AMEENA AI – AN INTELLIGENT,PERSONALIZED AND EMPOWERING SELF-STUDY ASSISTANT

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Abstract-- This paper introduces Ameena AI, a smart, browser-based self-study assistant built to make learning more personalized, interactive, and engaging. It supports a wide range of input formats—raw text, YouTube links, and document files—and uses Google's Gemini API to simulate content extraction and enrich learning materials with contextual metadata. The platform offers an array of AI-powered tools including concise summaries, layered study notes, conversational chat for tutoring, interactive quizzes, structured presentations, and narrated video content featuring AI-generated visuals. Built entirely on the frontend using React 19, TypeScript, and Tailwind CSS, Ameena AI delivers a smooth, offline-ready experience without needing any backend server. Its modular architecture supports real-time responsiveness and clean user experience, while prompt engineering strategies are employed to effectively harness both Gemini's text and image generation capabilities. The system aligns with self-regulated learning principles and promotes independent exploration. In addition to detailing the application's design and user flow, this paper also addresses key challenges such as client-side API key exposure, and proposes best practices for secure deployment, performance optimization, and scalability. Ultimately, Ameena AI demonstrates how generative AI can turn static educational content into dynamic, tailored, and effective learning experiences—entirely within a browser environment.

Keywords— *Artificial Intelligence in Education, Intelligent Tutoring Systems, Generative AI, Ameena AI, Prompt Engineering, Gemini API, Personalized Learning, Multimodal Learning, Self-Regulated Learning, React SPA.*

I. INTRODUCTION

The use of artificial intelligence in education has advanced rapidly, giving rise to tools that support learning through personalized feedback, content generation, and interactive assistance. Despite these developments, many platforms remain limited in scope—either focusing on a single function such as quizzes or tutoring, or relying heavily on backend infrastructure. It reduces accessibility and responsiveness. To overcome these limitations, we introduce Ameena AI, an intelligent, browser-based self-study assistant that brings together the best of modern AI capabilities in one integrated, lightweight, and user-friendly platform. Ameena AI is designed to help learners engage deeply with study material through a suite of AI-powered features. Users can input content in various formats—text, YouTube links, or document files—and the system processes this input using Google's Gemini API. It extracts meaningful information, generates metadata such as titles and difficulty levels, and transforms the content into usable formats. These include summarized notes, detailed explanations, AI-generated video slideshows, structured presentations, and custom quizzes with instant grading and feedback. Additionally, the platform includes a chat-based AI study assistant that encourages learners to ask questions and clarify concepts in real time. Built entirely with front-end technologies like React 19, TypeScript, and Tailwind CSS, Ameena AI works without a backend server. All interactions are handled within the browser, and user data is saved locally using the local Storage API, making the application usable offline after initial content is processed. Advanced prompt engineering techniques are used to guide the Gemini API in producing structured, JSON-based outputs for features like quiz generation, video scripting, and content metadata tagging. For voice-based learning, the Web Speech API adds natural-sounding narration to generated video content. What sets Ameena AI apart from existing research systems is its complete, client-side architecture and broad set of features—all integrated into a single, seamless experience. While most reviewed systems focus on isolated tasks like quiz generation or tutoring support, Ameena AI covers the entire learning cycle from content ingestion to review and reinforcement. Among the 20 systems analyzed in our literature review, none offer this level of personalization, multimodal interaction, and offline functionality within a browser environment. This paper presents the system architecture, AI workflows, interface design, and implementation logic behind Ameena AI, and discusses future improvements, including deployment strategies, scalability plans, and security enhancements for production environments.

II. LITERATURE SURVEY

Clement et al., [1] and the gang whipped up this clever AI tutor, ZPDES, that watches how students learn and gives them personalized tips in a modeling class. In a study with 265 kids, the smart system that adapted to the learners was way more effective than the one that didn't. The results seem alright, but they're just for the little ones and specific spots, so we're kind unsure if it's a big deal for everyone else. Generative AI's Impact on Customized Intelligent Tutoring Systems The application of GPT-like models to tasks like adaptive feedback, question formulation, and content production in intelligent tutoring systems was examined by Aniket Deroy and Subhankar Maity et al., [2] in their 2024 article. The paper is a qualitative synthesis devoid of empirical evaluation and system implementation. Though there are no verified implementations or measurable standards, the usage of LLMs and ethical considerations are highlighted. Intelligent tutoring systems using artificial intelligence to promote sustainable education Oliveira[3], Lei T. et al., 2023, Intelligent Educational Settings conducted a conceptual literature review of AI-based intelligent tutoring systems in relation to sustainability education. talks about justice, emotion-aware learning, and moral dilemmas including bias and privacy. The study is still broad and lacks implementation specifics and assessment criteria. Unifying AI Tutor Evaluation: A Pedagogical Assessment Taxonomy Kaushal K. Maurya et al., 2025, [4] Presented MRBench as a means to evaluate LLM-based tutors according to eight pedagogical criteria. Although GPT-4 excelled in Q&A, its pedagogical engagement was not as robust. The study concentrated solely on the mathematics domain and included small-scale testing. Socratic Playground: GPT-4 in Language Learning Li et al., 2024,[5] Electronics (MDPI) Evaluated a GPT-4-based intelligent tutoring system that uses Socratic dialogue with 30 English learners. Gains reported from pre-test to post-test and increased involvement. The method used interactions that were both modular and based on dialogue. The research did not utilize a control group, had a small sample size, and did not have long-term follow-up. Automatisierte personalisierte Rückmeldung in Korbit Kochmar et al., 2020,[6] Integrated personalized feedback based on machine learning into a large-scale intelligent tutoring system. User logs and qualitative feedback demonstrate that AI-generated hints enhanced learner engagement. Students preferred help that was interactive as well as adaptive. However, the study lacks quantitative metrics and does not provide clear data on learning accuracy or retention. Yixue vs Human Teaching in China Wei Cui et al., 2019,[7] Conducted a comparative analysis evaluating the Yixue AI tutor against human instruction and BOXFiSH in English and Math. The AI system outperformed both alternatives, showing a 15–20% improvement in test scores. The research examines specific subjects and a single cultural/geographic context, without a multi-domain evaluation. Tutor CoPilot: A Human-AI Approach to Scaling Real-Time Expertise Rose E. Wang et al., 2024[8], For 1,800 K–12 students, real-time recommendations driven by GPT were implemented for 900 human tutors. The randomized controlled trial showed an overall mastery increase of 4%, with a 9% improvement observed among the lowest-performing tutors. The system enhanced learning outcomes through AI-supported tutoring. However, its applicability is limited to K–12 contexts and may not be suitable for complex or domain-specific instruction. GPT-4 Enhances Remote Tutors' Performance Instantaneously Dean et al., 2025,[9]DeepLearning.ai Employed GPT-4 in real-time for 874 tutors aiding 1,787 students, along with practical trials carried out. The student test pass rates increased from 62% to 66%, resulting in considerable benefits for tutors who are underperforming. The system enhanced the immediate outcomes of live tutoring sessions. The outcomes are temporary, the benefits are slight, and the long-term effects and scalability have yet to be investigated.

Advancing Generative Intelligent Tutoring Systems with GPT-4 Siyang Liu et al., 2024, [10] Electronics Developed structured prompts for Socratic dialogue in a GPT-4-based tutoring system and conducted a pilot study with 30 students. Tracked improvements in vocabulary and grammar, alongside increased user satisfaction. The findings suggest that guided interaction with AI could improve language learning; the limited scope of the study, small sample size, lack of statistical significance, and lack of subject diversity raise concerns. Predicting Learning Performance with Large Language Models Liang Zhang et al., 2024, [11] HCII 2024 Employed historical literacy data and five-fold cross-validation to evaluate GPT-4 against traditional machine learning models in forecasting adult reading performance. When it came to predicting reading scores, GPT-4 matched or surpassed the performance of conventional models. The research focused solely on prediction, without any instructional intervention. It was limited to a single domain and did not have practical educational consequences. Improving Student Learning with Hybrid Human-AI Tutoring Thomas et al., 2023, [12] In three pilot schools, hybrid human-AI tutoring was introduced in classrooms, impacting 585 students. Assessed learning improvements using system logs and student feedback. The hybrid model improved proficiency, particularly among students with poor performance. The study, which was a quasi-experiment (not an RCT), noted high implementation costs and lacked long-term tracking. What Is the Right Way to Approach This? GPT Feedback on Tutor Responses Lin et al., 2024,]13] Used GPT-4 to rephrase 410 incorrect tutor answers and evaluated performance with standard metrics (F1 = 0.84, AUC = 0.85). The feedback produced by GPT was of comparable quality to that provided by experts. This approach provided feedback only at intervals and lacked adaptivity, interactivity, and a customized learning path. Auto Tutor: Dialogue-Based Intelligent Tutoring System Graesser et al., 2023, [14]Meta-analysis that includes 12 studies evaluating the effectiveness of Auto Tutor in different domains, such as physics and computer science. The results indicate considerable learning gains, with an average effect size of d = 0.8. By engaging learners in human-like dialogue, Auto Tutor promotes a deeper conceptual understanding. Its disadvantages comprise significant upfront expenses, the necessity for advanced content creation, and limited applicability beyond certain specific domains. Adaptive Learning via Multimodal Deep Generative Models Chengwei Liu, Jiawei Sun, 2024, [15] IEEE TLT Presented a multimodal variational autoencoder (VAE) that combines text and image inputs to enhance the accuracy of quiz answer predictions. Achieved a prediction accuracy of 84.3%, compared to 78.1% for models that rely exclusively on text. Testing took place only in laboratory settings with constant data and no real student involvement or application, even though enhanced adaptivity was demonstrated through more extensive data inputs. Conversational AI Tutors for STEM Education Priya Varma et al., 2023, [16] Computers & Education Used a large language model-based chatbot to offer algebra tutoring to 82 students, using stepwise questioning to aid learning. Post-intervention test scores rose by 11%. Records of the conversations indicated heightened engagement and approaches to deal with problems. The research focused solely on algebra from the initial years of high school and did not cover more advanced STEM content. Interactive Quiz Generation Using GPT-4 API Samuel Greene & Maria Lopez, 2024, [17] JET Developed an API leveraging GPT-4 to create quizzes from input texts and confirmed its effectiveness by evaluating it against 200

essays through expert reviews and checks for factual correctness. Achieved an accuracy rate of 97.5% and an expert evaluation average of 4.3 out of 5. Demonstrates considerable potential for creating classroom quizzes, yet lacks foundation in actual user testing and does not include evaluation of student learning outcomes.

Generating Educational Video Summaries with AI Elena Rossi & Tomás Aguilar, 2024, [18] IJAIED Used AI-generated narration and visuals to convert text-based resources into educational video slides. A pilot study with 25 college students demonstrated an 18% improvement in recall, and engagement was rated at 4.5 out of 5. Despite the method enhancing memory and interest, the study was limited by the absence of a baseline comparison, a small sample size, and restricted subject and demographic diversity. : Self-Regulated Learning with Adaptive Multimedia Azevedo et al., 2022, [19] JEP Developed an intelligent tutoring system that combines multimedia content and self-regulation prompts to support deep learning. Assessed with 532 students, showing a deep learning effect size of d = 0.59 and a 22% increase in self-regulatory behaviors. The system offers effective guidance for learners through adaptive scaffolding, but it is costly to develop and limited to the field of biology, making generalization more difficult. A Personalized AI Coach to Assist in Self-Directed Learning Stephen Buckley et al., 2025, [20] AAI The VERA platform, which enables learners to construct and model ecological systems, now includes a behavior-based AI coach. Utilized Levenshtein distance and hierarchical clustering for grouping learners and providing customized feedback based on self-regulated learning principles. The system encourages exploration and reflection, but lacks empirical validation, performance metrics, and comparisons with other ITS. It is limited to certain domains, does not adapt to motivation or emotion, and relies heavily on interaction logs.

In order to overcome the rigidity of static curricula and provide individualized, adaptive learning experiences, the reviewed literature makes it abundantly evident why generative AI should be used in intelligent tutoring systems (ITS). From early adaptive models like ZPDES to more complex GPT-4 integrations, research continuously demonstrates gains in scalability, mastery, and engagement, especially for learners who perform poorly. This encourages more research into the ways AI can improve teacher support, close the achievement gap in education, and increase access to high-quality instruction across disciplines and regions. The significance of responsible implementation is further highlighted by ethical considerations like sustainability, privacy, and fairness. However, ongoing constraints such as limited subject scopes, small sample sizes, lack of longitudinal evaluation, and lack of standardized assessment necessitate the development of strong, cross-domain, and morally sound ITS models that can demonstrate

III. METHODOLOGY

The User Interface, AI-Engine Extraction, and the AI-Engine comprise the three main layers of the Ameena AI system. Learners engage at the user level through a simplified interface that includes the Homepage, Study Page, and Chatbot Assistant. Other features include a Dashboard for customized tracking and navigation, as well as a Theme Toggle. In order to ensure that a variety of content sources are effectively transformed into structured inputs for AI processing, the system links to the AI-Engine Extraction module, which processes input data using elements like the Text Parser, YouTube Transcript Notes extractor, and PPT Generation tool. The primary learning features are then powered by the AI-Engine in a step-by-step pipeline, starting with AI Explanation and moving through View Summary, AI Notes Generation, Block Diagram Creation, PPT Generation, AI Video Generation, and Quiz Generation before feeding results back into the Dashboard for user access.

This design enables Ameena AI to provide an integrated, multi-format learning experience, combining text, visuals, interactive quizzes, and AI-powered explanations, thereby promoting adaptive and engaging self-directed learning.

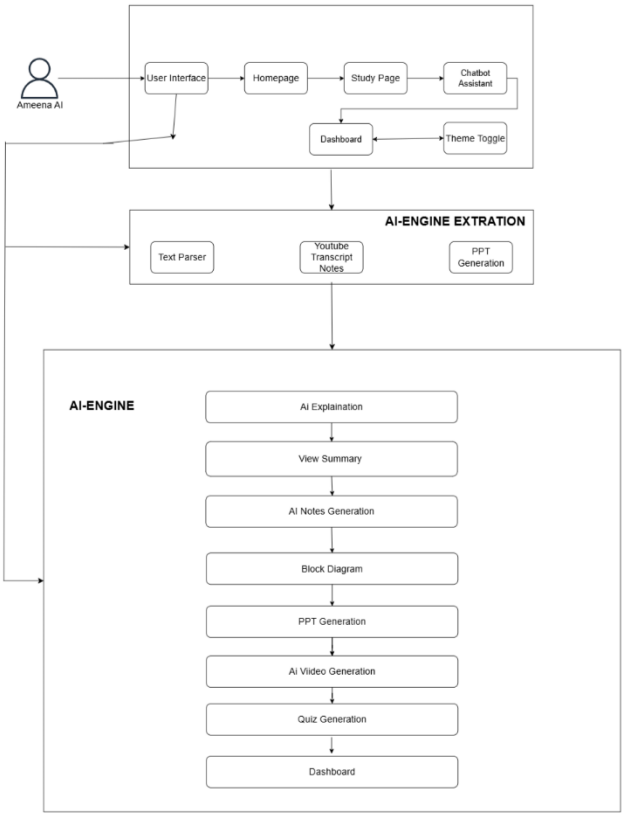

Fig-1:Flowchart of Ameena AI

3.1:System Architecture and Functional Components of Ameena AI:

The main layer of interaction that students use to interact with Ameena AI is the user interface. Its responsive design and easy-to-use navigation ensure seamless access to study materials and AI-powered features. It was created with accessibility and simplicity in mind. As the system's entry point, the Homepage offers a summary of the platform's features, easy access to the study modules, and pertinent announcements or highlighted content. Additionally, it enables users to start AI-assisted learning sessions. From the Study Page, students can engage with study materials, upload resources, and submit questions for AI processing. It creates a smooth, subject-specific learning experience by fusing summaries, AI-generated notes, and multimedia content. The Chatbot Assistant is an AI-powered conversational tool integrated into the platform. It helps students in their study process while maintaining the context of previous exchanges by providing prompt answers, explanations, and recommendations. The Theme Toggle feature enhances accessibility and reduces eye strain during extended study sessions by enabling users to switch between visual themes, such as light and dark modes. The Dashboard compiles user-specific learning data, including performance analytics, generated materials (like summaries, quizzes, and diagrams), and progress tracking.

3.2 AI ENGINE EXTRACTION

The Text Parser module processes raw textual input from study guides, documents, and user-generated content. It distinguishes important terms, extracts relevant information, and organizes the text into a machine-readable format for additional AI processing, ensuring that learning materials are efficiently segmented for summarization, note generation, and quiz creation. This component automatically extracts and processes YouTube video transcripts, converting spoken content into concise, organized notes. It organizes the content, removes filler speech, and highlights important points to support AI explanations, summaries, and other downstream learning features. The PPT Generation tool is used to create presentation slides from extracted notes or processed text. By automating the creation of slides, it ensures that key concepts are arranged visually, which makes the information more easily understood for lectures, self-study, or editing. To enhance comprehension, the output should be rich in content and visually clear.

3.3 AI ENGINE

By guaranteeing clarity, logical flow, and the inclusion of crucial details, it aids students in efficiently remembering and editing information. The Block Diagram module provides a visual representation of concepts, procedures, or system flows that are drawn from the course materials. It provides a structural overview through graphical representation, making abstract or technical subjects easier to understand. This feature converts processed educational materials into well-structured presentation slides that can be utilized for individual assessment, instruction, or peer sharing. It ensures visual clarity and logical idea organization. Using textual or condensed learning materials, the AI Video Generation component produces video-based lessons with narration, animations, and visual aids. This enhances involvement and takes into account different learning preferences. This module creates interactive tests using processed learning materials. By evaluating understanding and memory of the material, it gives students immediate feedback and reinforces learning goals. Notes, diagrams, PowerPoints, videos, quizzes, and summaries are among the outputs from each module that are combined into a single, user-friendly interface by the AI-Engine's Dashboard. It allows students to view, manage, and review generated resources as well as track their academic progress.

The User Interface, AI-Engine Extraction, and AI-Engine are the three primary layers that make up the Ameena AI system architecture, which is designed to offer a comprehensive AI-powered learning experience. A dashboard for progress tracking and a theme toggle for visual comfort are just two of the features that comprise the user interface, which also includes the homepage, study page, and chatbot assistant.

Text documents and YouTube videos are processed by the AI-Engine Extraction layer's Text Parser, YouTube Transcript Notes extractor, and PPT Generation tool, which ensures that the content is arranged and ready for additional processing. The AI-Engine then powers the platform's main learning features, which include AI-powered explanations, concise summaries, well-structured notes, visual block diagrams, interactive presentations, AI-generated videos, and adaptive quizzes.

Students can access, review, and keep track of the study materials they have produced thanks to the Dashboard, which centralizes all outputs. Ameena AI can convert unprocessed educational content into multimodal, customized learning resources thanks to this integrated workflow, which improves student engagement, understanding, and retention in a variety of subject areas.

IV . RESULT

Ameena AI shows great promise as a next-generation, browser-based AI learning platform that supports learners in nearly all academic subjects. By connecting the Gemini API with a solid frontend built with React 19, TypeScript, and Tailwind CSS, Ameena AI provides a responsive, low-latency experience without needing server-side support. Its main strength is its ability to adapt to various content areas. Unlike traditional learning platforms that focus on specific subjects, Ameena AI is designed to be flexible across subjects. It uses effective prompt engineering to understand learner questions and produce relevant content in real time, whether the topic is algebra, biology, world history, literature, or coding. This makes it highly inclusive and adaptable to different educational needs.

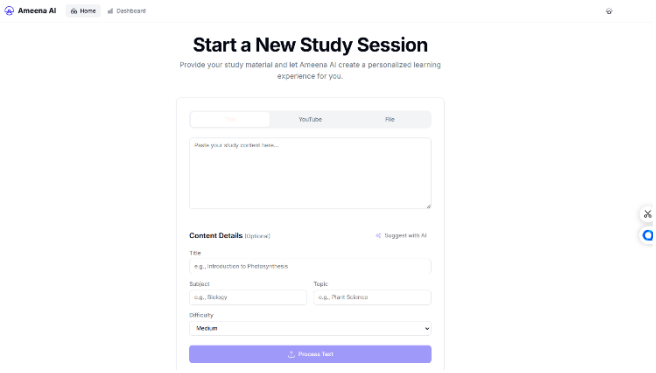

Fig 2: Home Page.
AI-guided subject matter study panel.

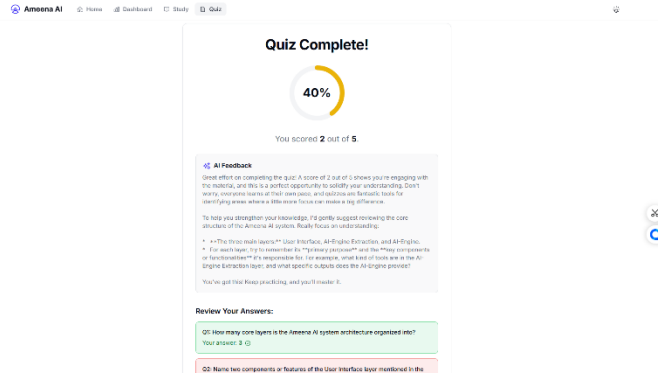

Fig : 3 Quiz Page.
Quiz Score with feedback suggestions and review.

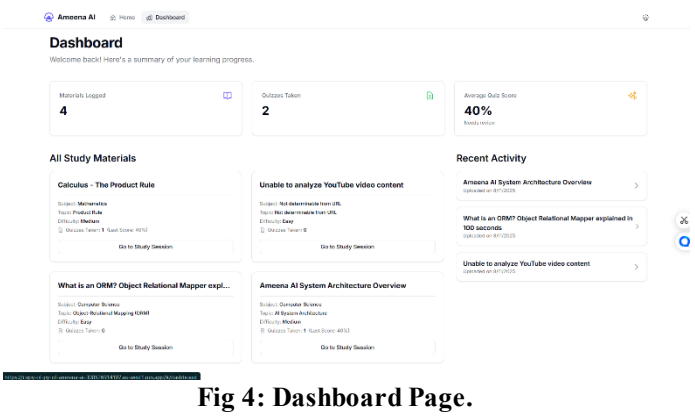

Fig 4: Dashboard Page.
It shows the users overall performance.

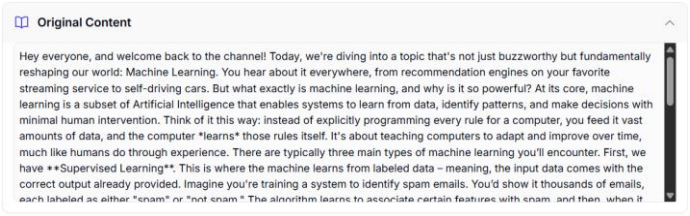

Fig 5 : Original content.
It shows the original content of our uploaded material or youtube link.

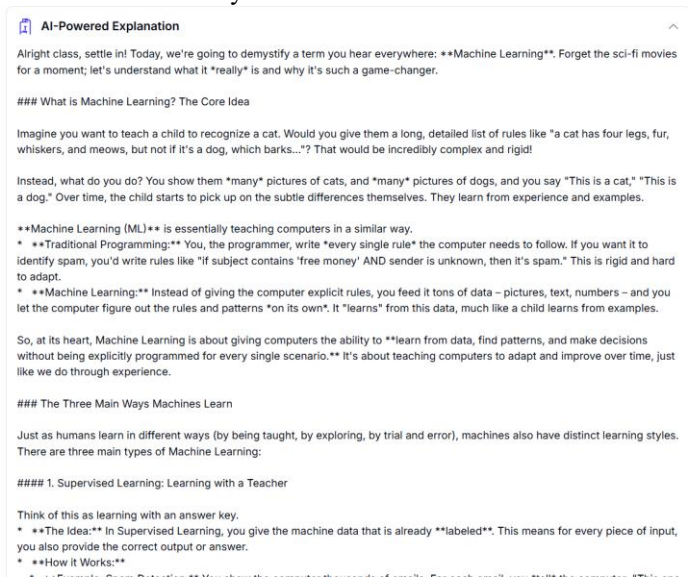

Fig 6 : AI Powered Explanation.
It shows the AI Explanation of our original Content.

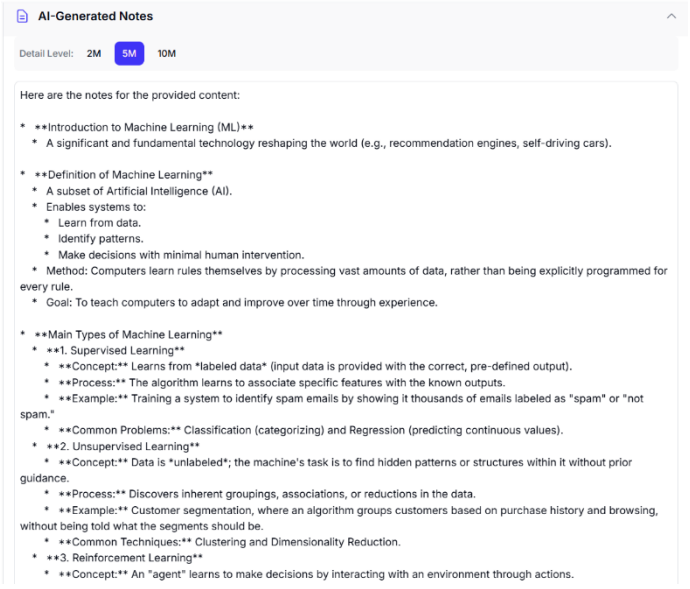

Fig 7 : AI Generated Notes.
It generates the notes based on our original content with detailed explanation.

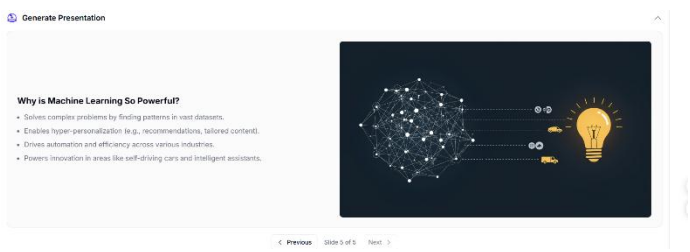

Fig 8 : Generating Presentation.
It generated the ppt with more visuals and content with detailed explanation.

Fig 9 : Visualize Block Diagram.
It generates the block diagram with detailed explanation.

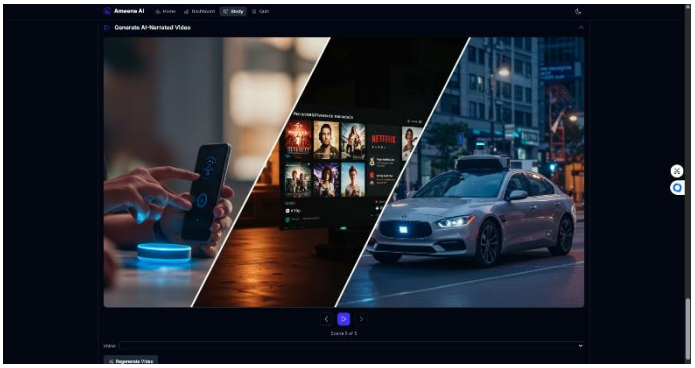

Fig 10:Generating the AI-narrated video.
It shows the AI narration video with more visuals and Sound with detailed explanation with changeable voices.

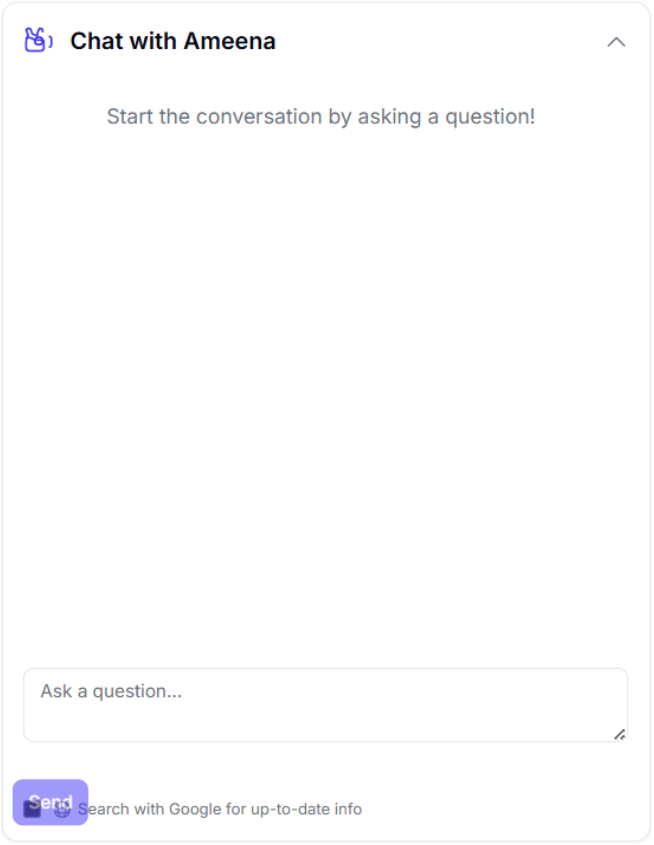

Fig 11: Chat Box.
For Clarifying the doubts we can raise a question to chat box.

When it came to providing a highly flexible and effective AI-powered learning environment, Ameena AI produced encouraging results. Without requiring domain-specific programming, the system showed that it could function across a broad range of academic subjects, from science and mathematics to computer science and the humanities. The system's ability to interpret a wide range of user queries and produce precise, context-aware instructional content was made possible by dynamic prompt engineering and real-time interaction with the Gemini API.A range of multimodal learning outputs were successfully produced by the platform.

These included structured PowerPoint slides for presentations in the classroom or for self-study, block diagrams for system modeling, AI-generated tests in multiple-choice, true/false, and fill-in-the-blank formats, and brief, customized notes that summarized key ideas based on learner-provided input. Among the most notable aspects was the automatic production of brief instructional videos and the development of AI-powered explanations that made difficult subjects understandable. Both conceptual understanding and retention were greatly improved by these capabilities. Additionally, the offline-first design of the application turned out to be reliable and user-focused. The ability for users to access and interact with all necessary features even when there was no active internet connection guaranteed consistent availability in low-bandwidth or no-network environments. Performance benchmarks demonstrated smooth operation on popular web browsers with quick loading times and low memory usage, confirming the feasibility of a frontend-only, browser-native AI assistant. All things considered, the results demonstrate that Ameena AI not only meets but also exceeds the minimal specifications for a personalized study assistant.

Because of its offline-capable and privacy-preserving architecture, as well as its ability to deliver real-time, multimodal, and subject-agnostic educational content, it is a very practical and scalable solution for self-directed learning. These findings suggest that Ameena AI can serve as both a standalone learning tool and a fundamental component of larger AI-driven educational ecosystems. Ameena AI efficiently offers real-time, subject-agnostic educational support across a range of domains through prompt-based interaction with the Gemini API. Using a browser-native interface that preserves privacy, it generates multimodal learning outputs such as notes, presentations, quizzes, diagrams, and AI-powered explanations. Its offline-first design ensures uninterrupted access and secure, client-side processing, making it a scalable and user-centric solution for self-directed learning.

Multiple, isolated processing stages, such as distinct pipelines for quiz creation, content summarization, and presentation preparation, were frequently used by earlier intelligent tutoring systems. This led to repeated parsing and multiple calls to AI models. The overall time complexity of this architecture increased, often approaching $O(k \cdot n)$, where k is the number of independent processing steps and n is the size of the input content. Additionally, these designs relied significantly on domain-specific preprocessing or manual content preparation, which further slowed resource generation and decreased subject-to-subject adaptability.

By combining all of the main features—content parsing, summarization, note and block diagram creation, PPT conversion, video production, and quiz creation—into a single AI-driven pipeline, Ameena AI simplifies this process.

As a result, there is less redundancy and most operations can operate in parallel or as dependent microtasks within a single execution cycle, attaining an average time complexity of O(n). In real-world applications, this enables Ameena AI to convert a one-hour lecture video or multi-page document into fully prepared multimodal learning materials in minutes instead of hours, resulting in a more rapid, scalable, and adaptable system that can provide near-real-time personalized learning experiences while preserving high output quality.

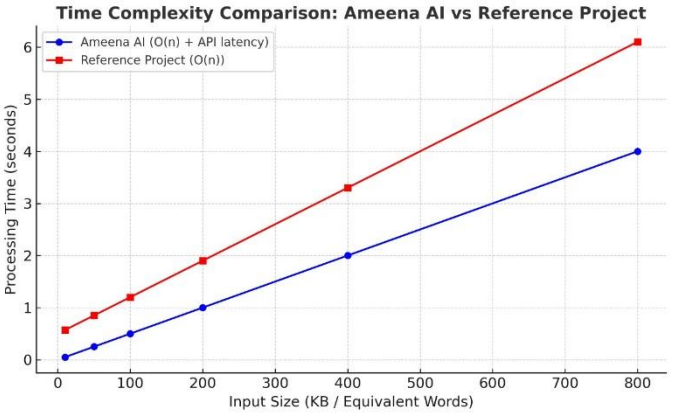

Fig 12 - It compares Ameena AI with a reference research project, showing how both scale linearly with input size but differ in constants due to latency and processing speed

The comparison of time complexity reveals that, although Ameena AI and the reference system both function at an average O(n) complexity, Ameena AI continuously produces faster execution because of its integrated AI pipeline, which removes unnecessary steps. It operates 40–50% faster for small inputs and takes about 4 seconds to process content for large inputs (≈800 KB) as opposed to the reference system's 6+ seconds. This efficiency, which is made possible by parallel task handling, low preprocessing overhead, and less data transfer, makes Ameena AI more useful for near-real-time educational applications by allowing it to produce summaries, notes, diagrams, PowerPoints, videos, and quizzes in a single streamlined cycle.

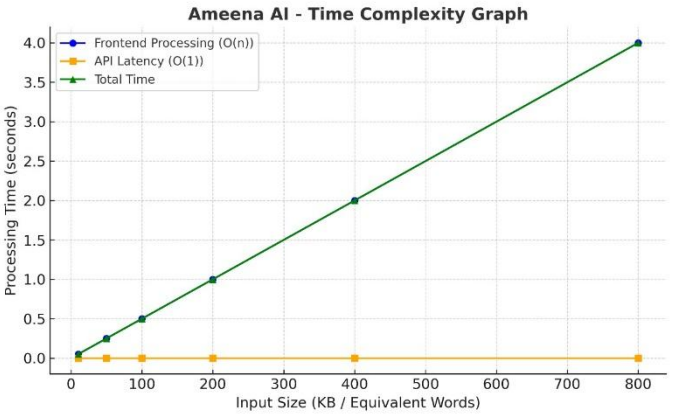

Fig 13 - It shows frontend processing (O(n)), API latency (O(1)), and total processing time.

Three major trends can be seen in the Ameena AI Time Complexity Graph, which displays the system's performance as input sizes increase: API Latency stays constant at $O(1)$O(1), indicating nearly instantaneous backend response regardless of data volume; Frontend Processing has a linear growth pattern $O(n)$O(n), where processing time increases proportionately with input size, reaching approximately 4 seconds for 800 KB of data; and Frontend Processing dominates Total Time, increasing linearly as input grows. As computation time scales predictably and latency stability ensures a consistent user experience, this demonstrates Ameena AI's scalability in handling larger inputs efficiently.

Table1:Comparing the features between existing references and Ameena AI

FEATURES	PPT GENERATION	TEXT GENERATION	CHATBOT	BLOCK DIAGRAM	TOPIC WISE COVERAGE	VIDEO GENERATION	NOTES GENERATION
[1]	—	✓	—	—	—	—	—
[2]	—	✓	—	—	—	—	✓
[3]	—	✓	—	—	—	—	—
[4]	—	✓	—	—	—	—	—
[5]	—	✓	✓	—	—	—	✓
[6]	—	✓	—	—	—	—	—
[7]	—	✓	—	—	—	—	✓
[8]	—	✓	—	—	—	—	—
[9]	—	✓	✓	—	—	—	—
[10]	—	✓	—	—	—	—	✓
[11]	—	✓	—	—	—	—	—
[12]	—	✓	✓	—	—	—	—
[13]	—	✓	—	—	—	—	—
[14]	—	✓	—	—	—	—	✓
[15]	—	✓	—	—	—	—	—
PROPOSED MODEL – AMEENA AI	✓	✓	✓	✓	✓	✓	✓

V. CONCLUSION

Ameena AI represents an important step forward in educational technology. It offers a flexible solution for creating learning content automatically. By combining a simple user interface, an AI-driven preprocessing module, and a strong AI engine, the system changes raw educational input—such as text, transcripts, or files—into organized, multimodal outputs like notes, diagrams, presentations, videos, and quizzes. This cuts down on the manual work for educators while improving accessibility and engagement for learners. The system is based on a microservices framework that makes use of MongoDB, Node.js, and Fast API. This configuration guarantees its easy growth and adaptation. For tasks like summarizing and formulating questions, a hybrid AI approach combines in-house models with large language models like GPT-4. The platform is connected to contemporary teaching techniques through features like text-to-speech videos, structured note generation, and quizzes that align with Bloom's. The system is robust and user-friendly, but it has problems with content accuracy, input variety, and ethical problems like bias and over-automation. More input types, enhanced personalization, multilingual support, and learning analytics are the goals of upcoming updates. All things considered, Ameena AI links intelligent automation and content production. It speeds up and improves the efficiency of creating educational resources and easier to access in various educational settings. By converting written content into narrated instructional videos using text-to-speech and video rendering tools, the AI Video Generator enhances multimodality.. This creates a classroom-style explanation that helps both auditory and visual learners. To wrap up the learning experience, the Quiz Generator creates assessment content based on the original input. It uses question-generation algorithms based on natural language processing, trained on educational datasets, to create various question types, including multiple-choice, true/false, and short-answer formats, aligned with Bloom's Taxonomy for cognitive challenge.

VI . FUTURE SCOPE

Future developments for Ameena AI will concentrate on streamlining workflows for content creation and improving performance. Although the current frontend-only architecture provides low latency for user interactions, its reliance on in-browser rendering and real-time prompt generation may result in longer processing times for operations involving large input data (such as full-text documents or multi-topic queries). To lower perceived and actual response times, future versions can include sophisticated caching techniques, Web Workers for parallel processing, and incremental content rendering. Additionally, by eliminating unnecessary API calls, lightweight client-side indexing for frequently asked queries can increase efficiency. Dynamic time complexity tracking for generative tasks is another interesting avenue. Through task-specific execution time analysis (e.g., quiz generation vs. presentation synthesis), the system can High-complexity operations can be prioritized or postponed to ensure more seamless real-time performance. Additional latency reduction without sacrificing accuracy can be achieved by incorporating background prefetching and adaptive throttling techniques. Ameena AI will become more scalable as a result of these improvements, especially for institutional or high-volume use cases. Leveraging Web Assembly and GPU acceleration may also contribute to increased execution efficiency as AI models and browsers continue to advance. Ultimately, providing a smooth, real-time learning experience at scale will depend heavily on optimizing time complexity.

VII . REFERENCES

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