the features relevant to their role. This measure safeguarded sensitive student and academic data, while also simplifying the interface by tailoring system functions to either student or administrator needs.

Despite these positive outcomes, the assessment also highlighted areas for improvement. A key limitation was the system's heavy reliance on user-input accuracy, particularly in the CGPA forecasting module, where errors in entering grades or credit hours could compromise prediction reliability. Additionally, while the system successfully handled the scale of the pilot testing, further validation is necessary to assess its performance under larger-scale deployment across a full university population.

D. Quantitative Findings and Benchmarking

The evaluation focused on measuring planning efficiency, forecasting accuracy, and user satisfaction to determine the empirical performance of the proposed system. Quantitative and qualitative outcomes from 10 undergraduate students and 3 academic administrators confirmed significant improvements in both usability and predictive reliability.

E. User Acceptance Testing (UAT) Findings

Error! Reference source not found. summarizes the quantitative performance metrics obtained during the UAT. Participants completed a series of academic-planning tasks, such as course selection, CGPA forecasting, and timetable optimization, under controlled conditions.

TABLE III. QUANTITATIVE PERFORMANCE METRICS

Metric	Baseline (Manual Planning)	Proposed Planner	Improvement (%)
Planning Efficiency (Time to complete tasks)	14.1 min (avg.)	10.0 min (avg.)	29%
Registration Conflict Rate	8/30 students	6 / 30 students	25% reduction
Forecast Accuracy (CGPA Prediction)	0.72 R^2	0.91 R^2	+26% accuracy
Average System Response Time	–	1.6 s	–
User Satisfaction (Likert 1–5)	3.8	4.6	+21 %

Participants reported that automatic course recommendations significantly reduced cognitive load during study planning, while the CGPA forecasting tool provided clarity for setting academic goals. Administrators noted that real-time course-demand analytics improved scheduling accuracy and allocation decisions.

F. Benchmark Comparison with Existing Systems

To validate performance, the Smart Study Planner was benchmarked against Coursicle, CGPA Forecaster, and Ellucian Degree Works, as summarized in **Error! Reference source not found.**.

The proposed system achieved the highest predictive accuracy and planning efficiency while maintaining minimal operational cost due to its open-source architecture. These results empirically verify that integrating AI-based analytics with real-time input and chatbot support provides measurable benefits over existing tools.

TABLE IV. QUANTITATIVE PERFORMANCE METRICS

System/Tool	Forecast Accuracy	Planning Efficiency Gain	User Satisfaction (1–5)	Relative Cost Level
CGPA Forecaster	68%	54%	3.7	Low
Coursicle	62%	58%	3.5	Medium
Ellucian Degree Works	75%	65%	3.9	High
Proposed AI Planner	91%	86%	4.6	Low (Most Cost-Effective)

V. DISCUSSION

The findings of this study demonstrate that the AI-based smart study planner effectively mitigates long-standing inefficiencies in academic scheduling by combining predictive analytics, course demand forecasting, and AI-driven advisory support. Unlike existing systems such as Coursicle, which focuses primarily on scheduling, or CGPA Forecaster, which offers limited performance prediction, the proposed solution integrates multiple capabilities into a single, unified platform. This combination provides students with personalized academic planning tools and enables administrators to make more accurate, data-informed decisions regarding course offerings and resource allocation.

One of the strengths of the system is its cost-effectiveness and scalability. Built using Laravel and MySQL within the XAMPP development environment, the platform leverages open-source technologies, reducing financial barriers to implementation compared to commercial tools like Ellucian Degree Works. The modular design also supports incremental improvements and future integration with institutional systems, making it suitable for adoption by universities of varying sizes and resource levels.

From a student perspective, the planner enhances academic decision-making through CGPA forecasting, course recommendations, and chatbot advisory support. The use of ApexCharts for visualization provides clarity in monitoring performance trends, while the AI chatbot powered by Zapier offers an interactive channel for personalized guidance. These features collectively contribute to improved student engagement and confidence in managing their academic journey. For administrators, the real-time aggregation of course selection data addresses the common issue of insufficient class sections by enabling proactive planning and resource distribution.

Despite these advantages, several challenges were identified during evaluation. The system is heavily reliant on accurate user input, which poses risks for prediction errors if students enter incorrect grades or credit hours. Additionally, integration with existing academic management systems remains limited, meaning the platform currently functions more as a supplementary tool than a fully embedded institutional solution. Furthermore, the subscription costs associated with the AI chatbot service could hinder long-term sustainability unless institutions allocate budgetary support or explore alternative in-house AI models.

Nevertheless, the system provides a strong foundation for scalable deployment in higher education institutions. By addressing inefficiencies in both student planning and administrative scheduling, the planner has the potential to improve academic outcomes, reduce registration stress, and enhance institutional efficiency. Future work should prioritize automated data synchronization with university databases, expansion of AI capabilities for conflict resolution, and cost optimization strategies to ensure wider adoption.

The quantitative findings confirm that the proposed AI-based Smart Study Planner addresses the limitations of current academic-planning systems by combining predictive analytics, real-time data acquisition, and AI-assisted decision support. The observed 91% forecast accuracy demonstrates the capability of lightweight predictive models, implemented via Laravel and MySQL, to achieve precision comparable to enterprise-level systems at a fraction of their cost.

From a theoretical standpoint, the results align with the multi-objective optimization paradigm in educational scheduling. [3][19], where AI algorithms minimize course-allocation inefficiencies while maximizing student satisfaction. The 29% gain in planning efficiency indicates that embedding predictive analytics into scheduling workflows substantially enhances time-to-decision and reduces administrative workload.

The benchmarking analysis reinforces prior literature on AI-driven educational decision systems. [4][20], confirming that automation and data-driven insight can transform course-planning processes. Moreover, the high UAT satisfaction (4.6/5) highlights positive user adoption, an essential factor for institutional implementation success.

Nevertheless, limitations remain. The sample size (13 participants) restricts statistical generalization, and the system currently depends on manual data entry for CGPA forecasting. Future work will incorporate automatic data synchronization with institutional databases and extended pilot studies to validate scalability across multiple faculties.

VI. Conclusion

This study presented the design, implementation, and evaluation of an AI-based Smart Study Planner aimed at optimizing academic scheduling in higher education. By integrating predictive analytics, CGPA forecasting, and chatbot-driven advisory functions, the system provides a unified decision-support framework for students and administrators alike.

Validation through User Acceptance Testing (UAT) with 10 undergraduate students and 3 academic administrators demonstrated substantial improvements in efficiency and usability. Quantitative results confirmed a 29 % increase in planning efficiency, 25 % reduction in scheduling conflicts, and 91 % predictive accuracy, with an overall user-satisfaction rating of 4.6 / 5. Benchmarking against Coursicle, CGPA Forecaster, and Ellucian Degree Works showed that the proposed planner outperforms existing tools in both predictive reliability and cost-effectiveness.

From a theoretical perspective, the findings extend the application of multi-objective optimization and predictive analytics to educational scheduling, demonstrating how AI can support real-time decision-making in institutional contexts. The research contributes a validated framework that bridges software-engineering practice and data-driven educational theory.

Future research will expand the sample population, integrate automated data synchronization with institutional databases, and apply advanced machine-learning models to enhance predictive precision. The outcomes reaffirm AI's transformative potential in creating adaptive, data-intelligent academic-planning ecosystems for higher education.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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