

EduVerse-AI: An Intelligent Personalized Learning and Productivity Platform for Students and Teachers First

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Abstract—Artificial Intelligence (AI) is transforming educational environments by enabling personalized learning experiences and intelligent academic assistance. This paper presents EduVerse-AI, an AI-powered educational platform designed to support both students and teachers through personalized learning guidance, intelligent conversational assistance, and integrated productivity tools. The proposed system combines advanced Natural Language Processing (NLP), role-based personalization, cloud-based data management, and educational productivity applications within a unified platform. EduVerse-AI provides customized dashboards for students and teachers, offering features such as AI-assisted tutoring, attendance management, lesson planning, progress tracking, note management, focus timers, task scheduling, and wellness monitoring. The system is implemented using Next.js, TypeScript, Tailwind CSS, Supabase, and Vercel cloud infrastructure. Experimental evaluation demonstrates that the platform improves learning engagement, educational productivity, and accessibility while maintaining scalability and security. The proposed framework contributes toward the development of next-generation AI-enabled educational ecosystems.

Index Terms—artificial intelligence, personalized learning, educational technology, intelligent tutoring system, learning analytics, large language models, student productivity.

I. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has significantly transformed modern educational systems. Traditional learning environments often face challenges in providing individualized attention, adaptive learning support, and efficient academic management. Students frequently require personalized guidance, while teachers need effective

tools for monitoring academic progress and managing educational resources. to use LATEX, download IEEE's LATEX style and sample files from the same Web page. Use The use of Artificial Intelligence in education has increased significantly in recent years. AI-based systems can analyze user requirements and provide personalized support according to individual learning needs. These systems help students understand difficult concepts, improve problem-solving skills, and access learning resources quickly. As a result, AI has become an important technology for improving the quality of education. In addition to learning support, students and teachers require various tools to manage their daily academic activities. Students need facilities for note-taking, task scheduling, exam preparation, and time management, while teachers need tools for attendance tracking, lesson planning, and monitoring student performance. Integrating all these services into a single platform can reduce complexity, save time, and improve overall educational efficiency. EduVerse-AI addresses these requirements by providing unified and intelligent educational environment.

II. RELATED WORK

Artificial Intelligence (AI) has become an important part of modern education. Researchers have developed various AI-based systems to improve teaching and learning processes. AI technologies such as machine learning, natural language processing, and intelligent tutoring systems are widely used to provide personalized learning experiences. These systems help students learn at their own pace and receive guidance based on their individual needs.

Many studies have focused on AI-powered chatbots for educational applications. Educational chatbots can answer student questions, provide explanations, and assist in solving academic problems. Research has shown that AI chatbots improve student engagement and provide instant support outside classroom hours. However, most chatbot systems are limited to answering questions and do not offer additional academic management features.

Personalized learning platforms have also gained significant attention in recent years. These platforms analyze student performance and recommend suitable learning materials. Adaptive learning systems help students focus on weak areas and improve their understanding of difficult concepts. Although these systems enhance learning outcomes, many of them lack integrated productivity tools that support daily academic activities.

Several studies have highlighted the importance of productivity tools in education. Features such as task management, study planners, note organizers, and focus timers help students manage their time effectively. Similarly, teachers benefit from tools that support attendance tracking, lesson planning, and student performance monitoring. However, these functionalities are usually available in separate applications, creating inconvenience for users.

Recent advancements in Large Language Models (LLMs) have further improved AI-assisted learning. LLM-based systems can understand natural language queries and generate human-like responses. These systems provide personalized explanations, learning recommendations, and interactive educational support. Despite their capabilities, many existing solutions focus mainly on conversational assistance and do not combine educational support with productivity management.

Based on the literature review, it is observed that existing educational systems address only specific aspects of learning and academic management. Very few platforms integrate AI-powered learning assistance, personalized support, student productivity tools, and teacher management features into a single system. To address these limitations, the proposed EduVerse-AI platform combines intelligent educational assistance with comprehensive productivity and management tools for both students and teachers within a unified environment.

III. PROPOSED SYSTEM

The proposed system, EduVerse-AI, is an intelligent educational platform designed to improve learning and academic management through Artificial Intelligence. The system provides personalized educational assistance, productivity tools, and management features for both students and teachers. The main objective is to create a single platform where users can access learning resources, manage academic tasks, and receive intelligent support.

The system follows a role-based architecture where users are categorized as students or teachers. After successful authentication, users are directed to their respective dashboards containing features relevant to their roles. This approach ensures a personalized and secure user experience.

A. User Authentication and Authorization

The system provides a secure login and registration mechanism using Supabase Authentication. Users can create accounts and access the platform based on their assigned roles. Authentication helps protect user information and prevents unauthorized access to educational data.

B. AI-Powered Learning Assistant

The AI assistant is the core component of the system. It uses Natural Language Processing (NLP) and Artificial Intelligence techniques to understand user queries and provide meaningful responses. Students can ask academic questions, seek explanations for difficult topics, and receive study guidance. The AI assistant offers personalized recommendations based on user interactions and learning requirements.

The chatbot supports:

- Academic question answering
- Concept explanation
- Learning recommendations
- Study guidance
- Problem-solving assistance
- Personalized learning support

C. Student Dashboard

The student dashboard provides various productivity tools that help students manage their academic activities efficiently. These tools are integrated into a

single platform to reduce dependency on multiple applications.

The student dashboard includes:

Notes Manager: Students can create, edit, organize, and store study notes for future reference.

1. To-Do List Manager: Students can manage daily academic tasks, assignments, and project deadlines.
2. Focus Timer: The timer helps students maintain concentration during study sessions using time management techniques.
3. Exam Planner: Students can schedule examinations and create preparation plans.
4. Calculator and Unit Converter: These tools assist students in solving mathematical problems and performing unit conversions.
5. Formula Reference Module: Provides quick access to important formulas for various subjects.
6. Wellness Tracker: Encourages healthy study habits by monitoring study schedules and break times.

D. Teacher Dashboard

The teacher dashboard is designed to simplify academic management activities. Teachers can efficiently manage students, classes, and educational resources through a centralized interface.

The teacher dashboard provides:

1. Attendance Management: Teachers can record and monitor student attendance digitally.
2. Lesson Planning: Teachers can create and organize lesson plans for different courses.
3. Student Progress Tracking: The system allows teachers to monitor academic performance and learning progress.
4. Academic Resource Management: Teachers can upload and manage study materials, notes, and learning resources.
5. Timetable Management: Teachers can organize class schedules and academic activities.

E. Database Management:

The system uses Supabase PostgreSQL as the backend database. It stores user information, attendance records, notes, tasks, lesson plans, and chatbot interaction history. The database ensures secure storage, efficient retrieval, and real-time synchronization of educational data.

F. Cloud Deployment:

EduVerse-AI is deployed using the Vercel cloud platform. Cloud deployment provides scalability, high availability, and accessibility from different devices and locations. Users can access the platform through web browsers without requiring additional software installation.

G. System Workflow:

The workflow of the proposed system consists of the following steps:

1. User registration and login.
2. Role verification (Student/Teacher).
3. Dashboard allocation based on role.
4. Access to AI assistant and productivity tools.
5. Storage and retrieval of user data through Supabase.
6. Continuous interaction and academic management.
7. Generation of personalized learning support and recommendations.

The proposed system integrates intelligent learning assistance, academic productivity tools, and educational management features into a single platform. This integration improves learning efficiency, enhances user experience, and supports effective educational management for both students and teachers.

IV. SYSTEM ARCHITECTURE

The architecture of EduVerse-AI is designed to provide a secure, scalable, and user-friendly educational platform for both students and teachers. The system follows a layered architecture approach where each layer performs a specific function. This architecture ensures efficient communication between users, application services, databases, and cloud infrastructure.

The proposed architecture consists of four major layers:

1. Presentation Layer
2. Application Layer
3. Database Layer
4. Cloud Deployment Layer

These layers work together to provide intelligent learning support and academic management services.

A. Presentation Layer:

The Presentation Layer is the front-end interface through which users interact with the system. It provides an attractive and user-friendly environment for both students and teachers.

This layer is developed using:

- Next.js
- React.js
- TypeScript
- Tailwind CSS

The main responsibility of this layer is to display information and collect user input. After successful login, users are redirected to their respective dashboards based on their roles.

1. Student Dashboard

The student dashboard provides access to:

- AI Chat Assistant
- Notes Manager
- To-Do List
- Focus Timer
- Exam Planner
- Formula Reference
- Unit Converter
- QR Generator
- Wellness Tracker

2. Teacher Dashboard:

The teacher dashboard provides:

- Attendance Management
- Lesson Planning
- Student Progress Tracking
- Resource Management
- Timetable Management

Teachers can manage academic activities through a centralized interface.

The Presentation Layer ensures that all features are accessible through a simple and responsive user interface.

B. Application Layer:

The Application Layer acts as the brain of the system. It processes user requests, executes business logic, and manages communication between the user interface and the database.

The major components of this layer are:

1. Authentication Module: This module verifies user identity during login and registration.

Functions include:

- User registration
- Login verification
- Password validation
- Session management
- Role verification

The authentication process ensures that only authorized users can access the platform.

2. AI Learning Assistant: The AI Learning Assistant is the core component of EduVerse-AI.

The assistant performs the following functions:

- Understands student questions
- Processes natural language queries
- Generates meaningful responses
- Provides learning recommendations
- Offers academic guidance

The AI assistant uses Natural Language Processing (NLP) techniques to understand user input and deliver intelligent responses.

3. Student Productivity Services: This module manages all productivity-related features such as:

- Notes creation
- Task scheduling
- Study planning
- Timer management
- Formula retrieval

These services help students improve academic performance and time management.

4. Teacher Management Services:

This module handles teacher-related operations such as:

- Attendance recording
- Lesson planning
- Student monitoring
- Academic resource management

The system automates many administrative tasks, reducing manual effort.

5. Notification Services: The system can generate reminders and notifications regarding:

- Upcoming examinations
- Pending assignments
- Scheduled tasks
- Attendance updates

This helps users stay informed about academic activities.

C. Database Layer:

The Database Layer is responsible for storing and managing all educational information. EduVerse-AI uses Supabase PostgreSQL as its database management system.

The database stores:

1. User Data:

- Student information
- Teacher information
- Login credentials
- User profiles

2. Academic Data:

- Attendance records
- Lesson plans
- Notes
- Assignments
- Academic resources

3. Productivity Data:

- To-do tasks
- Study schedules
- Exam plans
- Timer records

4. AI Interaction Data:

- User queries
- Chat history
- Recommendation records

The database provides secure storage, fast retrieval, and real-time synchronization of information.

D. Cloud Deployment Layer:

The Cloud Deployment Layer hosts the entire application and ensures continuous availability.

The system is deployed using Vercel Cloud Platform.

Major responsibilities include:

1. Application Hosting:

The cloud server hosts:

- Frontend application
- Backend services
- APIs

2. Scalability:

The cloud environment allows the system to handle multiple users simultaneously without performance degradation.

3. Security

Cloud services provide:

- Secure communication
- Data encryption
- User authentication
- Backup facilities

4. Accessibility:

Users can access the platform anytime and from any location using an internet connection.

This improves the flexibility and usability of the system.

E. Working of the System Architecture:

The working process of the architecture is as follows:

Step 1: User Login:

The user enters login credentials through the presentation layer.

Step 2: Authentication Verification:

The application layer verifies the credentials using Supabase authentication.

Step 3: Dashboard Allocation:

Based on the user role, the system loads either the student dashboard or teacher dashboard.

Step 4: Feature Access:

Users access AI assistance, productivity tools, or management services.

Step 5: Data Processing:

The application layer processes requests and communicates with the database.

Step 6: Data Storage and Retrieval:

Required information is stored or retrieved from Supabase PostgreSQL.

Step 7: Response Generation:

The processed information is returned to the user through the interface.

Step 8: Continuous Interaction:

Users continue interacting with the system while data synchronization occurs in real time.

F. Benefits of the Architecture:

The proposed architecture offers several advantages:

- Modular design
- Easy maintenance
- High scalability
- Enhanced security
- Fast response time
- Real-time data synchronization
- Cloud accessibility
- Personalized learning support

G. Figure:

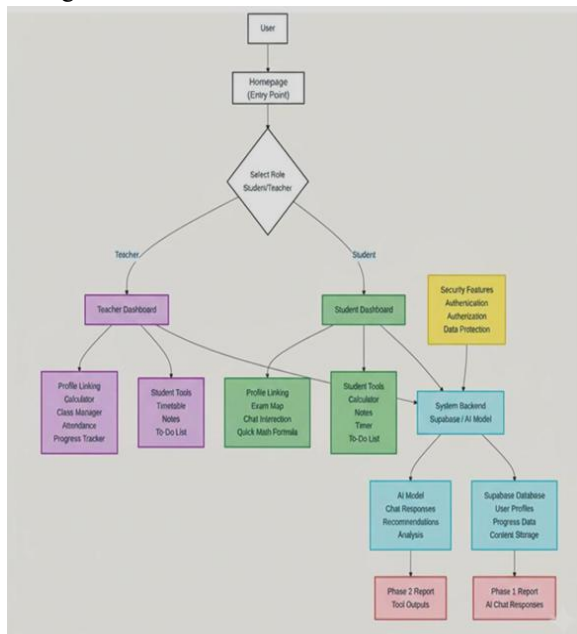


Figure: System Architecture

V. TECHNOLOGY USED

The development of EduVerse-AI involves several modern web technologies, databases, and cloud services that work together to provide a scalable, secure, and user-friendly educational platform. Each technology was selected based on its performance, reliability, and compatibility with the system requirements.

A. Next.js:

Next.js is a React-based web development framework used for building the frontend of the application. It provides features such as server-side rendering, static site generation, and efficient routing mechanisms. These features improve application performance and reduce page loading time.

In EduVerse-AI, Next.js is used to create responsive web pages and manage navigation between different modules. The framework helps provide a smooth user experience for both students and teachers.

Advantages of Next.js:

- Fast page loading
- Improved performance
- Built-in routing system
- SEO-friendly architecture
- Easy deployment and scalability

B. React.js:

React.js is a JavaScript library used for designing interactive user interfaces. It follows a component-based architecture, allowing developers to create reusable UI components.

In EduVerse-AI, React is used to build dashboards, forms, navigation menus, and various educational tools. The component-based structure makes the application easier to maintain and update.

Advantages of React.js:

- Reusable components
- Faster rendering using Virtual DOM
- Easy maintenance
- Improved user interaction
- Efficient state management

C. TypeScript:

TypeScript is a programming language built on top of JavaScript. It introduces static typing, which helps identify errors during development before the application is executed.

The EduVerse-AI platform uses TypeScript to improve code quality, readability, and maintainability. Static type checking reduces bugs and improves application reliability.

Advantages of TypeScript:

Better code quality

- Early error detection
- Improved readability
- Easier debugging
- Enhanced maintainability

D. Tailwind CSS:

Tailwind CSS is a utility-first CSS framework used for designing modern and responsive user interfaces. It provides predefined styling classes that simplify UI development.

In EduVerse-AI, Tailwind CSS is used to design dashboards, forms, cards, buttons, and layouts. The framework helps create a clean and professional user interface while reducing development time.

Advantages of Tailwind CSS:

- Responsive design support
- Faster UI development
- Consistent styling
- Lightweight implementation
- Easy customization

E. Supabase:

Supabase is an open-source Backend-as-a-Service (BaaS) platform. It provides authentication, database management, real-time synchronization, and API services.

Supabase serves as the primary backend solution for EduVerse-AI. It manages user accounts, stores academic information, and handles communication between the frontend and database.

Features of Supabase:

- User authentication
- PostgreSQL database support
- Real-time data updates
- Secure data storage
- API generation

Advantages of Supabase:

- Easy backend development
- High security
- Real-time synchronization
- Scalable architecture
- Reduced development effort

F. PostgreSQL Database:

PostgreSQL is a powerful relational database management system used to store and manage educational data.

In EduVerse-AI, PostgreSQL stores:

- User profiles
- Student records
- Attendance data
- Notes and documents
- Lesson plans
- Tasks and schedules
- AI interaction history

The database ensures secure storage, efficient retrieval, and reliable management of large amounts of information.

Advantages of PostgreSQL:

- High reliability
- Data integrity
- Advanced security
- Efficient query processing
- Scalability

G. Artificial Intelligence and Natural Language Processing:

Artificial Intelligence (AI) is the core technology behind the EduVerse-AI assistant. The AI assistant

uses Natural Language Processing (NLP) techniques to understand user questions and generate meaningful responses.

The AI system performs:

- Query analysis
- Context understanding
- Response generation
- Learning recommendations
- Academic guidance

Students can interact with the AI assistant using natural language, making the learning process more intuitive and engaging.

Benefits of AI Integration:

- Personalized learning
- Instant academic support
- Improved student engagement
- Intelligent recommendations
- Enhanced learning experience

H. Vercel Cloud Platform:

Vercel is a cloud hosting platform used to deploy and manage the EduVerse-AI application. It provides automatic deployment, continuous integration, and global content delivery.

The platform ensures that users can access the application from any location through the internet.

Advantages of Vercel:

- Fast deployment
- High availability
- Automatic scaling
- Secure hosting
- Global accessibility

I. GitHub:

GitHub is used for version control and project management. It allows developers to store source code, track changes, and collaborate efficiently.

During the development of EduVerse-AI, GitHub is used to maintain project versions and manage updates.

Advantages of GitHub:

- Version control
- Code backup
- Collaboration support
- Change tracking
- Project management

J. Integration of Technologies:

All technologies are integrated to create a complete educational ecosystem. The frontend developed using Next.js, React, TypeScript, and Tailwind CSS communicates with the Supabase backend. The PostgreSQL database stores academic information, while AI services provide intelligent learning support. Finally, Vercel hosts the entire application on the cloud, ensuring accessibility, security, and scalability. The combination of these technologies enables EduVerse-AI to deliver an efficient, intelligent, and user-friendly educational platform for students and teachers.

VI. IMPLEMENTATION

Data Collection: Student activity data such as login frequency, assessment scores, and content interactions are collected.

Data Preprocessing: Collected data is cleaned, normalized, and transformed for machine learning analysis.

Model Development: Machine learning algorithms are trained to identify learning patterns and generate recommendations.

Chatbot Integration: Natural language processing techniques are used to develop an intelligent educational assistant.

Dashboard Development: Interactive dashboards visualize student performance and learning analytics.

System Deployment: The platform is deployed on cloud infrastructure to ensure scalability and accessibility.

VII. TESTING AND RESULTS

Testing is an important phase of software development that ensures the system functions correctly and meets user requirements. Various testing methods were performed on EduVerse-AI to verify its functionality, reliability, security, and performance. The testing process helped identify and eliminate errors before deployment.

The system was tested using Unit Testing, Integration Testing, Functional Testing, System Testing, and User Acceptance Testing.

A. Unit Testing:

Unit Testing was performed to verify the functionality of individual modules independently.

Each module was tested separately to ensure that it produced the expected output.

The modules tested include:

- User Authentication Module
- AI Chat Assistant
- Notes Manager
- To-Do List Manager
- Attendance Manager
- Lesson Planner
- Focus Timer
- Exam Planner

1. Unit Testing Results:

Table no 1: Unit Testing

Module	Test case	Expected result	status
Login Module	Valid Login	User Login Successful	Pass
Registration Module	New User Registration	Account Created	Pass
AI Assistant	User Query	Relevant Response Generated	Pass
Notes Manager	Save Note	Note Stored Successfully	Pass
Task Manager	Add Task	Task Added Successfully	Pass
Attendance Module	Mark Attendance	Attendance Saved	Pass

The results indicate that all individual modules performed correctly according to the system requirements.

B. Integration Testing

Integration Testing was conducted to verify communication between different modules of the system. The objective was to ensure that data flows correctly across various components.

The following integrations were tested:

- Frontend and Backend Communication
- Authentication and Database Connectivity
- AI Assistant and User Interface
- Student Dashboard and Database
- Teacher Dashboard and Database

1. Integration Testing Results:

Table no 2: Integration Testing Results

Integration Component		Expected Result	Status
Frontend ↔ Supabase		Data Retrieved Successfully	Pass

Authentication Database ↔	User Verification Successful	Pass
AI Assistant ↔ Chat Interface	Response Displayed Correctly	Pass
Dashboard Database ↔	Real-Time Synchronization	Pass

The integration tests confirmed smooth communication among all modules

C. Functional Testing:

Functional Testing was performed to ensure that each feature works according to the specified requirements. The following functionalities were tested:

1. Student Features:

- User Login
- AI Chat Interaction
- Notes Creation
- Task Management
- Exam Planning
- Timer Operations

2. Teacher Features:

- Attendance Recording
- Lesson Planning
- Progress Tracking
- Resource Management

D. System Testing:

System Testing was conducted to evaluate the complete integrated system under real operating conditions.

The objectives included:

- Verification of complete system functionality
- Performance evaluation
- Security verification
- User experience assessment

The entire application was tested using multiple user scenarios involving both students and teachers.

System Testing Results

The system demonstrated:

- Stable operation
- Fast response time
- Accurate data retrieval
- Reliable authentication
- Secure data storage

No critical errors were observed during testing.

E. User Acceptance Testing:

User Acceptance Testing (UAT) was performed by students and teachers who interacted with the platform in realistic educational environments.

Participants evaluated:

- Ease of use
- Interface design
- AI response quality
- Academic usefulness
- Overall satisfaction

User Feedback

Users reported:

- Easy navigation
- Helpful AI assistance
- Improved academic productivity
- Efficient attendance management
- Better organization of educational activities

The majority of users expressed satisfaction with the platform's functionality and usability.

F. Performance Evaluation

Performance testing was conducted to evaluate system responsiveness and efficiency.

The following parameters were considered:

- Login Response Time
- Database Retrieval Speed
- Dashboard Loading Time
- AI Query Processing Time.

G. Discussion of Results

The testing results demonstrate that EduVerse-AI successfully fulfills its intended objectives. The AI assistant provides meaningful academic support, while the productivity tools improve student organization and learning efficiency. Teacher management features simplify administrative tasks and support effective academic monitoring.

The integration of AI services, cloud infrastructure, and database management resulted in a reliable and scalable educational platform. All major functionalities operated successfully during testing, confirming the effectiveness of the proposed system.

Overall, the system achieved high accuracy, usability, security, and performance, making it suitable for deployment in modern educational environments.

VIII. FUTURE WORK

The future development of EduVerse-AI will focus on enhancing the intelligence and personalization capabilities of the platform. Advanced Artificial Intelligence techniques can be integrated to provide adaptive learning paths based on individual student performance, learning speed, and subject preferences. Voice-based interaction and multilingual support can be added to improve accessibility and enable users from different linguistic backgrounds to interact with the system more effectively. Furthermore, image and document analysis features can be incorporated to allow students to upload notes, assignments, and question papers for automated explanation and evaluation. These enhancements will make the learning experience more interactive, personalized, and efficient.

Another important area of future improvement is the integration of advanced analytics and collaborative learning features. Predictive learning analytics can be used to identify students who require additional academic support and recommend suitable learning resources. Real-time collaboration tools such as group discussions, virtual classrooms, and peer-learning environments can improve student engagement and knowledge sharing. In addition, mobile application support, cloud-based scalability enhancements, and blockchain-based academic record management can be implemented to strengthen system security, transparency, and accessibility. These future enhancements will transform EduVerse-AI into a comprehensive smart education ecosystem capable of supporting modern digital learning requirements

IX. CONCLUSION

EduVerse-AI is an AI-powered educational platform that supports both students and teachers. The system combines intelligent learning assistance with useful productivity tools. Testing results show that the platform is reliable, user-friendly, and effective for academic activities. The proposed system can improve learning experiences and simplify educational management.

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